

June 6, 2018

Dear Sir:

Attached is Addendum No. 6 dated June 6, 2018 to the Specifications for The Manitoba Water Services Board Contract No. M.W.S.B. 1413, City of Selkirk Wastewater Treatment Plant. Please verify receipt of this Addendum for our records by fax to (204) 726-6290.

ACKNOWLEDGEMENT OF RECEIPT OF ALL ADDENDUMS
MUST BE INCLUDED IN THE TENDER SUBMISSION.**

Failure to include acknowledgement shall cause the tender to be rejected. If Tender is submitted before Addendum is issued, the Board will accept a faxed acknowledgement prior to the tender closing.

Yours truly,

R. Lytle
Construction Manager

The Manitoba Water Services Board
Unit #1A - 2010 Currie Blvd.
Brandon, MB R7B 4E7

Dear Sir:

We have received Addendum No. 6 dated June 6, 2018 to the Specifications for The Manitoba Water Services Board Contract No. M.W.S.B. 1413, City of Selkirk Wastewater Treatment Plant.

Yours truly,

Company

Per

THE MANITOBA WATER SERVICES BOARD

CONTRACT NO. M.W.S.B. 1413

City of Selkirk Wastewater Treatment Plant

ADDENDUM NO. 6

To the tender documents for:

June 6, 2018

1) PRECEDENCE

This addendum forms an integral part of the specifications describing all aspects of the work and is to be read in conjunction therewith.

2) SCOPE

The purpose of this addendum is to amend the following sections of the Tender Documents:

1. Specifications

1.1 Section 01212-Start-Up, Commissioning and Training:

- o Clause 1.3.4.6 shall read as:

.6 All training sessions shall be professionally video taped and catalogued by subject. After recording, the material may be edited and supplemented with professionally produced graphics to provide a permanent record for the Owner's use. Advise all suppliers providing training sessions that the training material will be recorded.

- o Add to Clause 1.3.4:

.7 Video recordings to include titled chapters for easy access to specific subjects and references to location of items in the Operation and Maintenance Manuals. Provide a time codes and time index for presentations that run more than 7 minutes.

.8 Video Recording to be completed by a professional with experience in taping a minimum of three (3) previous wastewater treatment plant training videos.

1.2 Section 02475-Precast Concrete Piles:

- o Clause 1.2.1.1 shall read as:

.1 Supplying precast piles will be measure in linear metred of piling. The number of linear metres to be paid for will be the total number of linear metres piling unloaded and stockpiled at the Site as authorized by the Engineer.

- o Clause 1.6.5 shall read as:

.5 The piling contractor is responsible to install minimum 10 (ten) test piles prior to order rest of the piles. The location of the test piles will be chosen by Engineer. The test pile's driving information shall be reviewed with Engineer and shall be used to determine the order length of the remaining piles. Any unusual condition during pile driving shall be reported to Engineer. An approval is required from Engineer prior to proceed to next pile driving.

○ Clause 3.3.8 shall read as:

.8 Remove, relocate, re-drive and provide additional piles where directed when boulders or other obstructions prevent driving piles to an adequate bearing strata or within allowable tolerances in locations indicated on the Drawings. An approval is required from Engineer prior to proceed to next pile driving.

1.3 Section 15900-HVAC Controls General Provisions:

○ Add Clause 2.1.12:

.12 Provide all major equipment and gas detectors status and alarms from BMS system to Plant PLC via modbus TCP connection.

1.4 Section 16010-Electrical General Requirements:

○ Clause 1.3.3 shall read as:

.3 For Vendor Supplied Packages, the electrical contractor will provide, install and connect (1) 600 V, and in some cases, as shown on panel schedules LP-204A, MP-204B, and PP-204C, (1) 120 V control circuit. It is the responsibility of the vendor to provide transformation, controls and instrumentation and to distribute power and control signals to equipment that comprise the package system. It is Contractor's responsibility to provide power to every equipment, device and instrument installed under this Contract complete with all hardware components such as breakers and cables.

○ Clause 1.3.4 shall read as:

.4 The electrical contractor shall coordinate with the mechanical contractor for installation of all devices associated with HVAC equipment, instruments, gas alarm and air lock pressure alarms.

1.5 Section 16015-Scope of Electrical Work:

○ Clause 1.2.3.3.2 shall read as:

.2 Provide all cabling (power, controls and monitoring) required making a complete and operational facility. It is Contractor's responsibility to provide power and controls cabling to every equipment, device and instrument installed under this Contract complete with all hardware components such as but not limited to breakers, terminal blocks and relays. Provide raceway systems to allow complete installation for all cables.

○ Clause 1.2.3.3.5 shall read as:

.5 Provide power connections from the MCC to the various items of electrical equipment, motors, actuators, gates, HVAC equipment, instrumentation and control equipment.

1.6 Section 16225-Motor Control Center:

○ Clause 1.1.3 shall read as:

.3 All motor I/Os to be hardwired to local control panels as shown on P&IDs. Provide additional monitoring capabilities from drives to main Plant PLC via Modbus TCP protocol.

○ Clause 1.4.3 shall read as:

.3 Provide additional monitoring capabilities each drive to main Plant PLC via Modbus TCP protocol. Each MCC to have one connection point to main Plant PLC.

- Clause 1.5.2.10 shall read as:
 - .10 Modbus TCP communications network of the MCC system and the ancillary equipment.
- Clause 2.8.2. shall read as:
 - .2 Bus Rating:
 - .1 Main horizontal busbars: minimum 800 A continuous, or as indicated.
 - .2 Branch vertical busbars: minimum 300 A continuous, or as indicated.
- Clause 2.10.2.10 shall read as:
 - .10 Spaces indicated as “Reserved for Future VFD” or “Reserved for Future RVS” shall be prepared spaces suitable for VFD or RVS equipment, in accordance with these specifications.
- Clause 2.11.4 shall read as:
 - .4 Control Wiring:
Provide Cat 6 cabling.
- Clause 2.23.7 shall read as:
 - .7 All control and monitoring parameters for motor control and monitoring shall be pre-configured at the factory. This includes settings for overload relays, configuration of soft starters and VFDs, power meters, and any other devices connected within the MCC. Intent is that entire MCC shall be fully tested and verified as fully configured and operational before it leaves the MCC factory. Some modifications to the configurations may be made during commissioning but the MCC shall be shipped as close to final configuration as is possible.
- Clause 3.3.2 shall read as:
 - .2 Provide commissioning start-up assistance at site as required as specified in the Corporation’s equipment installation schedule. The Corporation will give the Supply Contractor advance notification of time to commission at least fourteen (14) days prior to time when start-up assistance is needed. Start-up assistance shall include the onsite presence of at least one MCC manufacturer’s technical representative during the commissioning period. A minimum of five (5) days per MCC. Manufacturer’s representative(s) shall be fully familiar with the equipment supplied under this Contract and be factory-trained in the use and application of the manufacturer’s technology and components, Reduced Voltage Soft Starters (if supplied), and Variable Frequency Drives (if supplied).
- Clause 3.4.1 shall read as:
 - .1 Provide not less than three (3) sessions (up to ten (10) people per session), one (1) day each of on-the-job training of plant personnel MCC system, communications and power supplies. Each session shall include “hands-on” demonstration as reasonably feasible. The training sessions shall follow commissioning of the MCC.
- Delete Clause 2.15 Ground Fault Monitoring System
- Delete Clause 2.17 Thermal Motor Protection Relay
- Delete Clause 2.4.10 General Description CANopen
- Delete Clause 2.10.2.12 CANopen
- Delete Clause 2.15.3 Ground Fault Alarm
- Delete Clause 3.18 Current Sensor

1.7 Section 16301-Automatic Transfer Switch:

o Clause 2.2 shall read as:

2.2 Breaker Type Transfer Equipment

.1 Switchgear built-in (Revise Drawing 05-E007).

.2 Rated: 600 V, 60 Hz, 2000 A, 3 Poles (solid neutral).

o Clause 2.4.3 shall read as:

.3 Two (2) sets SPDT form c auxiliary contacts, rated 240 V, 5 A.

o Add Clause 2.3.6:

.6 Provide normal power supply and emergency power supply statuses to main plant PLC.

1.8 Add Section 16610-Uninterruptible Power Systems Static, attached.

1.9 Section 16720-Data and Voice Systems:

o Clause 1.9.3 shall read as:

.3 Entrance Conduit - Supply and install for exclusive MTS use a 65 mm (2.5") HDPE conduit e/w pull wire from the left hand side of the plywood backboard in the electrical room, through the building wall, to the hydro pole which is to be coordinating during construction with Engineer. The buried conduit must be placed a minimum of 1 m (3') below final grade. All conduits inside the building must be E.M.T. and/or R.G.S., (corrugated pipe is not acceptable) if passing through a grade beam or foundation wall. This conduit must be continuous, have no more than two (2) - 90 degree bends between pull points and be free of "L" type fittings. If more than two (2) - 90 degree bends are required provide an adequately sized pull box. Pull boxes are to be placed on straight conduit runs and are to be fully accessible. Entrance conduit must slope away from the building which is to be coordinated during construction with Engineer.

o Clause 1.9.4 shall read as:

.4 Provide all telephone system (voice and data) requirements for Plant. The telephone system shall consist for primary connection with telecommunications service provided located in electrical room, switching and distribution of incoming telephone lines, telephone communications within Plant and wiring to areas as shown on Drawings. Power to telephone system to be fed from electrical panelboard on UPS power with dedicated power circuits. Provide main telephone enclosure, two dedicated lines (one for main communication and one for auto dialer), enhanced telephone sets including as a minimum: speakerphone, hands-free operation, programmable speed dial, hold, transfer, conference and last number redial features; all enhanced telephone sets to have a message light activated from the attendant console; computer interconnection wiring will be 4 pair Cat 6 data cabling directly from each RJ45 data jack to patch panel without splices or interconnections and less than 90 m per run.

o Clause 1.9.5 shall read as:

.5 Telephone Backboard - Supply and install for Exclusive MTS use, a 1220 x 1220 x 19 mm (4' x 4' x 3/4") plywood backboard mounted 914 mm (36") above finished floor for termination of the telephone entrance cable. At the backboard, provide a 1 m (3') coil of #6 AWG green insulated copper ground wire connected to the street side of the water meter or power ground and one (1)

115 V, 15 A duplex receptacle on a separate circuit. A 1 m (40”) clear working space in front and separation from electrical equipment must be maintained as per MTS standards which is to be coordinated during construction with Engineer. The telephone equipment will be non-exposed. Distribution conduit as per MTS standards.

o Add Clause 1.9.7:

.7 Vendor to provide wireless access point cover study for general admin area to electrical room. Provide between 3-5 wireless access points. Final count to be determined from coverage study review by Engineer.

o Delete Clause 2.4.

o Delete Clause 2.5.

1.10 Section 16840-Security and Video Systems:

o Clause 2.1.1.3 shall read as:

.3 Internal storage suitable for seventy-two (72) hours recording for all cameras.

o Clause 2.1.1.5 shall read as:

.5 Vandal resistant exterior PTZ cameras suitable for minus 40°C complete with enclosure, heaters, weatherproof junction boxes and weatherproof power supply enclosures. Provide power from the electrical panelboard on UPS power complete with breakers required for system.

o Add Clause 2.1.1.7 to read as:

7. Provide all software and licensing requirements for each system supplied. Software and licensing requirements shall include remote logins to remotely view live streams from CCTVs. Provide full programming and configuration of CCTV system and interfacing with Station PLC.

1.11 Section 17130-Power Supplies:

o Clause 2.3.1 shall read as:

.1 Provide an un-interruptible power supply (UPS) in each control panel to power control system and SCADA equipment except for main Plant PLC panel. For main Plant PLC system, provide feed from centralized UPS electrical panel UPS-PP. Refer to Specification Section 16610 for centralized UPS system.

1.12 Section 17276-Process Control Wireless Equipment:

o Add Clause 1.1.3:

.3 Contractor to provide radio path study between new water treatment plant building to each remote site – Dufferin Lift Station, Equalization Pond List Station, UV building. Submit study for review.

.1 For lift stations: Provide antenna pole complete with hardware mounting equipment and antenna base. Radio system enclosure to be mounted on antenna pole as close to control panel shown on 00-E102 as possible. Supply power for radio system from control panel. Final antenna pole length and location to be determined based on antenna study.

.2 For existing UV building: Provide antenna pole complete with hardware mounting equipment. Antenna pole length and location

to be determined based on antenna study. Final location of radio system to be determined based on antenna study, system cable length restrictions and available space for installation inside existing UV building to be determined during construction with Engineer. Supply power to radio system from nearest available electrical panelboard complete with 15 A breaker.

- .3 For main plant building: Provide antenna pole complete with hardware mounting equipment. Antenna pole length and location to be determined based on antenna study. Final location of radio system to be determined based on antenna study, system cable length restrictions and available space for installation inside existing UV building to be determined during construction with Engineer. Supply power to radio system from nearest electrical panelboard on UPS power complete with 15 A breaker. Supply all necessarily cabling and hardware components to receive all signals from lift stations and UV building to main plant PLC. All signals to be integrated into main plant PLC/HMI system.

1.13 Section 17500-Control and Operator Interface Requirements:

- o Clause 2.6.1.1 shall read as:

.1 All new PLC equipment to be based on Honeywell HC900 Process Controller with Honeywell Process Controller Designer software. Main Plant PLC to be equipped with dual CPUs and dual power supplies for redundancy. For individual instruments and devices, which are not physically redundant, provide inherent redundancy through system redundancy such that loss of a single IO or control cable or device will not disable the process because operation will revert to the alternate device(s) and associated IO or alternate system(s). Provide partitioning of Plant at the I/O level.

- o Clause 2.6.1.14 shall read as:

.14 Provide all run-time licenses necessary for the operation of the new PLC and RTU installations.

- o Add Clause 2.6.1.15:

.15 Main Plant PLC and HMI programming to include I/Os (alarms and status signals) from the following: BMS system, fire alarm panel, security panel, generator panel, doorbell entry system, ATS, UPS, MCC, VFDs, wireless radio system, vendor control panels, gates and actuators, instruments and network switches.

2. Drawings

2.1 Reference Drawing 00-C003:

- o Provide 7 Barkman Truck Curbs, Model 43-30012, for the 7 parking lots shown on the Drawing.

2.2 Reference Drawing B-0502:

- o Add detail 9, Typ Interior to Exterior Wall Plan @ Gas Tight Seal: Refer to Drawing B-S001, attached, for details 9 to be added to B-0502.

- Add detail 10, Typ Interior to Exterior Wall Elevation @ Gas Tight Seal: Refer to Drawing B-S001, attached, for detail 10 to be added to B-0502.
- 2.3 Reference Drawings 00-E102 and 05-E011:
- Clarification: Contractor to provide radio path study between new water treatment plant building to each remote site – Dufferin Lift Station, Equalization Pond List Station, UV building. Submit study for review. For details, see SKE-1, attached.
- 2.4 Reference Drawing 00-E102:
- Lift Station Panel: Provide 3 kVA transformer (instead 1.5 kVA).
 - Provide additional 1 pole, 15A breaker to feed Radio equipment.
- 2.5 Reference Drawing 05-E001:
- Delete Main Circuits Breakers from Panels LP-204A, MP-204B, PP-204C.
 - All 120/208 V breakers shall be minimum 14 kA rated.
 - Provide 1 pole, 15 A breakers in Panel MP-204B to feed Fire Alarm Panel, Security Panel.
 - Provide 1 pole, 15 A breakers in Panel MP-204B to feed exterior cameras internal heaters.
- 2.6 Reference Drawing 05-E002:
- Delete Main Circuits Breakers from Panels DP-204A, DP-204B.
 - All 600 V breakers shall be minimum 42 kA rated.
 - Provide (2) 3 pole, 15A breakers in Panel DP-204A to feed actuators.
- 2.7 Reference Drawing 05-E003:
- The switchgear SW-204 shall be Service Entrance Rated, 3 wire system.
 - Use 4C cables between CSTE and SW-204. As per App. B, Figure 3, CEC.
 - Use 3C cables between SW-204 and MCC-1, MCC-2, DP-204A, DP-204B.
 - Use 4C cable between Generator and ATS. As per App. B, Figure 3, CEC.
 - Use 100% Rated, LSIG breaker for generator.
- 2.8 Reference Drawing 05-E004:
- MCC-1: 3 wire system.
- 2.9 Reference Drawing 05-E005:
- MCC-1(Continued): 3 wire system.
- 2.10 Reference Drawing 05-E006:
- MCC-2: 3 wire system.
- 2.11 Reference Drawing 05-E011:
- Add note 2:
 - 2. Vendor control panels and main control panel are interconnected via CAT 5E for additional monitoring status only. All motors, devices, instruments, generator statuses, ATS statuses, etc. to be hardwired to local control panels and to main PLC/HMI panels as shown on P&IDs.

- 2.12 Reference Drawing 20-E102:
- Use only Heat detectors in Classified Areas.
 - Delete Duct smoke detectors in Classified Areas.
- 2.13 Reference Drawing 05-E009, Drawing 05-E011 and Drawing 30-E101:
- Provide 20A 2p breaker in MCC, provide single phase built-in MCC-2, Section 8, 9 kVA transformer. Provide centralized 8 kVA 120/240 V UPS complete with transfer switch with bypass and breakers, and provide 24 cct electrical panelboard (label as UPS-PP) complete with 15 A breakers for all circuits. UPS-PP to be dedicated to centralized UPS power distribution. UPS and electrical panelboard to be located in electrical room.
 - The following equipment is to be connected to UPS-PP: Auto dialer, fire wall box, wireless radio system, main control panel, doorbell entry system, data and voice system and CCTV system.
- 2.14 Add general Note to all P&IDs:
- For control valve and gate actuators, refer to specification 17213 for position switches and indicator requirements as well as minimum monitoring and control signal requirements.
 - All motors, devices, instruments to be hardwired to local control panels and to main PLC/HMI panels as shown on P&IDs.

END OF ADDENDUM

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

1. GENERAL

1.1 Description of System

- .1 The UPS system shall consist of a rectifier/charger, battery, inverter, protective devices, static transfer switch, maintenance breaker-type transfer switch, synchronizing and phase lock circuitry, and controls required to provide regulated, uninterrupted, conditioned power to the critical load.
- .2 The UPS shall include all mechanical and electrical devices that will automatically provide continuity of electrical power within the defined limits without interruption upon failure or degradation of the commercial power source. Continuity of conditioned electric power is maintained for sixty (60) minutes. Upon return of the utility power source, the UPS shall automatically re-assume the full load, while simultaneously recharging the batteries.
- .3 System to use normal power supply mains and battery to provide continuous, regulated AC power to isolated load.
- .4 Equipment to operate continuously and unattended.

1.2 Reference Standards

- .1 Conform to the following reference standards:
 - .1 Canadian Electrical Code.
 - .2 UL Standard 924- Emergency Lighting and Power Equipment.
 - .3 NEMA PE 1-2012 (R2017) Uninterruptible Power Systems (UPS)—Specification and Performance Verification.
 - .4 ASA-C-39.1-latest edition.
 - .5 FCC PT 15, Subpart J, Class B.
 - .6 IEEE Std C62.41.2-2002 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.

1.3 Shop Drawings

- .1 Submit Shop Drawings in accordance with Section 01300 - Submittals.
- .2 Include:
 - .1 Outline sketch showing arrangement of cubicles, meters, controls, recommended aisle spaces, battery rack, battery arrangement and dimensions.
 - .2 Shipping weight.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .3 Schematic diagram showing interconnection of rectifier, inverter, battery, bypass switch, meters, controls and indicating lamps.
- .4 Description of system operation, referenced to schematic diagram, for:
 - .1 Manual control during initial start-up and load transfer to bypass and back to inverter output.
 - .2 Inverter.
 - .3 Bypass.
- .5 System performance and reliability:
 - .1 Consider any deviation from the required output power waveform as a failure in the UPS and include an estimate, with supporting calculations, of the Mean Time Between Failures (MTBF) expressed in hours.
 - .2 Provide an estimate with supporting data for the Mean Time to Repair factor (MTTR).
- .6 Full load kVA output at 0.8 power factor.
- .7 Efficiency of system at 25%, 50%, 75% and 100% rated load.
- .8 Type of ventilation: natural or forced.
- .9 Battery:
 - .1 Number of cells.
 - .2 Maximum and minimum voltages.
 - .3 Type of battery.
 - .4 Type of plates.
 - .5 Catalogue data with cell trade name and type.
 - .6 Size and weight of each cell.
 - .7 Cell charge and discharge curves of voltage, current, time and capacity.
 - .8 Derating factor for specified temperature range.
 - .9 Nominal ampere hour capacity of each cell.
 - .10 Maximum short circuit current.
 - .11 Maximum charging current expected for fully discharged condition.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .12 Recommended low voltage limit for fully discharged condition.
- .13 Expected life.
- .10 Inverter:
 - .1 Type and catalogue number.
 - .2 DC current at minimum battery voltage to produce full load AC output.
- .11 Rectifier:
 - .1 Type and capacity, with catalogue number.
 - .2 Battery charging sequence.
 - .3 Current-time data for SCR protective devices.
 - .4 Guaranteed noise level.
 - .5 Estimated life.
 - .6 Metering.
 - .7 Alarms.
- .12 Manufacturer's field experience with uninterruptible power systems of similar ratings including engineering expertise, manufacturing facilities and listing of UPS units manufactured and installed during last five (5) years including model, customer, location and installation dates.
- .13 Heat losses at no load, 25%, 50%, 75% and 100% of rated output, in kW.
- .14 Cooling air required in m³/s.
- .15 List of recommended spare parts, tools and instruments with catalogue numbers and current prices.
- .16 Typical operation and maintenance manual.
- .17 Description of factory test facilities.
- .18 Manufacturer's maintenance capabilities including:
 - .1 Willingness to undertake maintenance contract.
 - .2 Number of trained personnel available.
 - .3 Location of trained personnel and repair facilities.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

1.4 Operation and Maintenance Data

- .1 Provide data for incorporation into Operation and Maintenance Manual specified in Section 01730.
- .2 Submit interim copies to Engineer prior to notification of factory test date.
- .3 Operation and Maintenance Manual to include:
 - .1 Operation and maintenance instructions concerning design elements, construction features, component functions and maintenance requirements to permit effective operations maintenance and repair.
 - .2 Technical data:
 - .1 Characteristic curves for automatic circuit breakers and protective devices.
 - .2 Project data.
 - .3 Technical description of components.
 - .4 Parts lists with names and addresses of suppliers.

1.5 Maintenance Materials

- .1 Provide maintenance materials as per Manufacturer's recommendation.
- .2 Include:
 - .1 Four (4) sets of each type and size of fuses used.
 - .2 Four (4) sets indicating lamps.
 - .3 Spare parts provided.

1.6 Care, Operation, and Start-Up

- .1 Arrange with Engineer:
 - .1 For factory service engineer to supervise start-up of system, checking, adjusting and testing on site.
 - .2 For instruction of operating and maintenance personnel on theory, construction, installation, operation and maintenance of system:
 - .1 After installation and during site testing.
 - .2 At factory during shop testing.
- .2 Advise on:

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .1 Expected failure rate of equipment.
- .2 Type of expected failures.
- .3 Estimated time between major overhauls based on twenty (20) year equipment life.
- .4 Estimated cost of major overhaul based on current costs and excluding travelling expenses.
- .5 Type and cost of test equipment needed for fault isolating and performing preventive maintenance.

1.7 Delivery and Storage

- .1 Crating:
 - .1 Adequately enclosed and protected from weather and shipping damage by use of minimum 12 mm plywood with vapour barrier inside.
 - .2 For tractor train or sea shipment, use double layer of vapour barrier and 19 mm plywood covering.
 - .3 Subassemblies may be packed separately.
 - .4 Label crates:
 - .1 Shipping address.
 - .2 Weight and dimensions.
 - .3 Serial number of unit and brief description of contents.
 - .4 Stenciled with durable paint on at least two sides of each crate.
 - .5 List of contents:
 - .1 In weatherproof envelope stapled on outside of each crate.
 - .2 Copy placed inside each crate.

1.8 Source Quality Control

- .1 Complete system including rectifier, inverter, bypass switch, remote annunciator panel, controls and battery factory tested in presence of Engineer.
- .2 Notify Engineer:
 - .1 One (1) week in advance of date of factory test.
 - .2 That system has had preliminary testing and has met design requirements satisfactorily.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .3 Test procedures:
 - .1 Prepare blank forms and check sheet with spaces for recording data.
 - .2 Mark check sheet and record test data on forms in duplicate as test proceeds. Attach meter recordings.
 - .3 Provide Engineer's signature on form to indicate concurrence in results reported.
 - .4 Duplicate given to Engineer at end of test.
 - .5 Information from original presented as part of Operation and Maintenance Manual.
- .4 Test equipment:
 - .1 Indicating and recording instruments to satisfaction of Engineer.
 - .2 Instruments used during test, including indicating meters installed as part of system to have recent calibration certificate, or calibrated in presence of Engineer against instruments which have calibration certificates.
 - .3 Dummy load for testing, adjustable to 150% of system rated output at 0.8 power factor lagging.
- .5 Tests:
 - .1 Visual inspection to determine that:
 - .1 Materials, workmanship, and assembly conform to design requirements.
 - .2 Parts are new and free of defects.
 - .3 Battery and components are not damaged.
 - .4 Battery cells are of identical construction.
 - .5 Electrolyte in each cell is at Manufacturer's recommended full level.
 - .6 Each battery cell polarity and polarity of connections to inverter is correct.
 - .7 Proper size fuses are installed.
 - .8 Meters have suitable range.
 - .9 Accessories are present.
 - .10 Portable meters for acceptance tests are suitable and instrument transformers connected correctly.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .2 Demonstrate:
 - .1 System start-up and shut down.
 - .2 Operation during mains power failure, recording output during failure and return of mains power, using oscilloscope and camera attachment. Repeat several times.
 - .3 Adjustable settings.
 - .4 Record values measured at test points using oscilloscope, digital multimeter, and camera attachment.
 - .5 That protective devices and indications function as designed. Record actual settings, and note operation of remote indications and transfer to bypass. Tests to include:
 - .1 Annunciator lights correct indication.
 - .2 Overcurrent on inverter output.
 - .3 Over-voltage and under-voltage of inverter output.
 - .4 DC input voltage to inverter too low. Gradually reduce DC input voltage to inverter while delivering full load output and load to transfer automatically to bypass and inverter shut down. Record input and output values.
 - .6 Simulate over temperature by applying heat to sensor with hot air blower.
 - .7 Simulate fuse blowing to test indication response.
 - .8 Simulate fan failure.
 - .9 Bypass switch automatic operations. Record with camera/oscilloscope absence of load disturbance during automatic bypass switching.
 - .10 Over-voltage of rectifier DC output.
- .3 Harmonic test:
 - .1 With system fully loaded, one-half loaded, and at no load, determine total harmonic content with harmonic distortion meter at output terminals.
 - .2 Determine each harmonic magnitude with harmonic wave analyzer.
 - .3 Measure phase to neutral at 0.8 lagging power factor.
- .4 Transients:
 - .1 With normal power input, apply full load to system.
 - .2 Remove one half load from each phase.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .3 Reapply one half load instantly.
- .4 Record voltages and currents using camera/oscilloscopes and/or visicorder.
- .5 Steady load:
 - .1 Switch system onto AC mains, start inverter and connect dummy 0.8 power factor load.
 - .2 Operate system at full rated load for twenty-four (24) hours and at 125% load for ten (10) minutes in ambient temperature of 40°C.
 - .3 Record data at start of test and at half hour intervals thereafter; including:
 - .1 Input frequency.
 - .2 Input voltage each phase.
 - .3 Input current each phase.
 - .4 Input kW.
 - .5 Output voltage phase to phase, phase to neutral.
 - .6 Output current each phase.
 - .7 Output kW.
 - .8 Temperature of ventilating air-in.
 - .9 Temperature of ventilating air-out.
 - .10 Temperature at critical zones.
 - .11 DC voltage to inverter.
 - .12 DC current to inverter.
 - .13 Rectifier DC current.
- .6 Varying loads:
 - .1 Take one set of readings as above of no load, 25% load, 50% load, 75% load and 125% load.
 - .2 Calculate efficiencies of rectifier, inverter, and complete system.
- .7 Unbalanced loads:
 - .1 Adjust loads on inverter to full load on two phases, 80% load on third phase.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .2 Adjust loads on inverter to zero load on two phases, 20% load on third phase.
- .3 For both cases, record phase and line voltages and currents with phase angles to prove that phase relation remains unchanged with unbalanced loads.
- .8 Battery:
 - .1 Charge battery to ensure cells fully charged. When voltage reaches steady value at end of charge, record:
 - .1 Ambient temperature.
 - .2 Temperature of each cell.
 - .3 Voltage of each cell.
 - .4 Voltage of battery.
 - .5 Charging current.
 - .6 Specific gravity of each cell (lead acid battery only).
 - .2 Discharge battery by operating uninterruptible power system with AC mains open, at full rated output for duration quoted in design requirements. Record, at five (5) minute intervals.
 - .1 Voltage of battery.
 - .2 Current.
 - .3 Voltage of 10% random cells.
 - .4 Ambient temperature.
 - .5 Battery temperature.
 - .6 Specific gravity of 10% random cells (lead acid only).
 - .3 Recharge battery automatically by closing AC mains supply to system for four (4) hour period, with dummy load connected. Record at fifteen (15) minute intervals.
 - .1 Battery voltage.
 - .2 Charging current.
 - .4 At start and finish of charge, record ambient and battery temperatures, and specific gravity of each cell (lead acid only).
 - .5 Repeat discharge test and readings to prove battery was at least 95% recharged in four (4) hour charge period.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .6 Recharge battery.
- .9 Operating sound level:
 - .1 Measure sound level according to ANSI S1.13 using sound level meter with A weighting and slow response, conforming to ANSI S1.4.
 - .2 Take reading by placing meter with microphone pointed at right angles to path of travel of generated sound, positioned at height of 1.5 m and distance of 1 m from equipment to be tested.
 - .3 Measure sound level during low ambient sound level.

1.9 Warranty

- .1 The Construction Manager hereby warrants the battery against defects in material and workmanship in accordance with GC 24, but for ten (10) years. This warranty is for 100% replacement for the first year and prorated in equal yearly decreasing increments for the remaining nine (9) years until the expiration of the warranty at the end of ten (10) years from the date of construction completion.

2. PRODUCTS

2.1 Uninterruptible Power System

- .1 UPS Unit:
 - .1 Refer to UPS Schedule.
- .2 Battery:
 - .1 The battery shall be of the valve regulated lead acid calcium type, comprised of enough multi-cell batteries to meet the DC voltage levels of the UPS.
 - .2 Expected life: Ten (10) years or two-hundred (200) full discharge cycles at full-load.
 - .3 Capacity: The battery to be sized to support the inverter at the kilowatt load specified for the protection time indicated above.
 - .4 Battery circuit breaker: a molded case breaker to be provided for battery short-circuit protection.
 - .5 The battery cabinet shall be constructed of the same materials used in the UPS cabinetry. The battery cabinet shall include slide-out shelves for mounting of the batteries and to provide access for ease of maintenance. (Battery racks are available as an option to using battery cabinets.)
- .3 The UPS system consists of the following major components:
 - .1 Pulse width modulation inverter/charger with output power transformer and control

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- circuits.
- .2 Indicators and alarms.
- .3 Static transfer switch.
- .4 Maintenance bypass switch.
- .5 Battery cabinet and batteries.
- .4 UPS to be continuous type, designed to operate as a true on-line system in the following modes:
 - .1 **Normal** - The critical load to be continuously controlled by the inverter. The inverter charger to derive power as needed from the commercial AC source and supplied filtered AC power to the critical load. In addition, simultaneous float charging of the battery to occur.
 - .2 **Emergency** - Upon failure of the commercial AC power critical load continues to be supplied by the inverter, which without any switching, obtains its power from the storage battery. There is to be no interruption to the critical load upon failure or restoration of the commercial AC source.
 - .3 **Recharge** - Upon restoration of the commercial AC source, the inverter charger to recharge the battery. This is to be an automatic function and causes no interruption to the critical load.
 - .4 **Static Transfer Mode** - If the UPS must be taken out of service for overload, load fault, or internal failures, the static transfer switch to automatically transfer the load to the alternate source with virtually instantaneous transfer and no noticeable interruption in the output.
 - .5 **Maintenance Bypass Mode** - When the UPS requires maintenance or for other reasons is to be taken out of service, a manual bypass transfers the output to the alternate source parallel and interlocked with the static transfer switch alternate position. The by-pass switch to be of molded case circuit breaker type.
- .5 Electrical Characteristics:
 - .1 Electrical Load Capacity: Refer to schedule.
 - .2 Input and Output Voltage Characteristics: Refer to schedule. Input and output frequency to be 60 Hz nominal.
 - .3 Output voltage regulation to be better than plus or minus 2% and frequency regulation 60 Hz, plus or minus 0.1% under any of the following conditions:
 - .1 Input voltage plus or minus 10%.
 - .2 Input frequency plus or minus 5%.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .3 No-load to full-load regulation.
- .4 20% unbalance in output loading.
- .4 Under inverter operation from the storage battery (AC power not available) the output voltage to be within 5% of nominal at full-load for specified discharge period; and the frequency to be within plus or minus 0.5% of nominal. During this mode of operation, system efficiency to be not less than 85%.
- .5 Total harmonic distortion of output waveform to be below 5% under all load conditions. Step loading capabilities to be fifteen (15) seconds maximum from zero to full-load.
- .6 UPS to be capable of sustaining a 125% overload for ten (10) minutes.
- .7 The overall system efficiency, input to output, shall be not less than 85% with the battery fully charged and the system supplying full rated kilowatt load.
- .8 UPS output neutral to be electrically isolated from the input neutral to provide common mode transient and noise attenuation to the critical load. UPS output AC neutral to also be electrically connected in normal operation to UPS chassis providing local ground.
- .9 All power cables and busses to be copper.

2.2 Environmental Criteria

- .1 UPS system shall operate satisfactorily in ambient temperature range of 5 to plus 40°C, relative humidity of 10-85%.
- .2 Noise generated by the UPS under any condition of normal operation not to exceed a sound pressure level of 65 dBA measured 1 m from the surface of the UPS.
- .3 Integral ventilation fans to be provided as necessary to maintain safe temperatures inside cabinet for room ambient not exceeding 40°C.

2.3 System Performance

- .1 Normal operation:
 - .1 System operates on mains power when mains voltage is within plus or minus 10% of nominal value and mains frequency is between 59.5 and 60.5 Hz.
- .2 Battery operation:
 - .1 System transfers automatically to battery operation.
 - .1 When manually selected at control panel.
 - .2 When mains power fails.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .3 When mains voltage varies more than 10% from nominal or mains frequency varies more than 0.5 Hz from 60 Hz.
 - .4 When mains power is restored and mains voltage is within 10% of nominal and mains frequency is within 0.3 Hz of 60 Hz, system automatically resynchronizes with mains.
 - .5 Slew rate of frequency during transition period of system output automatically synchronizing with mains and return to its internal frequency to be set between 0.5-1.0 Hz per second.
- .3 Bypass operation:
- .1 For maintenance purposes, system can be bypassed automatically by manual selection at control panel to connect load directly to AC mains. Transfer without load interruption and leaving inverter energized.
 - .2 Load transfer from mains back to system automatically by manual selection at control panel when maintenance completed.
 - .3 Automatic transfer of load to mains in not more than 1/4 cycle including sensing with inverter left energized but disconnected from load in case of:
 - .1 Inverter overloaded.
 - .2 Short circuit in load.
 - .4 Automatic retransfer of load to system without load interruption when above conditions disappear.
 - .5 Automatic transfer of load to mains in not more than 1/4 cycle including sensing and shutdown of inverter in case of inverter internal malfunctions.
 - .6 Automatic transfer of load to mains without load interruption and inverter shutdown in case of:
 - .1 Over-temperature harmful to system.
 - .2 Loss of forced ventilation.
 - .3 Low voltage of DC supply to inverter.
 - .7 Bypass capable of closing onto and withstanding momentary fault current of 800% of rating for 0.01 s.

2.4 System Protection

- .1 Circuit breakers in system used to isolate it from load and from mains for safe working on equipment, and for manual blocking of bypass automatic control to prevent inadvertent operation of bypass during work on inverter.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .2 Automatic circuit breakers and protection included in:
 - .1 AC input to rectifier.
 - .2 Battery input.
 - .3 Bypass circuit input.
 - .4 Inverter output.
- .3 Surge suppressors:
 - .1 To protect system against supply voltage switching transients.
 - .2 To protect internal circuits where necessary against voltage transients.
- .4 Current limiting devices, with panel front indication of device operation, to protect inverter SCRs.
- .5 Suitable devices, with panel front indication of device operation, to protect rectifier diodes.
- .6 Failure of circuit or component not to cause equipment to operate in dangerous or uncontrolled mode.

2.5 Indicators and Alarms.

- .1 Standard modular control panel to be included in the UPS system and to be equipped with the following metering controls and indicators. All status indicators to have light emitting diodes (LED) for long-life.
 - .1 UPS LED's shall include:
 - .1 "Fault" indicator.
 - .2 "Battery" indicator.
 - .3 "Bypass" indicator.
 - .4 "UPS On" indicator.
 - .5 "AC Input" indicator.
 - .2 Typical status/alarm indication to be displayed as listed below. Provide form "C" dry contacts for integration to main Plant PLC/HMI system.
 - .1 Line Loss.
 - .2 Low Battery.
 - .3 On Bypass.

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .4 UPS Failure.
- .5 Summary Alarm.
- .6 Lamp test.

2.6 Inverter/Charger

- .1 The UPS shall contain a battery recharge rate designed to prolong battery life. Recharge time shall be seven (7) hours maximum to 95% capacity. There shall be DC overvoltage protection so that if the DC voltage exceeds the pre-set limit, the UPS shall shutdown automatically and the critical load shall be transferred to bypass.
- .2 Inverter to have minimum input power factor of 0.98 with nominal input voltage and while operating at full rated load.
- .3 Inverter to have sufficient capacity to support a rated load and recharge the battery to 95% of its full capacity within seven (7) times the discharge time.
- .4 The UPS inverter shall employ electronic current limiting and an output circuit protector.

2.7 Battery

- .1 Battery type and electrical characteristics:
 - .1 Discharge current to supply inverter at full load output, for fifteen (15) minutes.
 - .2 Sealed lead acid: Ten (10) year life.

2.8 Static Bypass Switch

- .1 Two solid state closed circuit automatic transfer switches.
- .2 Logic unit with three normal source voltage sensors, which monitor over-voltage under-voltage and loss of voltage.
- .3 High speed automatic transfer from normal voltage to alternate source when:
 - .1 Normal source voltage lost: transfer time and sensing 1/4 cycle.
 - .2 Normal source: under-voltage at 80% of nominal value adjustable.
 - .3 Normal source: over-voltage at 110% of nominal value.
 - .4 Loss of normal source static switch continuity.
 - .5 Short circuit on normal source trips normal source breaker.
- .4 Return to normal source:

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .1 When normal source remains within return voltage limits of 95-110% of nominal value (adjustable) for approximately one (1) second timing interval, circuit checks voltage balance and phase synchronization, then initiates return with zero switching time.
- .5 Switch position lights and contacts.
- .6 Synchronizing verification light.
- .7 Manual reset push-button.
 - .1 Transfer test switch.
- .8 Alternate power source monitor light.
- .9 Accessories:
 - .1 Manual bypass switch for maintenance and testing without load disturbance.
 - .2 Continuity monitor: automatic transfer to alternate source in event of static switch discontinuity.
 - .3 Alternate power source loss alarm contacts.

2.9 Mechanical Design

- .1 UPS to be housed in a free-standing enclosure.
- .2 Provide matching cabinets for all external components (battery cabinet).

2.10 Communication Module

- .1 UPS to be provided with built-in serial communication module for use with remote monitoring and automated shutdown software.
- .2 Serial communication port to allow SNMP and web-based monitoring and control capabilities of the UPS.

2.11 Equipment Identification

- .1 Provide equipment identification in accordance with Section 11910 - Identification and Section 16010 - Electrical General Requirements.
- .2 For major components such as AC input breaker, inverter breakers, bypass switch: size 4 nameplates.
- .3 For mode lights, alarms, meters: size 2 nameplates.

2.12 Fabrication

- .1 Shop assemble:

UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .1 Rectifier unit.
 - .2 Inverter unit.
 - .3 Bypass switch unit.
 - .4 Battery rack and battery.
- .2 Interconnect units and add remote mode lights, alarms and controls to produce complete UPS before requesting Engineer to witness factory tests.

2.13 Approved Manufacturers

- .1 The following are approved manufactures of this equipment:
- .1 Eaton 9155.

2.14 UPS Schedule

Location	Size	Input Voltage	Output Voltage	Phase	Connection
Electrical Rm.	8 KVA 30 min.	208/120 V	208/120 V	3Ø	MCC

- .1 Refer to Specification Section 17130 for individual UPS for each control panel, SCADA workstation requirements.

3. EXECUTION

3.1 Installation

- .1 Locate UPS cubicles, battery rack and battery as indicated.
- .2 Assemble and interconnect components to provide complete UPS as specified.
- .3 Connect AC mains to main input terminal
- .4 Connect UPS output to load.
- .5 Start-up UPS and make preliminary tests to ensure satisfactory performance.

3.2 Testing

- .1 Perform tests in accordance with Section 16980 - Testing, Adjusting and Balancing of Electrical Equipment and Systems and Section 16990 - Commissioning of Electrical Systems.
- .2 Provide:
 - .1 Competent field personnel to perform test, adjustments and instruction on UPS equipment.

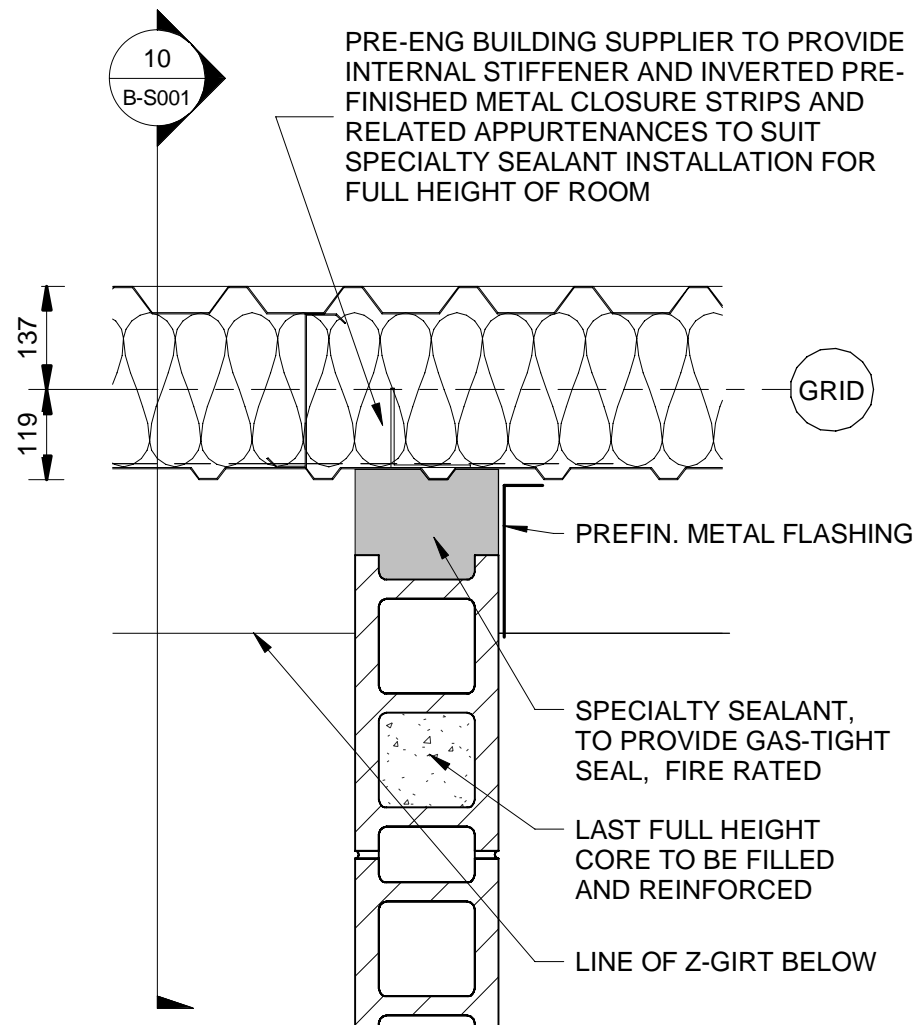
UNINTERRUPTIBLE POWER SYSTEMS STATIC (ADDENDUM 6)

- .2 Dummy load adjustable to 150% of system rated output.
- .3 Notify Engineer ten (10) working days in advance of test date.
- .4 Tests:
 - .1 Inspection of cubicles, battery rack and battery.
 - .2 Inspection of electrical connections.
 - .3 Inspection of installation of remote mode lights and alarms.
 - .4 Demonstration of system start-up and shut-down.
 - .5 Run UPS for minimum period of two (2) hours at full rated load to demonstrate proper operation with AC mains input, and no AC input.
 - .6 Discharge battery by operating UPS with AC mains open for specified duration of full load. Record readings of temperature of each cell. Provide appropriately rated load bank for this full-load testing. Conduct testing in the presence of the Engineer and include test results in Operation and Maintenance Manuals.
 - .7 Recharge battery automatically with full rated load on UPS for four (4) hours and record readings of voltage of each cell.

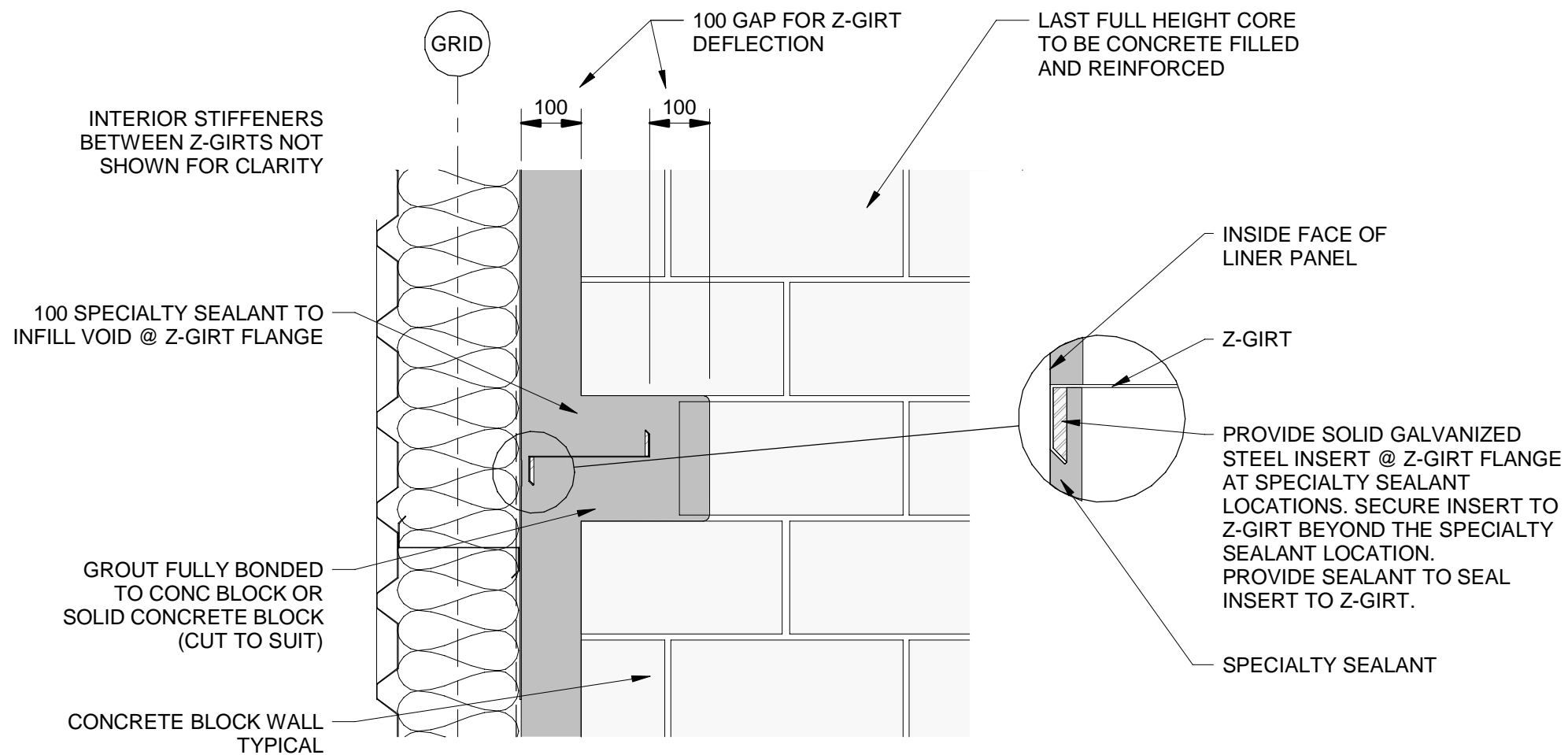
3.3 Training

- .1 Provide demonstration and training on equipment operation and maintenance in accordance with Section 01730 - Operation and Maintenance Manuals and Section 01212 – Start-Up, Commissioning and Training.

END OF SECTION



**9 | TYP INTERIOR TO EXTERIOR WALL PLAN
@ GAS TIGHT SEAL**



**10 | TYP INTERIOR TO EXTERIOR WALL ELEVATION
@ GAS TIGHT SEAL**

NOTES:

1. SPECIALTY SEALANT TO BE APPROPRIATELY SIZED TO BE INFILLED (SITE CONFIRM).
2. SPECIALTY SEALANT TO BE SEALED TO ALL SUBSTRATES AND TO INDIVIDUAL PIECES OF SPECIALTY SEALANT PRODUCT.
3. TYPICAL FOR ALL INTERIOR WALL TO EXTERIOR WALL CONNECTIONS WITH GAS TIGHT SEALS

**TO BE ADDED TO ORIGINAL
ISSUED FOR TENDER DRAWING B0502**

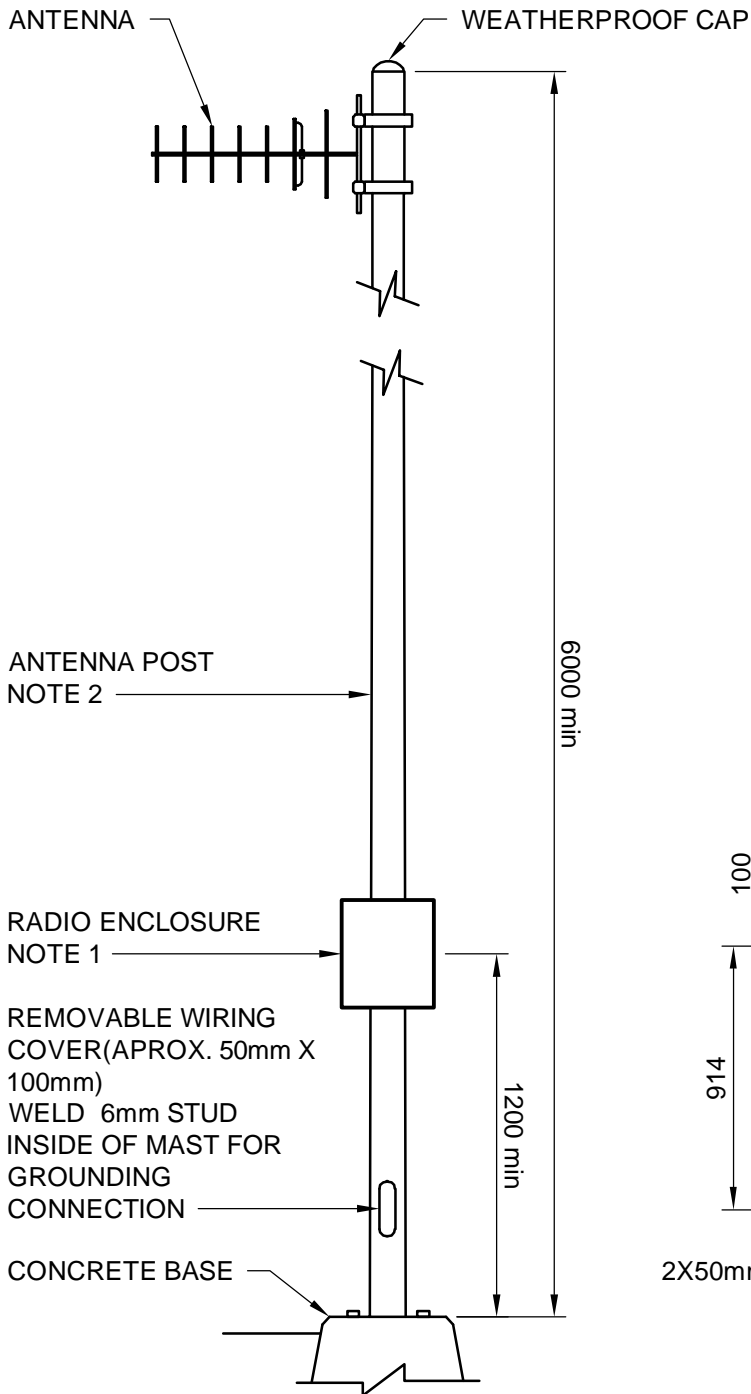
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I/R	DATE	ISSUE / REVISION DESCRIPTION	DES	CHK	APP
1	2018-06-06	ISSUED FOR ADDENDUM	KF	KG	IH

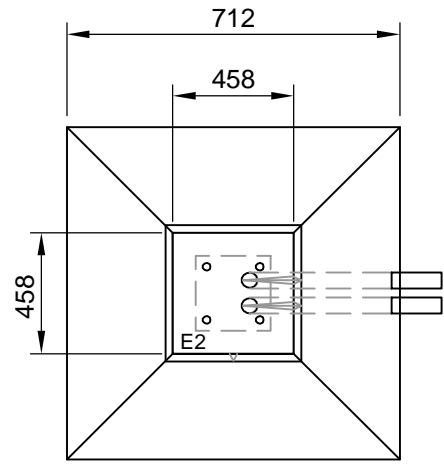


**MANITOBA WATER SERVICES BOARD
CITY OF SELKIRK - WASTEWATER TREATMENT FACILITY
TYPICAL INTERIOR TO EXTERIOR WALL DETAILS AT GAS TIGHT SEALS**

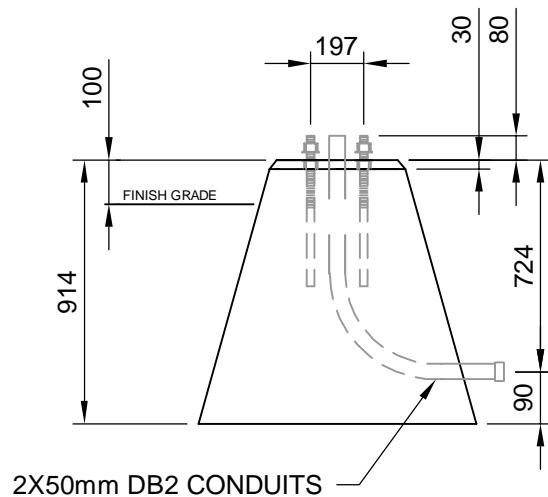
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60530834
DRAWING NUMBER
B-S001



DETAIL SCADA
ANTENNA
N.T.S.



PLAN VIEW



SIDE VIEW

BASE DETAIL
N.T.S.

NOTES:

1. PROVIDE A NEMA 4X, FRP ENCLOSURE, PRE-WIRED WITH TERMINAL BLOCKS AND SPACE TO MOUNT THE RADIO AND ADDITIONAL I/O MODULES. ENCLOSURE TO BE 12" W X 14" H X 8" D.
2. FINAL POLE HEIGHT TO BE DETERMINED FROM ANTENNA PATH STUDY.

ADDENDUM SKE-1