



ADDENDUM 5 BID OPPORTUNITY NO. 515-2005

WINNIPEG WATER TREATMENT PROGRAM – SUPPLY OF RAW WATER PUMPS

ISSUED: October 24, 2005
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URGENT

PLEASE FORWARD THIS DOCUMENT TO WHOEVER IS IN POSSESSION OF THE BID OPPORTUNITY

THIS ADDENDUM SHALL BE INCORPORATED INTO THE BID OPPORTUNITY AND SHALL FORM A PART OF THE CONTRACT DOCUMENTS

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Please note the following and attached changes, corrections, additions, deletions, information and/or instructions in connection with the Bid Opportunity, and be governed accordingly. Failure to acknowledge receipt of this Addendum in Paragraph 10 of Form A: Bid may render your Bid non-responsive.

PART A – BID SUBMISSION

Replace: 515-2005_Addendum_4-Bid_Submission with 515-2005_Addendum_5-Bid_Submission
(Form B: Prices has been replaced with Form B(R1): Prices)

PART B – BIDDING PROCEDURES

- Revise: B8.1 to read: The Bidder shall state a price in Canadian funds for each item of the Work identified on Form B: Prices for Alternative 1, Alternative 2 or both.
- Revise: B14.4 to read: Further to B14.1(c), the Evaluated Bid Price shall be the Total Bid Price adjusted for the comparison of Bids only, by adding construction and maintenance costs based on a twenty (20) year life cycle cost analysis.
- Revise: B14.4.1 to read: If there is any discrepancy between the Total Bid Price written in figures, the total Bid Price written in words and the sum of the quantities multiplied by the unit prices for each item, the sum of the quantities multiplied by the unit prices for each item shall take precedence.
- Add: B14.4.2: The construction cost adjustment will be applied only to Alternative 2 and will be based on the cost for the additional facility required to accommodate the VFD alternative using estimated construction costs for piling, concrete, site preparation, earthworks, building superstructure and mechanical and electrical infrastructure.
- Add: B14.4.3 The maintenance cost adjustment will be the maintenance cost for the equipment based on:
- Add: B14.4.3(a) A service life of twenty (20) years for the VSDs used in Alternative 1, and a service life of five (5) years for the VFDs used in Alternative 2.
- Add: B14.4.3(b) The estimated service life of five (5) years for the VFDs used in Alternative 2 will be assumed unless the Bidder provides the Contract Administrator with:
- Add: B14.4.3(b)(i) An extended warranty of longer than five (5) years; or

- Add: B14.4.3(b)(ii) Independently verified evidence that a longer service life is consistently achieved in existing installations of similar size, application and value. This evidence shall include (but is not limited to) statistical data that demonstrates the validity of the claim to the satisfaction of Contract Administrator.
- Add: B14.4.3(c) Requests that the Contract Administrator consider a service life longer than five (5) years for the VFDs used in Alternative 2 shall be made in accordance with B5, prior to the Bid Submission deadline.
- Revise: B14.5 to read: This Contract will be awarded based on: Alternative 1 – pumps, motors and variable speed drives or Alternative 2 – pumps, motors and variable frequency drives. In either case, the City reserves the right to purchase item 1 only.
- Add: B14.5.1 The Bidder is not required to bid on more than one alternative.
- Add: B14.5.2 The City shall have the right to choose the alternative that is in its best interests. If the Bidder has not bid on both alternatives, he shall have no claim against the City if his partial Bid is rejected in favour of an award of the Contract on the basis of an alternative upon which he has not bid.

PART D – SUPPLEMENTAL CONDITIONS

- Revise: D2.2(a) to read: Alternative 1: To supply four (4) raw water pumps including (but not limited to) delivery to Site, training, performance verification support, operation and maintenance manuals, variable speed drives, motors, accessories and spare parts.
- Revise: D2.2(b) to read: Alternative 2: To supply four (4) raw water pumps including (but not limited to) delivery to Site, training, performance verification support, operation and maintenance manuals, four (4) installed VFD's, one (1) spare VFD, accessories, and spare parts.
- Add: D2.2(c) Controls and instrumentation scope defined in Section 17010.
- Revise: D16.1(c)(ii) to read: Satisfactory installation shall be considered complete upon the issuance of Form 102: Certificate of Satisfactory Installation. A separate form is required for each raw water pump and drive and separate form for the entire system.
- Revise: D20.1(a) to read: Measurement and payment for the unit prices as listed in Form B: Prices, shall include all Shop Drawings, equipment, accessories, spare parts, delivery, performance verification and training.
- Revise: D20.1(a)(i) to read: One (1) percent of the unit price will be paid upon the issuance of Certified Shop Drawings for the entire scope of this supply Contract
- Revise: D20.1(a)(ii) to read: Seventy four (74) percent of the unit price will be paid upon issuance of Forms 100: Certificate of Equipment Delivery and 101: Certificate of Readiness to Install and for transference of title to the City of Winnipeg for all Major Equipment.
- Revise: D20.1(a)(iii) to read: A further ten (10) percent of the unit price will be paid upon issuance of Form 102: Certificate of Satisfactory Installation.
- Revise: D20.1(a)(iv) to read: A further ten (10) percent of the unit price will be paid upon the issuance of Form 103: Certificate of Satisfactory Performance.
- Revise: D20.1(a)(v) to read: A further five (5) percent of the unit price will be paid upon the issuance of Form T1: Certificate of Satisfactory Training.

Add: D21.4 The Warranty period for all goods specified in Section 11330 and Section 16815 shall be a minimum of two years from Total Performance.

Add: D21.5 Prior to Substantial Performance for Alternative 2, the Contractor shall provide a written approval from the VFD and motor manufacturers certifying that both pieces of equipment are compatible when used together and maintain their individual warranties. One such written approval shall be provided for each different VFD and motor pair.

PART E – SPECIFICATIONS

Section 11200

Add: 2.2.10 For Alternative 2 – Item 1, the electric motors shall be rated for inverter duty.

Section 16815

Add: Section 16815

VARIABLE FREQUENCY DRIVES

1. GENERAL

1.1 Standards

- .1 All variable frequency drives (VFD's) supplied under this Contract shall meet or exceeds the following Specifications.
- .2 Provide a complete inventory of spare cooling fans, and fuses, for each VFD supplied.
- .3 The adjustable frequency controller shall be designed to operate standard squirrel cage induction motor with a 1.15 S.F. or definite purpose motors meeting National Electrical Manufacturer's Association (NEMA) MG1 Part 31.
- .4 Harmonic loading shall not exceed a motor service factor of 1.0.
- .5 Products shall comply with Institute of Electrical and Electronic Engineers (IEEE) Standard 519.
- .6 VFD unit shall be Underwriters Laboratories Inc. (UL) listed and Canadian Standard Association (CSA) certified.
- .7 VFD unit shall comply with applicable requirements of the latest standards of CSA, American National Standards Institute (ANSI), IEEE and the Canadian Electrical Code (CEC).

1.2 Tests

- .1 Factory testing
 - .1 VFD units are to be factory tested prior to shipment. Provide confirmation from factory of actual tests completed and results.
 - .2 Provide certified copies of production test results required by CSA and Electrical and Electronic Manufacturer's Association of Canada (EEMAC) to the Contract Administrator, prior to acceptance of the equipment.
- .2 Field testing
 - .1 The VFD Manufacturer's Representative shall provide on-site start-up, fine-tuning, commissioning, operator training and instruction.
 - .2 The VFD Manufacturer's Representative shall provide Site functionality test reports indicating loading/current levels during testing as well as control point proving results.
 - .3 The VFD Manufacturer's Representative shall ensure shaft to ground voltages do not exceed 1.5 V at any speed or load requirement.

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- .4 Allow for all costs and labour for as many trips as necessary to complete requirements.
- .5 It is the intent of this Specification to provide a VFD installation that does not adversely affect the electrical system.

The VFD Manufacturer's Representative shall evaluate the predicted effect of the VFD installation on electrical system and advise the Contract Administrator of these effects. Further information about the electrical distribution on-site will be provided upon request.

- .3 Provide certified copies of all production test results required by CSA and NEMA.

2. PRODUCTS

2.1 Variable Frequency Drives

- .1 VFD as supplied by the following acceptable Manufacturer:
 - .1 ABB ACS 800 series.
- .2 Application for the VFDs is for the Raw Water Pumps as described in other Sections.
- .3 Each VFD supplied under this Contract shall be of a modular design that allows for the complete withdrawal of the power module and all electronics from the outer cabinet. For the purpose of removing the power module, the power bars shall be disconnected at the module, some securing screws shall be removed and the power module can then be removed.
- .4 Variable speed controller shall be electronic adjustable frequency and voltage output unit.
- .5 The VFD shall employ a minimum 6-pulse PWM (pulse width modulated) inverter system utilizing Insulated Gate Bipolar Transistors (IGBT) power switching devices and come complete with line reactors or DC link filters.
- .6 The drive shall be rated for continuous duty while operating a NEMA design induction motor of the sizes and operating voltages as shown in the following schedules and indicated on the Drawings. Drive output shall be sized for a 1.0 motor service factor. The VFD shall have a current rating at least 10% in excess of the motor full load amp rating. Overload service factors of 110% for thirty (30) minutes and 135% for one (1) minute must be provided to ensure adequate safety margins. VFD selection shall be based on load current at constant torque ratings. Do not size VFD's based on variable torque maximums.
- .7 The VFD shall have a fixed bridge type converter (PWM) with a minimum of 98% input displacement power factor over a 10 to 100% speed range. The efficiency shall be a minimum of 97% for all inverters when operated at full speed and load.

VARIABLE FREQUENCY DRIVES

- .8 Input voltage shall be as indicated on motor schedules and Drawings (line voltage variation $\pm 10\%$). Based on 347/600 volt systems (Not 575 V). Line frequency variation $\pm 5\%$. Output voltage shall vary with motor speed to nominal motor voltage. Speed stability shall be $\pm 1\%$. Drive shall match torque characteristic of load.
- .9 Input frequency setting signal will be 4 to 20 mA. Output speed monitoring signal shall be 4 to 20 mA.
- .10 Enclosure:
 - .1 Drive shall be installed in motor control centres or with individual CSA one (1) enclosure, drip proof or NEMA 12. Filters to be provided for any forced air cooled enclosures as required by the Manufacturer. VFD(s) shall be suitable for mounting in a typical building electrical room and shall be able to operate under these conditions with no special cleaning requirements. VFD cabinets shall be mounted in such a way that there is adequate room for ventilation and no build up of heat. The minimum clearance in front of VFD's is 1 m.
- .11 Protective devices to be incorporated are:
 - .1 Fast acting electronic circuit board protective devices for protection of electronic components; line transients of up to 6,000 volts with energy levels of 16,770 joules, response time – sub-nanoseconds as manufactured by Psychotics or approved equal.
 - .2 Line reactor, DC link or filter in the drive input to protect electronic components from transient voltage conditions.
 - .3 Design and supply with each VFD the required harmonic filter to comply with IEEE 519 – Standard – to control and mitigate harmonic distortion caused by the VFD. The harmonic filter shall be MTE Matrix Harmonic Trap Filter or approved equivalent.
 - .4 Integral electronic motor overload protection adjustable up to 150% of motor rating for 60 seconds.
 - .5 Overcurrent instantaneous trip 250%.
 - .6 Programmable short-circuit protection.
 - .7 Programmable ground fault protection.
 - .8 Overvoltage/overcurrent DC bus monitor/protection.
 - .9 Undervoltage protection.
 - .10 Loss of phase and phase unbalance protection.
 - .11 Inverter over-temperature protection.

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- .12 Capable of running without motor for start-up.
 - .13 Design and supply with each VFD the required Inverter Output dv/dt filter to limit motor voltage to 1200 volts maximum at motor terminals. The output filter shall be TCI KLC filter or approved equal.
 - .14 Longlead (motor feeder) filter package, as required for these installations. Contractor is responsible to determine where this will be required, and must indicate as to the requirement or non-requirement of longlead filter package components in their submittals.
 - .15 Maximum acceptable noise level is 80dBA at 1m.
- .12 Operation features:
- .1 Integral flush mounted display in VFD cover with keypad for programming, monitoring and operating of drive, accessible through password or other acceptable security measure only.
 - .2 Fault shutdown and indication.
 - .3 Automatic restart following power outage.
 - .4 Ability to disconnect motor load for setup or trouble.
 - .5 Manual speed control (potentiometer or keypad).
 - .6 Adjustable maximum and minimum speed.
 - .7 Acceleration and deceleration time adjustment.
 - .8 Controller “stop” interlock from a NC dry contact.
 - .9 Drive fault contact.
 - .10 Stop/start push buttons on key pad.
 - .11 Transient voltage protection.
 - .12 Provide three (3) dry “C” type contacts programmable for any combination of the following:
 - .1 Running (output frequency being generated).
 - .2 Fault lockout.
 - .3 Stopped.
 - .4 At speed.

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- .5 Under speed.
- .6 Forward/Reverse.
- .7 Low reference.
- .8 Manual/Auto Mode.
- .9 Local/Remote Mode.
- .13 Soft start sequence.
- .14 Minimum of three (3) skip frequencies.
- .15 Provide Computer/Off/Hand selector switch. Keypad C/O/H is not an acceptable replacement.
- .16 Password protection of parameter programming or some method to prevent unauthorized changes.
- .17 Output speed monitoring signal to be 4-20 mA.
- .18 Ethernet data communication gateway.
 - .1 A data communication gateway shall be provided for the connection to the Ethernet Plant Control and Monitoring System. The data communication protocol shall be Modbus/transmission control protocol (TCP).
- .13 Environmental Capabilities: The drive shall operate without mechanical or electrical damage under any combination of conditions as follows:
 - .1 Ambient temperature -0° to 40° C.
 - .2 Humidity 0 to 90% (non condensing).
 - .3 Vibration up to 0.5 g.
 - .4 Altitude 0 to 1250 m.
- .14 Diagnostic and indicating features:
 - .1 Power On indication.
 - .2 Percentage speed indicator.
 - .3 Overload indication.
 - .4 Short circuit indication.
 - .5 Ground fault indication.

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- .6 Overvoltage indication.
- .7 Undervoltage indication.
- .8 High temperature (controller).
- .9 AC voltmeter (output).
- .10 AC ammeter (output).
- .11 Inverter ready.
- .12 Inverter fault.
- .13 External fault.
- .15 Cooling System:
 - .1 Contractor to provide adequate proven cooling devices for VFD equipment.
 - .2 Contractor to ensure any enclosure utilized will not allow a build up of heat. This can be accomplished by use of fans and/or sufficient guarded, filtered openings.
- .16 Normal Distribution
 - .1 Normal power distribution is subject to voltage surges and sags as a normal condition of operation. Design and supply with each VFD the required inverter protection such that the VFD will not be stressed or damaged, in the following conditions:
 - .1 Line surges of up to 115% of rated voltage for up to ten (10) cycles. Based on 347/600 volt systems.
 - .2 Line voltage sags down to 85% of rated voltage of up to one (1) second duration.
 - .2 Control wiring shall be TEW 105° C rise.
 - .3 Terminal blocks in separate control enclosures for remote interface shall be Weidmueller SAK6N or approved equivalent.
 - .4 Provide wire markers at both ends of all control wires, Electrovert Type Z or approved equivalent.
- .17 Spare VFD
 - .1 Provide and supply one complete VFD as spare unit. The spare unit will be used to replace a failed unit. All components shall be supplied as all for VFDs supplied with the pumps. The spare VFD shall be configured with the same parameters as all

VARIABLE FREQUENCY DRIVES

other VFDs. Harmonic Input Filter and Inverter Output filter need not to be supplied with the spare VFD.

2.2 Soft Starter Bypass

- .1 Design and supply with each VFD (except for the spare VFD) a Soft Starter Bypass to provide a further degree of redundancy to the overall system in the event of a VFD malfunction. Each pump could be placed into service at full speed and the VFD is totally isolated for repair work or maintenance. The soft starter shall be ABB model PSTB or approved equal and shall be fully incorporated into the bypass system complete with isolation contactor(s) and up-to-speed bypass contactor. The soft starter shall have, as a minimum 1,800 Volt PIV SCRs.

3. EXECUTION

3.1 Operations Manual Information

- .1 The Contractor shall provide the VFD Manufacturer as built of each motor application. Motor application data will include at a minimum, the following:
 - .1 Motor Manufacturer.
 - .2 Class.
 - .3 Motor model number.
 - .4 Motor serial number.
 - .5 Motor frame.
 - .6 Motor horsepower (hp).
 - .7 Motor full load amps.
 - .8 Motor conductor size.
 - .9 Ground conductor.
 - .10 Length of conductors from VFD to Motor.
 - .11 Motor master control panel (MCP) or fuse and overload.
- .2 Installation
 - .1 Provide all relevant information to the Installation Contractor regarding mounting requirements including concrete pads for all floor mounted equipment. Complete Form 101 as illustrated in Section 01650 – Equipment Installation.

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- .2 Inspect VFD for proper installation and operation settings and complete Form 102 as illustrated in Section 01650 – Equipment Installation. Record inspection results data and append to Form 102.
- .3 The Contractor shall make provisions for the wiring of all interlocks including (but not limited to) vibration switches to the VFD. These interlocks will be active in both the Hand (local) or Auto (remote) configurations.
- .4 Contractor shall ensure that all safety interlocks, control and stop commands shut down the drive as per Manufactures recommended procedure (example, ramp to stop, ramp and hold, or coast to stop). Contactors on the line or load side of the drive are not an approved method of control.
- .5 VFD and motor isolation switch shall be labelled with proper shutdown procedures as follows:

“Caution”

“* Ensure VFD is stopped before operating this switch”.

“* Record all faults before resetting”.

- .6 Motor supply cables/conductors shall be run in conduits separate from supply feeders to line side of VFD. No conductors (supply or motor feeders) are to be taped or otherwise bundled within the conduits.
- .3 Field Quality Control
 - .1 Contractor shall be responsible for complete commissioning of each variable frequency drive to satisfaction of the Contract Administrator and the City. Contractor shall allow for factory representative to completely calibrate all drive circuits after installation on-site.
 - .2 The Contractor shall be responsible for having the Manufacturer representative return to the Site to reset, repair, and re-commission the VFD during the warranty period if problems arise with the normal operation of the VFD. This includes prevention of any motor shaft voltages exceeding 1.5 volts when referenced to ground.
 - .3 Perform functional test on each VFD as specified herein and complete Form 103 as illustrated in Section 01650 - Equipment Installation. Record test data and append to Form 103.
 - .4 Software
 - .1 Provide VFD programming/troubleshooting software to City.
 - .2 Provide VFD Parameter list “as programmed during commissioning” for each VFD.
 - .5 VFD Shop Drawings.

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- .1 The Contractor shall indicate the level of local support detailing response time if a piece of equipment should happen to fail or malfunction. Details are to include estimated replacement part delivery times, as well as nearest parts depot location and a contact name and phone number.
- .2 The Shop Drawings for each type/size of VFD must be specific to that unit. A generic Shop Drawing is not acceptable. The Shop Drawings are to include dimensions and physical details of the cabinets, a wiring diagram and a ladder diagram showing both internal connections and terminals for field wiring.
- .3 Provide labels/lamacoids on each VFD, isolation switch as follows:

“Caution”

“* Ensure VFD is stopped before operating this switch”.

“* Record all faults before re-setting”.
- .4 All Drawings, manuals, parameter settings, and test reports are to be included with the “Electrical Maintenance Manual”. This manual shall be issued in both Hard Copy and Electronic format.

END OF SECTION