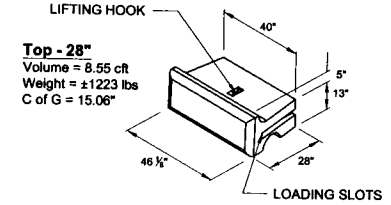
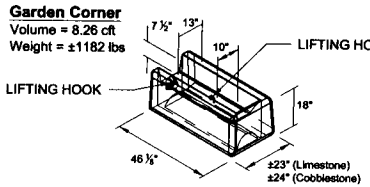
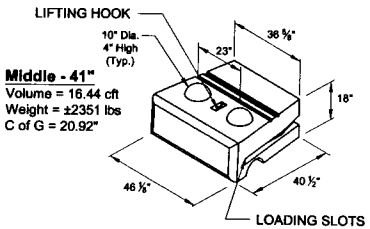


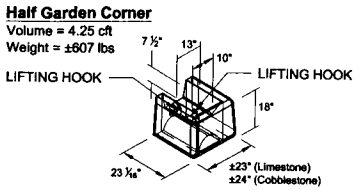
Top - 28"
Volume = 8.55 cft
Weight = ±1223 lbs
C of G = 15.06"



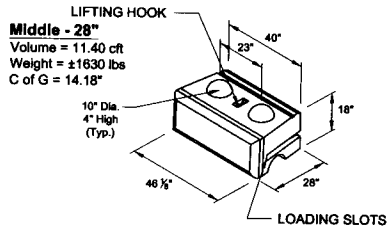
Garden Corner
Volume = 8.26 cft
Weight = ±1182 lbs



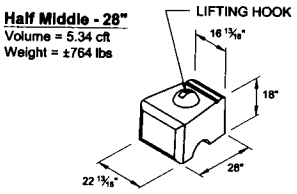
Middle - 41"
Volume = 16.44 cft
Weight = ±2351 lbs
C of G = 20.92"



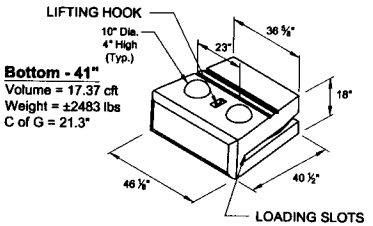
Half Garden Corner
Volume = 4.25 cft
Weight = ±607 lbs



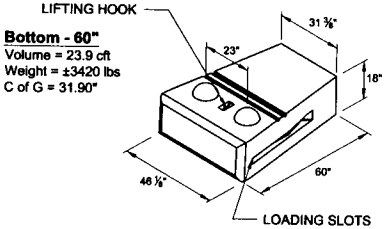
Middle - 28"
Volume = 11.40 cft
Weight = ±1630 lbs
C of G = 14.18"



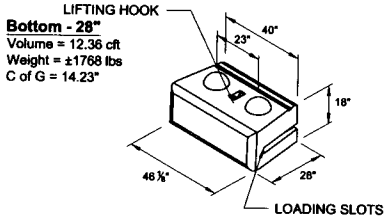
Half Middle - 28"
Volume = 5.34 cft
Weight = ±764 lbs



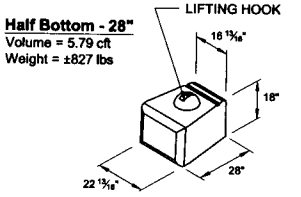
Bottom - 41"
Volume = 17.37 cft
Weight = ±2483 lbs
C of G = 21.3"



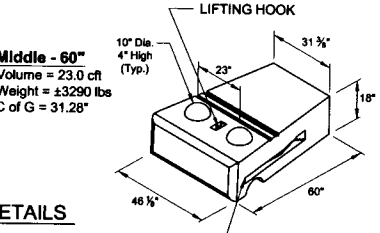
Bottom - 60"
Volume = 23.9 cft
Weight = ±3420 lbs
C of G = 31.90"



Bottom - 28"
Volume = 12.36 cft
Weight = ±1768 lbs
C of G = 14.23"

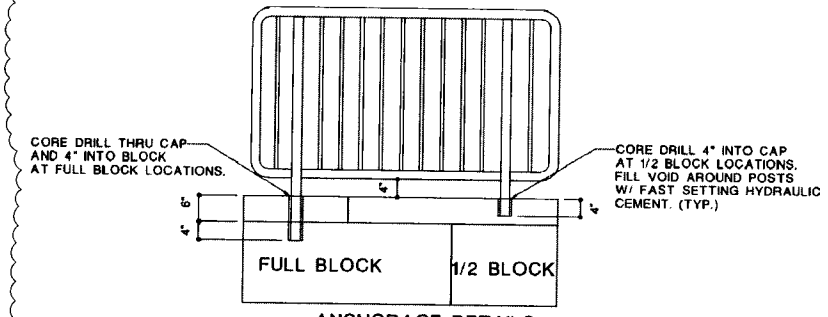


Half Bottom - 28"
Volume = 5.79 cft
Weight = ±827 lbs



Middle - 60"
Volume = 23.0 cft
Weight = ±3290 lbs
C of G = 31.28"

RETAINING WALL BLOCK DETAILS
NOT TO SCALE



ANCHORAGE DETAILS

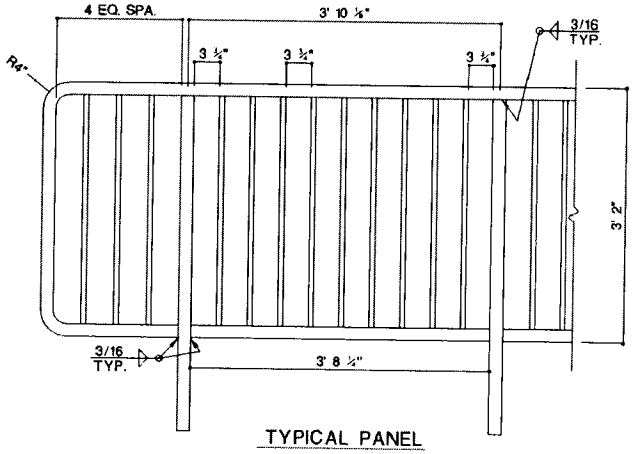
NOTES:

POST AND RAILS TO BE 1-1/2" SCH. 40 PIPE.

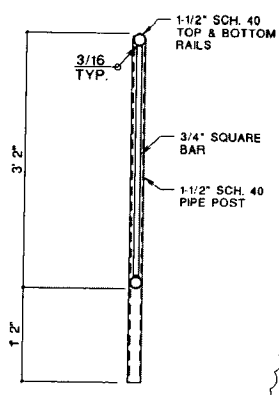
PICKETS TO MEET ASTM A36.

ALL WELDS TO BE 3/16" U.N.O.

RAILING TO BE POWDER COATED BLACK.



TYPICAL PANEL



SECTION

GUARDRAIL DETAILS
NOT TO SCALE

BIDDING DOCUMENTS

GRW PROJECT NO. 4176-01

LFDOS BID No. 137-2014

engineering | architecture | geospatial
www.grwinc.com

RETAINING WALL BLOCK DETAILS AND GUARDRAIL DETAILS

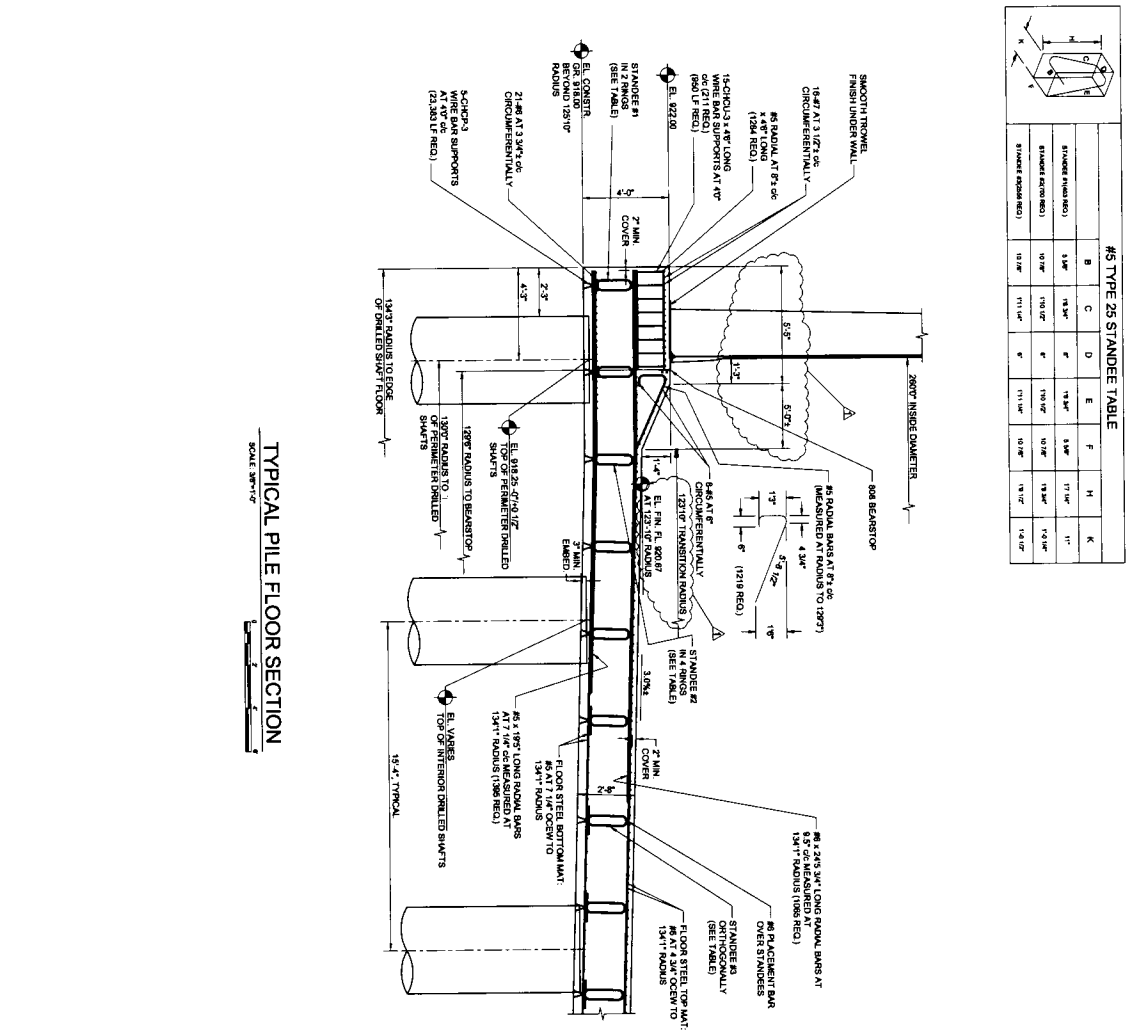
TOWN BRANCH WET WEATHER STORAGE FACILITY
REMEDIAL MEASURES PLAN ID No. G2-TB-1

REVISIONS					
NO.	DESCRIPTION	DATE	BY	CHKD	APPROVED
1	PER ADDENDUM #4	8/27/14	JAB	JAB	JLH

DESIGNED JAB
DRAWN JAB
REVIEWED JLH
APPROVED JLH
DATE AUGUST, 2014
SCALE NTS
SHEET NO. C-0-506

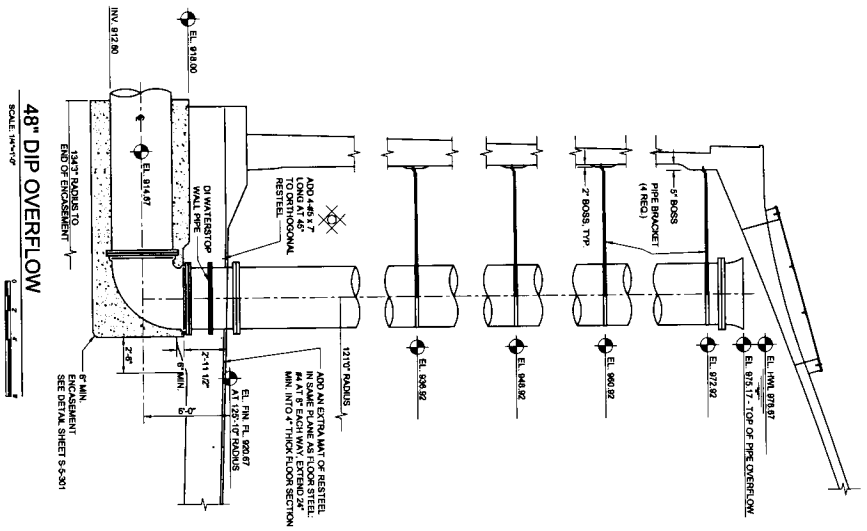
Conformance Set

PLOTTED BY: rhester
PRINTED: 9/18/2014 @ 11:16AM
FILE NAME: U:\4176\LFDOS TB WWS\Working Drawings\Arch\CAD\4176 CA-506.dwg



TYPICAL PILE FLOOR SECTION

SCALE: 3/8"=1'-0"



48" DIP OVERFLOW

SCALE: 1/4"=1'-0"

NOTES:
1. MAINTAIN A MINIMUM OF 18" CLEAR BETWEEN HWL ELEVATION AND ALL HATCHES.

REVISIONS			
NO	DESCRIPTION	DATE	BY
1	PER ADDENDUM #4	9/22/14	JLH

SCALE CHECK: THIS MARK SHOULD MEASURE EXACTLY 1" WHEN PLOTTED

DESIGNED: JLH
DRAWN: RLT
REVIEWED: JLH
APPROVED: JLH

DATE: AUGUST, 2014
SCALE: AS SHOWN
SHEET NO. C-5-302

22 MG STORAGE TANK
TYPICAL SECTIONS

TOWN BRANCH WET WEATHER STORAGE FACILITY
REMEDIAL MEASURES PLAN ID No. G2-TB-1

GRW engineering | architecture | geospatial
www.grwinc.com

GRW PROJECT NO. 4175-01
LFUCG BID No. 137-2014

BIDDING DOCUMENTS

Conformance Set

Addendum 5

Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #5

Bid Number: **#137-2014**

Date: September 25, 2014

Subject: Town Branch Wet Weather Storage Facilities

Address inquiries to:
Sondra Stone
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced Bid:

	Questions	Answers
1.	The EJCDC General Conditions specify the OWNER will provide builders risk insurance that includes coverage for the interests of contractors & subs (See Page 19, Article 5.06 Property Insurance, par. A.). Par. D of that same section on Page 20 states CONTRACTOR, Subcontractors, etc. are responsible for any deductibles on the owner-provided builders risk. Please clarify the amount of the deductible.	The deductible can be any amount, the contractor or sub-contractor has to pay that deductible. The owner, LFUCG is not an insurance company and can't provide builders risk or any other insurance to cover the property of a contractor or sub-contractor. LFUCG required the contractor to carrier builder risk insurance on equipment or machinery used on the work site from loss.
2.	Paragraph E, and language contained in Attachment Number 12 BONDS AND INSURANCE, last paragraph, that mandates flood insurance that may be available MUST be obtained from the FEMA National Flood Insurance Program by either the Contractor or the Owner. We believe the Owner should purchase the flood insurance as part of the builders risk coverage. Please clarify the responsibility for any deductible on the flood policy, which is normally substantial, much higher that deductibles on the standard builder risk coverage for fire, wind, etc.	Flood insurance is only needed in a federal Fema flood plain. LFUCG self insurance does not exclude flood damage to LFUCG owned property. LFUCG does not cover the property of the contractor or sub-contractor.
3.	Also, par. E, will the owner include special coverage's on the builders risk. Hall requests that EARTHQUAKE at full policy limits be included, along with flood insurance if this option is available outside the National Flood Insurance Program.	The Owner, LFUCG, will not provide builders risk or flood insurance for the property or equipment of a contractor or sub-contractor.

4.	Please refer to Plan Sheet C-8-101. It is unclear if the intent is to cut a section out of the existing line and construct the Flow Control Vault or to construct the Flow control vault around the existing pipe and utilize a mega-flange or similar product on the downstream side of the valve on the existing pipe. Please advise.	See Addenda. Megaflange or similar product will be required.
5.	Please refer to the Bid Form page 00410-5, BID SCHEDULE for these questions: Item 2 - System Programming Service Allowance Lump Sum is indicated to be a lump sum amount of $120,000.00 which is to be included in the bid. Please provide a more definitive description of what this allowance covers so there is no duplication in the bid price submitted by the contractors.	See Pay Item No. 2, Specification Section 01025 Measurement and Payment.
6.	On sheet C-0-103 the Retaining Wall is called out a "retaining wall with integral guardrail". Will there be a detail released on the guardrail? My intent is to clarify whether the integral guardrail will require a 6" cap block to be place on the wall similar to the Clays Mill Road widening project 1 and 2 that we provided block on.	See Addendum No. 4. The integral guardrail details were added to Sheet C-0-506 in addendum no. 4.
7.	I saw in the Specifications sec. 03410 that the "Ledgestoneface" was listed as the preferred face of the retaining wall product. However, I did not see a Color Specification. Will that be coming out in and addendum, and will it be the same color as was required by the city on the Clays Mill Rd. Project?	See Addendum No. 2, Item 13. The ledgestone face shall be manufactured with Lexington Limestone stock color scheme or equal.
8.	Please provide the diameter of the pipe that will be required for use at the Lower Cane Run Force Main Tie-In as shown on drawing C-0-111. On the left hand side of the profile we are tying into a 30" diameter pipe and on the right hand side we are tying into a 36" diameter pipe. Please verify where a transition to 30" diameter pipe will be made.	All involved piping is 30". The North Elkhorn force main is 36" in diameter. The stub from the North Elkhorn force main is 30" in diameter.
9.	Drawing C-0-111 plan view calls out an existing sanitary valve at the T intersection where we tie-in to the existing line near Old Frankfort Pike. Please verify if this valve is on the main line or the branch that we are removing the plug on and connecting to.	The valve is on the branch line of the 36" force main.
10.	Section 00410, Bid Form, Page 6, indicates "TOTAL BID PRICE … and summed from Items 1 through 11 in words and figures." Should that be Items 1 through 13?	See new Bid Form. See Addendum below.
11.	Will the contractor be allowed to use the plant's Non Potable Water (NPW) line during construction?	Yes. No charges shall be assessed for non-potable water usage. However, LFUCG non-potable water usage shall take priority over the Contractor's.
12.	On sheet E-0-101, will Windstream be demolitioning	The overhead communications lines shown on the northwest corner of the site and planned for

	the Existing Overhead Telephone that is not clouded and shown in the North West corner of the drawing?	demolition that are not clouded, shall be demolished by the Contractor as shown.
13.	Should fusing be added to the (2) two Riser poles to protect KU lines?	Fusing will be added to the riser poles by addendum. Only one line is KU's. The other belongs to LFUCG.
14.	What is the requirements for all demolition items shown on sheet E-0-101? (pole mounted transformers, wood poles, crossarms, light poles and fixtures, cables, ect…)	Specification 16100 covers demolition requirements. Pole top distribution transformers shall be disposed by the contractor, along with all other debris resulting from demolition activities.
15.	Could the delay time included for the drill shafts be broken out into per hour per rig?	No. The intent of the Measurement and Payment is per rig and no Addendum will be issued.
16.	Please explain why quantities in the proposed unit prices exceed the quantities given in the plans?	Considerable risk exists in the rock socket depth. The overages are provided as a contingency. The Contractor will be paid for completed unit price work only.
17.	Will measurement for the drilled shafts be measured at top of concrete or top of ground?	Top of concrete of the drilled shaft.
18.	If obstructions are encountered above top of concrete, will we be compensated for that? If so how?	No. Unit prices apply from the top of concrete to the base of the rock socket. In addition, delay time shall be similar. See addenda.
19.	Since the proposed unit items exceed the quantities in the plan, is the additional l.f. of overburden to be included within the limits of the depths provided by the plans or would the quantity apply to depths below elevations given for bottom of shaft in the plans?	The additional vertical footage is contingency footage. The Contractor shall be paid for actual work performed. The quantities shown on the Bid Sheet are greater than on Sheet S-5-102 for both the overburden and the rock socket.
20.	In the Prebid Meeting Minutes, included with Addendum No. 2, Q&A No. 7 indicates that there is no borrow associated with this project. However, considering the majority of existing ground cover at the site is gravel and asphalt pavement and the majority of new ground cover at the site will be topsoil/seeded lawn area, there will be a shortage of suitable topsoil required by Specification Section 02300, 3.08, thereby requiring an off-site borrow condition. Therefore, please clarify if the topsoil shortage will have to be supplemented by an off-site source or if the required topsoil thickness can be reduced such that the existing topsoil supply will be sufficient.	The intent is to use on site materials for final grade. It is understood the quality of the material may not be suitable. Should additional topsoil materials be required, the cost of hauling and providing the material from off site will be in addition to the contract bid amount. The cost of placing and grading the material will not additional in cost.
21.	Specification Section 02373 – Stream Crossings, Stream Bank Restoration and Stream Buffer Restoration is included in the Contract Documents; however, no streams or stream buffers are denoted on the applicable site plan sheets and no stream crossings are included in this project's scope of work.	There are no stream crossings associated with this project.

	Therefore, we will assume that this specification does not apply to this project unless specifically advised otherwise by addendum.	
22.	In accordance with the Pavement unit prices and the description of pavement work included on Plan Sheet C-0-110, it is our understanding that existing pavement maintenance/repairs, required during the course of the project, are the responsibility of the Contractor and those costs should be included in Bid Item 1; however, at the end of the project, permanent repairs/replacement of the existing pavement will be paid for under the Unit Price Bid Items. Please confirm our understanding of the existing pavement maintenance/repairs/replacement requirements or advise otherwise.	Your understanding is correct.
23.	MWDBE - Addenda 2, Item 3, clarifies that the EPA/KIA MWDBE requirements will apply for this project, and indicates on page 7 the MWDBE information to be submitted with the bid including executed EPA forms and certification letters from participating subcontractors. As bidders for this project will be receiving final price cuts from subcontractor's right up to the bid hour it is very challenging to assemble, complete and submit such items with the bid, and this administrative effort detracts bidders from being able to pass along to the Owner the best pricing for the project. Additionally we note the following specification sections which seem to conflict with the Addenda 2 bid form requirements: a. Specification section 00100 #1.12 indicates that EPA Documentation of the six "Good Faith Efforts will be a required to be submitted prior to contract award. b. Specification section 00300 #1.16 indicates the Good Faith Effort Documentation and listing of DBE Subcontractor information is to be submitted by the "Successful Bidder". c. Specification section 00810 page 17, Item #10 indicates that DBE Documents are to be submitted by "The low, responsive responsible bidder" no later than ten (10) days after bid opening. d. Specification section 00810 page 26, SRF Requirements, indicate that the EPA DBE forms are to be submitted to the DOW Project Administrator	See Addendum #2, Item 3. Additional Information – EPA/KIA Funded Projects

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. The equipment covered by this Specification is intended to be standard equipment of proven performance as manufactured by reputable concerns. Equipment shall be designed, constructed and installed in accordance with the best practices of the trade, and shall operate satisfactorily.

B. Consideration will be given only to the equipment of those manufacturers who have furnished comparable size diesel engine-generator sets for at least two similar installations that have been in regular successful operation for not less than five (5) years.

C. The Equipment Supplier shall furnish evidence of this experience and data on the equipment's operation at these installations to the Engineer upon request.

D. The engine-generator set manufacturers shall be Cummins/ONAN, Caterpillar, MTU/Detroit Diesel, or Kohler. The engine-generator set manufacturer shall be responsible for the entire engine-generator package including the engine-generator set with enclosure, fuel system, piping, accessories, electrical equipment, and other devices for a complete and operable system.

2.02 GENERAL DESCRIPTION

A. The generator set shall be a Kohler model 25REZG with a 4P4 alternator. It shall provide 25kW/31.25 kVA when operating at 277/480 volts, 60 Hz, .8 power factor. The generator set shall be capable of a Standby 130°C rating while operating in an ambient condition of less than or equal to 104° F and a maximum elevation of 656 feet above sea level.

B. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 121 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip i.e. engine, alternator, voltage regulator and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

C. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.03 ENGINE

A. The minimum 181-cubic-inch displacement engine shall deliver a minimum of 44 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:

1. Electronic isochronous governor capable of 0.5% steady-state frequency regulation.
2. 12-volt positive-engagement solenoid shift-starting motor.
3. 70-ampere automatic battery charging alternator with a solid-state voltage regulation.
4. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
5. Dry-type replaceable air cleaner elements for normal applications.
6. Engine-driven or electric fuel-transfer pump including fuel filter and electric solenoid fuel shutoff valve capable of lifting fuel.

B. The naturally aspirated engine shall be fueled by natural gas.

C. The engine shall have a minimum of 4 cylinders and be liquid-cooled by Unit Mounted Radiator 122°F/50°C.

D. The engine shall be EPA certified from the factory, and shall not require a site performance test.

E. Natural Gas fuel supply pressure, measured at the generator set fuel inlet downstream of any fuel system equipment accessories shall be within the operating range of 1.74-2.74 kPa (7.0-11.0 in. H^2O).

2.04 ALTERNATOR

A. The alternator shall be salient-pole, brushless, 2/3-pitch, 12 lead, self-ventilated with drip-proof construction and amortisseur rotor windings and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to Standby 130°C. The excitation system shall be of brushless construction controlled by a solid- state voltage regulator capable of maintaining voltage within ±0.25% at any constant load from 0% to 100% of rating. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.

B. The alternator shall have a single maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

C. The generator shall be inherently capable of sustaining at least 250% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.

2.05 CONTROLS

A. Engine-generator monitoring and controls shall be mounted in a single NEMA 1 dust-tight enclosure. A suitable accessible terminal strip having all wires properly identified shall be furnished. The panel shall include a local engine failure alarm, a dry contact for remote "Generator System Failure" alarm indication, and engine starting control wire. The panel shall be mounted 4'-8" measured from the center of the panel to ground level.

B. The engine starting shall be automatic and shall include a starting motor, a cranking contactor, provisions for electrically operated fuel control, and protective devices for low oil pressure, high coolant temperature, low coolant level, and overspeed conditions.

C. The automatic engine starting control shall operate from a single pole contact which closes for engine run and opens for engine stop. When the engine starts, starting control shall automatically disconnect cranking controls. The engine controls shall also include a two position selector switch with the following positions: RUN-STOP.

D. The cranking disconnect means shall be electrically self-regulating to prevent recranking for a definite time after source voltage has been reduced to a low value. If the engine fails to fire, or any safety device should operate while the engine is running, the engine shall be stopped immediately and the starting controls locked out requiring manual resetting. Failure to start shall initiate an alarm signal that must be reset in order to have the alarm activated after normal power is restored. The "Failure to Start" signal shall be derived from a dry contact closure which is wired as part of a common "Generator System Failure" alarm.

E. Starting control circuits shall be arranged so that cranking will commence immediately after the single pole contact closes. Four cranking cycles of 10 seconds "ON", 10 seconds "OFF" shall be provided.

F. The automatic engine starting controls shall use industrial rated control type elements throughout, and controls shall have the capability to operate at 50% battery voltage. Indicating lamps, pushbuttons, selector switches, and other pilot devices shall be accessible and mounted on the control enclosure.

G. A molded case generator/exciter field circuit breaker shall be furnished and installed as part of the engine generator set.

H. Molded case main line circuit breakers as specified herein shall be installed as load circuit interrupting and protection devices in NEMA 1 (gasketed) dust-tight enclosures. They shall operate both manually for normal operation and automatically for protection against overload or short circuits. Generator/exciter field circuit breakers are not acceptable for this service.

1. The molded case circuit-breakers described above shall be manufactured and tested in accordance with U.L. and NEMA AB1 standards. Their interrupting rating shall be suitable for the available fault current. All electrical ratings shall be suitable for the application.

I. The devices necessary for automatic starting shall be on the engine and in the engine control panel.

J. Engine-generator monitoring and control shall be provided using a microprocessor based control panel (EMCP 3.3, Digital Control Panel, Power Command, or equal) complete with LCD displays. Engine-generator monitoring and control shall include, but not be limited to, the following:

1. Engine oil pressure indicator
2. Coolant temperature indicator
3. Voltmeter
4. Ammeter
5. Phase selector switch
6. Running time meter
7. Frequency meter
8. High coolant temperature shutdown, signal light (red), and dry contact with reset
9. Low oil pressure shutdown, signal light (red), and dry contact with reset
10. Engine overspeed shutdown, signal light (red), and dry contact with reset
11. Engine overcranking protection with signal light (red) and dry contact with reset (after a cranking cycle of one minute, engine cranking shall stop)
12. Engine tried to start but failed signal light (amber)
13. Low coolant level signal light (red) and dry contact
14. Engine "Run" (green) and "Fail" (red) signal lights and dry contacts

15. Low coolant temperature signal light (red) and dry contact
16. Pre-high engine temperature indication and dry contact
17. Pre-low fuel indication and dry contact
18. Engine control mode switch (Run-Off-Auto)
19. Tachometer and engine speed (RPM) indicator
20. Emergency stop pushbutton
21. Generator voltage adjust potentiometer
22. Generator frequency adjust potentiometer
23. Indicator/display test switch
24. Panel lights with On/Off switch

2.06 ENGINE ACCESSORIES

A. Furnish and install the engine with all accessory equipment and appurtenances which may be required for proper operation, including the following:

1. Dry type air cleaner
2. Engine driven lubricating oil pump
3. Lubricating oil strainer
4. Lubricating oil filter, bypass type, with replaceable absorbent-type elements
5. Lubricating oil cooler, water cooled
6. Lubricating oil cooling circulator pump (may be integral with main oil pump)
7. Electronic controlled fuel injection
8. Fuel oil injection valve assemblies
9. Electronic isochronous governor
10. Safety controls, providing automatic engine shut-down, including:
    a. Overspeed control
    b. Low oil pressure control
    c. High coolant temperature control
    d. Failure to start control
    e. Low coolant level control
11. Radiator and cooling fan
12. Jacket water circulating pump

13. Thermostats

14. Water expansion tank

15. Exhaust manifold

16. Automatic battery starting system

17. Cold starting aid engine block heaters with all controls

18. Instrument panel mounted on the engine, complete with instruments, including:

    a. Lubricating oil pressure gauge

    b. Coolant temperature indicator

2.07 MOUNTING

A. Couple the engine and generator together through a flexible, non-backlash type, all metal coupling which overcomes all normal misalignment stresses and transmits full engine torque with ample safety factor. Also provide flexible connections for piping connections.

2.08 RADIATOR

A. Provide a radiator manufactured of a non-corrosive material mounted on the engine. The radiator core shall be coated with a corrosion resistant coating. Corrosion resistant coating shall be a corrosion resistant baked phenolic coating or similar.

B. Connect the radiator to the engine internal cooling system with flexible piping.

C. The engine shall be cooled through a radiator sized to continuously maintain safe operation at full load and at 104°F outside ambient air with 50% ethylene glycol coolant. A blower type fan and low noise fan drive and controls shall be furnished. The fan and all rotating members and drive belts shall be guarded and meet OSHA standards. Proof of 104°F ambient temperature capability shall be required.

D. The unit shall be provided with 50% ethylene glycol. Nalcool treatment shall also be added to the system in the proper proportion.

E. Unit mounted thermal circulation type water heaters shall be furnished to maintain engine jacket water temperature as recommended by manufacturer in an ambient temperature of 30° F. The heaters shall be single phase, 60 hertz, 120 volt thermostatically controlled as manufactured by Watlow Industries, Chromalox, Kim Hotstart, or equal. Heaters shall be 1.2 KW each, minimum.

2.09 ENGINE STARTING SYSTEM

A. Provide an engine starting system complete with battery charger and batteries.

B. The charger shall be an automatic battery charger, 6 A max, current limited, ±1% voltage regulation, ±10% line voltage variation, equalizing timer, DC voltmeter, and DC ammeter. Charger shall be as manufactured by Charles Industries, Exide, LeMarche, or equal.

C. Starting batteries shall be sealed, lead-acid typerated 12 or 24 volts having adequate capacity for rolling the engine for five (5), ten (10) second cycles without starting and operating the control devices in the generator panel. The batteries shall be mounted on a suitable non-corrosive rack

and shall be Nife, Exide, Tudor, or equal. Batteries shall have battery cables with lugs and shall be provided with lugs for connection to the battery charger.

2.10 EXHAUST SILENCER

A. Furnish and install an exhaust silencer mounted within the generator enclosure. The silencer system shall be designed, furnished, and installed to prevent moisture and condensation from corroding the silencer. Silencers shall be insulated using a calcium silicate material covered by a brushed aluminum skin. All exterior components of the exhaust silencer system shall be of 316 stainless steel. The work shall result in a long-term, aesthetically pleasing installation.

B. Silencers shall be of critical type and sized to produce a high degree of silencing. Reference the sound attenuation requirements specified herein.

C. Connect the silencer to the engine exhaust manifold with a high corrosion and temperature resistant stainless steel flexible convoluted exhaust pipe. Use flange-type connections. Provide a taper-cut tail pipe complete with rain cap to exhaust the gases to the atmosphere.

D. The exhaust manifold, exhaust piping, and expansion fittings including collector box, shall be completely covered with an insulation blanket in order to protect operating personnel and to reduce noise. Insulation shall be of composite fiberglass and stainless steel construction capable of withstanding 1,200°F continuously. The insulation blankets shall be tailored and custom fabricated to fit the contours of the manifolds. Average weight of the insulating blanket shall be 1.5 psf. Insulation shall conform to MIL-1-16411D, Type II and shall be custom fabricated to fit the contours of the manifold. Insulation shall be Hitco Blanket Armco, Hitco Blanket Insulation system, or equal.

2.11 WEATHERPROOF ENGINE - GENERATOR ENCLOSURE

A. All enclosures shall be constructed from high strength, low alloy steel, aluminum or galvanized steel.

B. The enclosure shall be finish coated with powder baked paint for superior finish, durability, and appearance. Enclosures will be finished in the manufacturer's standard color.

C. The enclosures shall allow the generator set to operate at full load in an ambient temperature of 40 - 45°C with no additional derating of the electrical output.

D. Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.

E. Doors shall be hinged with stainless steel hinges and hardware and be removable.

F. Doors shall be equipped with lockable latches. Locks shall be keyed alike.

G. A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.

H. The complete exhaust system shall be internal to the enclosure or optional with external mounted silencer.

I. The critical silencer shall be insulated with a tailpipe and rain cap.

2.12 *AUTOMATIC TRANSFER SWITCH*[ADD#4]

A. Rating

1. *An automatic transfer switch shall be furnished with ratings as indicated in the Drawings (nominal 104 amperes). The transfer switch shall be capable of switching all classes of load and shall be rated for continuous duty when installed in a non-ventilated enclosure that is constructed in accordance with Standard UL-50. The switch shall be 3 pole with solid neutral.*

2. *The switch shall be NEMA 1 enclosed, ASCO Series 300, Russelectric, or equal.*

B. Sequence of Operation

1. *Engine starting contacts shall be provided to start the generating plant if any phase of the normal source drops below 80 percent of rated voltage (adjustable), after a non-adjustable time delay period of 3 seconds, to allow for momentary dips. The transfer switch shall transfer to emergency as soon as the generator voltage and frequency have reached 90 percent of rated voltage (adjustable) and after an adjustable time delay period of 0-30 minutes shall delay retransfer to normal power until it has had time to stabilize. If the emergency power source should fail during the time delay period, the time delay shall be bypassed, and the switch shall return immediately to the normal source. After the switch is retransferred to normal, the engine-generator shall be allowed to operate at no load for an adjustable period of time (0-5 minutes) to allow it to cool before shutdown. The transfer switch shall include a key operated test switch (provide the Owner 5 keys) to simulate normal power failure (maintained contact), pilot lights on the cabinet door to indicate the switch closed on normal or emergency, and 2 auxiliary contacts on the main shaft: one closed on normal, the other closed on emergency. A selector switch shall be provided so that the switch may be either manually transferred or automatically transferred. A pushbutton manual operator shall be provided so that the plant operator will not have to manually throw the switch by lever. In addition, 1 set of relay contacts shall be provided in the automatic transfer switch that is normally open and closes upon transfer of the switch to emergency position, to signal an alarm at the SCADA system. All relays, timers, control wiring and accessories to be front accessible.*

C. Automatic Transfer Switch Commissioning

1. *After the installation is completed, the transfer switch shall be tested by simulating a power failure and having the generator automatically start, come up to speed, and assume the available load at the site. All signals and timers shall be verified. At the end of the simulation, the load should transfer back, engine run through cooldown and shutoff automatically. Manual pushbutton control should also be checked."*[ADD#4]

PART 3 - EXECUTION

3.01 INSTALLATION

A. After successful completion of all field testing and immediately prior to final inspection, the Equipment Supplier shall fill the engine fluid levels to their capacity for the standby power system.

B. The Equipment Supplier shall be responsible for delivering the generator sets to the Owner after all testing and engine startup.

END OF SECTION

SECTION 16670 - LIGHTNING PROTECTION SYSTEMS (AIR TERMINALS)

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The lightning protection system shall be furnished, installed, and connected as detailed on the Contract Drawings to provide a complete and functional system. Installation and equipment construction shall comply with Lightning Protection Institute Installation Code LPI-175, UL Master Label Code 96A, and NFPA 780.

B. The Contractor shall provide shop drawings indicating location and installation of equipment for review of the Engineer before beginning installation.

C. All equipment shall be of the same manufacturer, insofar as possible.

D. Equipment specified herein supplements actual suppression devices specified in Section 16280.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. "Thompson Lightning Protection, Inc.," "Independent Protection Co., Inc.," or equal.

2.02 EQUIPMENT

A. All equipment used in this installation shall be UL approved and labeled in accordance with UL procedures, with each air terminal bearing an "A" label and all main conductors bearing a "B" label at 10'-0" intervals.

B. All equipment shall be new, and of design and construction to suit the application where it is used in accordance with accepted industry standards and LPI and UL code requirements and as per manufacturers recommendations.

C. Downlead conductors from roof to ground shall be copper, of 28 strands, 17 gauge minimum. All main roof conductors shall be aluminum, of 24 strands, 14 gauge minimum.

D. Air terminals shall be solid, round aluminum bar of 1/2" minimum diameter, and shall project 10" minimum above the object to be protected.

E. Air terminal bases shall be of cast aluminum with bolted pressure cable connections and shall be securely mounted with stainless steel screws or bolts. Bases on built-up tar and gravel roofs shall be secured with a proper adhesive and shall have a minimum surface contact area of 18.5 square inches.

F. Ground rods shall be a minimum of 3/4" in diameter and 10'-0" long. They shall be connected to the system using exothermic welds, Cadweld, or equal.

G. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface and shall be spaced according to LPI and UL code requirements.

H. Bonding devices, cable splicers and miscellaneous connectors shall be of cast aluminum with

bolted pressure connections to cable. Cast or stamped crip fittings are not acceptable.

I. Equipment on stacks and chimneys shall be protected from corrosion and sized in accordance with LPI and UL requirements.

J. All miscellaneous bolts, nuts, and screws shall be stainless steel.

K. An approved bimetal transition fitting shall be used at the roof level to change from aluminum roof conductor to copper downlead cable.

PART 3 - EXECUTION

3.01 INSTALLATION/APPLICATION/ERECTION

A. The installation shall be accomplished by an experienced installer listed with Underwriters' Laboratories as qualified and who is also a Certified Master Installer of the LPI or working under the direct supervision of an LPI manufacturer as listed above or his authorized LPI Certified Master Installer representative.

B. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible. The system shall consist of a complete cable network on the roof including all air terminals, splices, and bonds with cable downleads routed concealed either directly in the building construction for a new structure or in conduit to ground for an existing structure.

C. The copper downlead cables shall not be brought directly through the roof. Through roof connectors with solid rods or conduits though pitch pockets shall be utilized for this purpose.

D. The limitations on areas of usage for aluminum cables and for copper and aluminum materials together as outlined in UL 96A and LPI 175 shall be observed. The lightning protection installer will work with other trades to ensure a correct, neat, and unobtrusive installation.

E. It shall be the responsibility of the lightning protection installer to assure a sound bond to the metallic main water service and to assure interconnection with other building ground systems, including both telephone and electrical and also to ensure that proper arresters have been installed on the power service.

F. Downlead conductors from roof to ground shall be protected from mechanical damage from a point 8 feet above to 1 foot below grade by conduit or other means.

G. The lightning protection installer shall secure and deliver a UL Master Label and LPI System Certification to the Engineer for the Owner upon completion of the installation.

H. The Contractor shall also submit 2 copies of as built shop drawings, 1 with the UL Master Label Application Form and another with LPI forms 175A and B.

I. A permanent plate shall be affixed to the protected structure in a prominent location, indicating its UL approval.

END OF SECTION

SECTION 16710 - COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. This Section of the specifications addresses Contractor's requirements for communication systems. The work includes raceways, cables, runways, entrance facilities, cabling, labor and equipment to execute communication systems as detailed on the Drawings.

B. The Contractor is responsible for furnishing and installing all raceway and cables with 14 feet of slack at terminals and cabinets.

C. The structured telecommunications cable and pathway distribution and wiring system shall include permanently installed horizontal cabling, horizontal pathways, telecommunications outlet assemblies, conduit, raceway, and hardware for splicing, terminating, and interconnecting. The horizontal system includes the cabling and pathway between the PLC cabinets. Hardware and terminating equipment shall consist of UL approved, 110 RJ-45 connectors. Horizontal cable shall consist of Category 6 (1,000 MPBS) 100 ohm four (4) pair cable, unshielded twisted pair (UTP).

D. Use shielded cables inside VFD cabinets.

E. Use multi-mode FO cable for interface with existing plant SCADA.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of this Contract including General and Supplementary Conditions and Division 1 Specifications Sections, apply to work of this Section.

B. Related Work in Other Technical Sections

1. Section 16050 - Basic Electrical Materials and Methods
2. Section 16120 - Wire and Cables
3. Section 16130 - Raceways
4. Section 16131 - Boxes

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Telephone and Data Cables

1. AT&T, General Cable, Okonite, Belden, Alpha, Houston, American, Anixter, or equal.

B. FO Cables

1. Optical Cable Corp.

2.02 MATERIALS

A. Components

1. Cabling passages shall be accessible via junction boxes and equipment cabinets. All cable installation will be facilitated with pull wires. Fixed cables and pathway systems for telecommunications systems shall be UL listed or third party independent testing laboratory certified, and shall comply with NFPA 70.

B. Pathways (Horizontal)

1. EIA/TIA-569 Pathway shall be conduit. Provide grounding and bonding as required by EIA/TIA-607.

C. Telecommunications Cabling

1. Cabling shall be UL listed for the application and shall comply with TIA-568 and ANSI/TIA/EIA-568-B.2-1 and NFPA 70. Cabling shall consist of Category 6 (1,000 MBPS) UTP cable. Provide a labeling system for cabling as required by EIA/TIA 606 and UL 969. Cabling manufactured more than 12 months prior to date of installation shall not be used.

D. Telecommunications Outlet/Connector Assemblies

1. Jacks shall comply with FCC Part 68.5, and TIA/EIA-568. Jacks shall accommodate UTP. UTP jacks shall be RJ-45 designation T568A type, UL 1863 listed, eight position, constructed of high impact rated thermoplastic housing rated for Category 6 (1,000 MBPS) service. UTP jacks for data shall be Category 6 (1,000 MBPS) hardware and shall comply with the attenuation requirements contained in ANSI/TIA-568-B.2-1. Telecommunications cover plates shall comply with UL 514C, and TIA/EIA-568.

E. Fiber Optic Cable

1. The fiber optic cable shall be a round, water-resistant, tight buffer cable suitable for both indoor and outdoor installation. The fiber optic cable shall consist of, but not be limited to the following components:

   a. Multimode, helically arranged, optical fibers with Aramid strength member and 900 micro meter tight buffer

   b. Elastomeric subcable jacket to prevent moisture intrusion

   c. A synthetic yarn strength member helically laid directly over the stranded core

   d. PVC core-locked outer jacket

2. Each optical fiber shall be all glass, graded index, with a core diameter of 62.5 microns and cladding diameter of 125 microns. The optical fiber shall have an attenuation no greater than 3.0dB/km at a wavelength of 850nm supporting a bandwidth of no less than 220MHz-km. The fiberglass shall be manufactured by AT&T, or equal.

3. The minimum bend radius of the cable under full long-term tensile load shall be no longer than 10-times the outside diameter of the cable. The outer jacket of the cable shall be surface printed with the manufacturer's identification, the cable part number and sequential numerical footmarks.

4. The cable manufacturer shall be ISO 9001 certified, UL listed and optimized for Gigabit Ethernet applications. Gell-filled cables are not acceptable. The cable shall be manufactured by Optical Cable Corp., B Series Ultra-Fox Plus Breakout Cables (fiber part no. W3RB/1GC), or equal.

F. Fiber optic waterproof termination shall be of ST all polymer type (including body and ferrule) as manufactured by Methode Electronics, Inc. Termination fiber must be bonded within the ST connector ferrule utilizing two part anaerobic bonding compound. Crimp type connectors and/or epoxy heat cure connectors that require ovens shall not be deemed acceptable. The fiber optic ST connector shall be the 908 Series MST Style by Methode Electronics, Inc. Upon proper termination of the fiber optic cabling, the Contractor shall measure dB losses over the cable length using an Engineer approved fiber testing device. This device shall be capable of producing hard copy test results for submittal to the Engineer. Official fiber tests are to be witnessed by the Engineer. In addition to allowing 1dB loss per connector, losses exceeding 3dB per kilometer of fiber will not be acceptable. All fiber technicians must be trained and certified by the fiber connector manufacturer. All connections must be approved by the fiber connector manufacturer. SC Connectors may be used as well.

PART 3 - EXECUTION

3.01 INSTALLATION/APPLICATION

A. Telecommunications cabling and pathway systems, including the horizontal cabling and pathway systems, telecommunications outlet/connector assemblies, and associated hardware shall be installed in raceway in accordance with TIA/EIA-568, EIA/TIA-569, NFPA 70, and UL standards as applicable.

B. Cabling

1. Install Category 6 (1,000 MBPS) UTP, telecommunications cabling and pathway system as detailed in TIA/EIA-568. Each RJ-45 connector shall have run to it one dedicating cable containing four pairs. Cabling installation shall comply with EIA TSB4O and EIA TSB-36. Screw terminals shall not be used except where specifically indicated on drawings. Use an approved insulation displacement connection (IDC) tool kit for copper cable terminations. Do not untwist Category 6 (1,000 MBPS) UTP cables more than 12 mm (one half inch) from the point of termination. Provide service loop on each end of the cable (one meter) for future additions. Do not exceed manufacturers' cable pull tensions for copper cables. Provide a device to monitor cable pull tensions. Do not exceed 110 N(25 pounds) pull tension for four pair copper cables. Do not chafe or damage outer jacket materials. Use only lubricants approved by cable manufacturer. Do not over cinch cables, or crush cables with staples.

C. Pathway Installations

1. Comply with EIA/TIA-569. Keep conduit minimum 150 mm (6-inches) away from parallel runs of electrical power equipment, flues, steam, and hot water pipes. Install conduit parallel with or at right angles to ceilings, walls, and structural members where located above accessible ceilings and where conduit is visible after completion of project. Install no more than two 1.57 rad (90 degree) bends for a single horizontal cable run.

2. All wiring shall be installed in conduit or a metal raceway. 3/4-inch minimum conduit size.

3. To facilitate future cable installations, a new pull string shall be pulled in conduit simultaneously with cables being installed.

4. All communication junction boxes shall be marked "DATA" or painted green.

3.02 TESTING

A. Telecommunications Cabling Field Testing

1. Perform telecommunications cabling inspection, verification, and performance tests in accordance with TIA/EIA-568.

B. Inspection

1. Visually inspect cabling jacket materials for UL or third party certification markings. Visually inspect UTP and OFO jacket materials for UL or other certification markings. Inspect cabling terminations in telecommunications rooms and at workstations to confirm color code for tip and ring pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568. Visually confirm Category 6 (1,000 MBPS) marking of outlets, wallplates and jacks.

C. UTP Verification Tests

1. UTP copper cabling shall be tested for DC loop resistance, shorts, opens, intermittent faults, near-end cross talk, proper pinning and termination and polarity between conductors. Test operation of shorting bars in connection blocks. Perform 250 MHz near-end cross talk (NEXT), far-end cross talk (FEXT) return loss, propagation delay, delay skew requirements, and attenuation tests for Category 6 (1,000 MBPS) 100 ohm 4-pair systems installations.

D. FO Cable Verification Tests

1. Contractor's Field Test: The Contractor shall verify the complete operation of the data transmission system in conjunction with field testing associated with systems supported by the fiber optic data transmission system prior to formal acceptance testing. Field tests shall include a flux density test. These tests shall be performed on each link and repeated from the opposite end of each link.

2. Optical Time Domain Reflectometer Tests: Optical time domain reflectometer tests shall be performed using the FO test procedures of EIA 455-59. An optical time domain reflectometer test shall be performed on all fibers of the FO cable on the reel prior to installation. The optical time domain reflectometer shall be calibrated to show anomalies of 0.2 dB as a minimum. An optical time domain reflectometer test shall be performed on all fibers of the FO cable after it is installed. The optical time domain reflectometer shall be calibrated to show anomalies of 0.2 dB as a minimum. If the optical time domain reflectometer test results show anomalies greater than 1 dB, the FO cable segment is unacceptable. The unsatisfactory segments of cable shall be replaced with a new segment of cable. The new segment of cable shall then be tested to demonstrate acceptability.

3. Power Attenuation Test: Power attenuation test shall be performed at the light wavelength of the transmitter to be used on the circuit being tested. The flux shall be measured at the FO receiver end and shall be compared to the flux injected at the transmitter end. There shall be a jumper added at each end of the circuit under test so that end connector loss shall be validated. Rotational optimization of the connectors will not be permitted. If the circuit loss exceeds the calculated circuit loss by more than 2 dB, the circuit is unsatisfactory and shall be examined to determine the problem. The Engineer shall be notified of the problem and what procedures the Contractor proposes to eliminate the problem. The Contractor shall prepare and submit a report documenting the results of the test.

4. Gain Margin Test: The Contractor shall test and verify that each circuit has a gain margin which exceeds the circuit loss by at least 6 dB.

END OF SECTION

SECTION 16900 - CONTROLS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Equipment controls shall be as specified herein and shown on the Contract Drawings. Legends for starter nameplates shall be taken from the one line diagram in the Contract Drawings.

B. Certain equipment starters contain nonresettable elapsed time meters as shown in the Contract Drawings. Also, certain motor starters have remote control devices and require connections to operate these control devices as shown on starter schematics (control circuits).

C. All starters contain red "on" lights, control transformers, and auxiliary contacts to operate as defined on the control circuits of the Contract Drawings. Reset pushbuttons shall also be provided for overloads built into the starters.

1.02 CUSTOM CONTROL PANELS

A. All control panels furnished under this Contract shall be manufactured in accordance with industry standards and as herein specified. Some control panels are specified to be furnished with the equipment controlled and others are to be furnished by the Contractor, as written elsewhere.

B. Panel construction shall comply with OSHA and other code requirements as applicable, and shall be attested to by UL listing the panels as an assembly under UL508.

C. Control panels to be furnished on this project shall be wired to function according to schematics shown on the contract Drawings. In addition to the requirements shown on the Contract Drawings, the panels shall adhere to additional requirements as written herein, and in the utilization equipment specifications.

D. Enclosures shall be dead front with all operators' devices accessible without opening the enclosure door. All relays, timers, terminal strips, etc., shall be mounted to a subpanel inside the enclosure. All wiring must be stranded and sized to be protected by a 20 A circuit breaker. Supplemental overcurrent protection may be used in lieu of oversized wiring. All panels mounted outside shall have operators devices mounted on an inner door with an outdoor door that is blank.

E. All terminal strips and lugs shall be of a type UL listed to terminate the size and quantity of wires encountered. Myers hubs shall be installed to maintain the enclosure rating where conduits enter NEMA 4X rated enclosures. The exterior of stainless steel NEMA 4X enclosures shall be unpainted. The exterior of NEMA 12 panels shall be painted ANSI 49 light gray, lacquer or enamel.

F. Enclosures shall be provided with a locking hasp and any exterior hardware shall be stainless steel or other corrosion resistant material. Enclosures for use in process or outdoor areas shall be NEMA 4X and enclosures for interior use in dry areas shall be NEMA 12, unless otherwise indicated.

G. Elementary control schematics and connection diagrams showing the spatial relationship of components and wiring shall be submitted for review. Also, a bill of materials, drawing of device arrangement on front, and enclosure fabrication drawings shall be submitted. Further,

descriptive literature is required on all components. A copy of the shop drawings shall be furnished and stored in a pocket inside the enclosure.

H. Sleeve type wire markers or other "permanent" type marker shall be installed on all wires, keynoted back to the elementary schematic or the connection diagram, and all terminals identified.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

DIVISION 17

INSTRUMENTATION

SECTION 17311 - PLC HARDWARE AND SOFTWARE

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. This Section includes Programmable logic controllers for control of process equipment, process oriented machinery, and process systems.

1.02 RELATED WORK

A. Refer to Section 17410.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.03 SUBMITTALS

A. Refer to Sections 01300 and 17410.

B. Product Data: For each type of PLC include dimensions, mounting arrangements, and weights. Also, include manufacturer's technical data on features, performance, electrical ratings, characteristics, and terminal connections.

C. Operation and Maintenance Data: Provide literature detailing routine maintenance requirements (if any) for each PLC component including:

1. System specifications
2. Electrical power requirements
3. Application considerations
4. Assembly and installation procedures
5. Power-up procedures
6. Programming procedures
7. Explanation of internal fault diagnostics
8. Shut down procedures
9. Recommended spare parts list

1.04 REFERENCE STANDARDS

A. ASTM D999-91: Vibration

B. (CFR) Title 47, Part 18 (European EN 55011 (formerly C1SPR 11))

C. CSA Certification Class I, Division 2, Group A, B, C, D Hazardous or non-hazardous locations

D. IEC 60068-2.1 Environmental testing — Part 2-1: Tests - Test A: Cold, 2.2 Environmental testing - Part 2: Tests. Tests B: Dry heat , 2.3, 2.6 Environmental testing - Part 2: Tests - Test Fe: Vibration (sinusoidal) and 2.27 Environmental testing. Part 2: Tests. Test Ea and guidance: Shock

E. IEC 61000 Electromagnetic compatibility (EMC) - Testing and measurement techniques

1. Part 4-2: Electrostatic discharge immunity test
2. Part 4-3: Radiated, radio-frequency, electromagnetic field immunity test
3. Part 4-4: Electrical fast transient/burst immunity test
4. Part 4-5: Surge immunity test
5. Part 4-6: Immunity to conducted disturbances, induced by radio-frequency fields

F. IEC 61131-3: Programmable controllers - Part 3: Programming languages

G. IEC 801-3: RFI Immunity

H. IEC 801-5: Ground Continuity

I. IEC 801-2: Electrostatic Discharge

J. IEEE 472-1974/ANSI C37.90/90A-1974 (Surge Withstand) IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

K. MIL STD 461B CS02: RFI/EMI Susceptibility

L. NEMA Pub No ICS2-230.42: Showering Arc Test

M. NSTA Project 1 A

N. UL 508 and CSA Standard C22.2 No. 142 (Isolation Voltages)

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer shall be capable of providing training, parts, and coordination of emergency maintenance and repairs.

B. The programmable controller and all of the corresponding components within the family of controller products shall be manufactured by a company that regularly manufactures and services this type of equipment.

C. The manufacturer shall comply with IS09001 standards for "Quality Systems- Model for Quality Assurance in Design/Development, Production, Installation, and Servicing".

D. The manufacturer shall provide complete technical support for all of the products. This shall include factory or on-site training, regional application centers, local or factory technical assistance, and a 24/7/365 technical support phone service.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver PLC components in packaging designed to prevent damage from static electricity and physical damage.

B. Store PLC equipment according to manufacturer requirements. At a minimum, store indoors in clean, dry space with uniform temperature to prevent condensation. Protect PLCs from exposure to dirt, fumes, water, corrosive substances, and physical damage. Also, protect the PLC from all forms of electrical and magnetic energy that could reasonably cause damage.

1.07 NOMENCLATURE AND IDENTIFICATION DEFINITIONS

A. AI: Analog Input

B. AO: Analog Output

C. Fixed I/O: A PLC style consisting of a fixed number of I/0, a processor, and a power supply all in one enclosure. Some fixed PLCs have limited expansion ability.

D. CPU: Central Processing Unit

E. DI: Discrete Input

F. Distributed I/O: Hardware specially designed to function as Remote I/O.

G. DO: Discrete Output

H. HMI: Human-Machine Interface

I. I/O Input and/or Output

J. Modular: A PLC style consisting of cards that are assembled to comprise a complete unit. All I/O, CPU, and Power Supply are dedicated cards. Typically, these cards are inserted into a chassis.

K. Master/Slave: Communication between devices in which one device, the master, controls all communications. The other devices, the slaves, respond only when queried by the master. Typically used in a Remote I/O application.

L. Peer to Peer: Communication between two or more devices, typically PLC's, in which each device can control the communication exchange.

M. PID: Control action, proportional plus integral plus derivative.

N. PLC: Programmable Logic Controller

O. Remote I/O: I/O that is located remotely from the processor. Remote I/O can communicate over a variety of communication protocols and can use standard rack based I/O, or special Remote I/O hardware referred to as Distributed I/O.

P. SCADA: Supervisory Control and Data Acquisition

1.08 SPARE I/O

A. Each I/O drop and I/O location shall include at least 20 percent (minimum of four) points of each type (AI, AO, DI, and DO) for future use, regardless of whether any of those point types are used in that drop or location or not. The spares shall be the same type of I/O modules supplied.

B. Spare output points that require the use of an external relay shall be supplied with the external relay.

C. Regardless of the spare requirement, all installed unused points on all I/O modules shall be wired to terminal blocks in the order that they occur on the I/O modules. Unwired spares shall not be acceptable.

1.09 SPARE PARTS

A. General requirements for spare parts are specified in section 17490.

B. The following PLC spare parts shall be furnished:

1. Processors: Provide spare processor unit(s) for each unique processor installed.

2. Memory Cards: Provide spares for each type of card installed.

3. I/O Cards: Provide spares for each unique I/O module type installed. Provide two or 10 percent of installed quantity, whichever is greater.

4. Network interface, remote I/O, and communication modules: Provide one spare communication module for each unique communication module installed.

5. Specialty Modules: Provide as a minimum a spare of each type of module identified. Provide an additional spare for every ten modules of a specific type installed.

6. PLC Power supplies: Provide spare power supplies for each unique power supply installed.

7. Chassis: Provide spare chassis for each unique chassis installed.

8. Fixed PLCs: Provide spares for each unique type of PLC installed.

9. Miscellaneous components (including cables): Provide spares for each unique component installed.

1.10 MANUFACTURER SUPPORT

A. Provide a written proposal for a manufacturer support agreement for PLC hardware and software for a minimum of 12 months starting at final completion of the project. The cost of this manufacturer support agreement shall not be included in the Contract Price. The support agreement shall be executed in the name of, and for the benefit of, the OWNER. At a minimum, this agreement shall provide the OWNER with:

1. Twenty-four hour, 7 day per week manufacturer telephone support

2. Access to the manufacturer's technical support web site

3. Software and firmware updates.

PART 2 – PRODUCTS

2.01 GENERAL

A. Provide Programmable Logic Controller equipment with the required memory and functional capacity to perform the specified sequence of operation with the scheduled input and output points.

B. Processor Systems shall include processor, power supply, input/output modules, communication modules, redundancy modules, and remote interface modules as required to meet system requirements.

C. Furnish products listed and classified by Underwriters Laboratories (UL), CSA, or FM approval as suitable for purpose specified and indicated.

D. All equipment and devices furnished hereunder shall be designed for continuous industrial service. The system shall contain products of a single manufacturer, insofar as possible, and shall consist of equipment models that are currently in production.

E. All equipment furnished shall be designed and constructed so that in the event of power interruption the systems shall go through an orderly shutdown with no loss of memory, and resume normal operation without manually resetting when power is restored.

F. The PLCs shall communicate between the operator workstation and field-mounted transducers, switches, controllers, and process actuators. Communications protocol shall be completely transparent to process operators at the Human Machine Interface (HMI).

G. The PLC shall be capable of stand-alone operation in the event of failure of the communication link to the HMI subsystem.

H. Backup Processor Systems, if indicated on the drawings, shall consist of two chassis with power supplies, each containing a processor, redundancy module and communications module(s). Remote chassis shall be provided with communication modules to meet I/O and communication requirements.

I. Remote Input/Output Units shall include input/output modules, interface modules, communication modules, and power supply to meet system input and output requirements.

J. Agency and environmental specifications:

1. Electrical supply voltage to the PLC shall be 120 Vac, plus or minus 15 percent, 48-63Hz. PLC system power supplies shall be fused for overload protection.

2. Vibration: 3.5 mm Peak-to-Peak, 5-9 Hz: 1.0G, 9-1501Hz. The method of testing is to be based upon IEC 68-2-6 and JIS C 0911 standards for vibration. The system is to be operational during and after testing. Vibration Rating of 2.0G maximum peak acceleration for 10 to 500Hz. in accordance with at least one of the following:

   a. Installed rating: DIN rail mounted PLC: 10-57 Hz, amplitude 0.075 mm, acceleration 25-100 Hz, and

   b. Panel or plate mounted PLC: 2-25 Hz, amplitude 1.6mm, acceleration 25-200 Hz.

   c. In compliance with IEC 60068 and IEC 61131.

3. Shock: 15G, 11 msec. The method of testing is to be based upon IEC 68-2-27 and JIS C 0912 standards for shock. The system is to be operational during and after testing.

4. Temperature: All PLC hardware shall operate at an ambient temperature of 0 to +55 degrees C (+32 to +140 degrees F), with an storage ambient temperature rating of -25 to +70 degrees C (-40 to +185 degrees F).

5. Relative Humidity: The Programmable Controller hardware shall function continuously in the relative humidity range of 30 percent to 95 percent non-condensing.

6. Noise Immunity: The Programmable Controller system shall be designed and tested to operate in the high electrical noise environment of an industrial plant as governed by the

following regulations: IEEE 472, IEC 801, MILSTD 461B, IEC 255-4, NEMA ICS 2-230.40, and ANSI/IEEE C-37.90A-1978.

7. Altitude:

   a. Operation: 0-6,500 feet

   b. Storage: 0-9,800 feet

8. Degree of protection: NEMA 1 (IP20)

9. All products shall have corrosion protection.

K. All major assemblies and sub-assemblies, circuit boards, and devices shall be identified using permanent labels or markings indicating:

1. Modules product type such as analog or digital

2. Modules catalog number

3. Modules major revision number

4. Modules minor revision number

5. Module manufacturer vendor

6. Module serial number

L. All necessary cables shall be included. All cables and connectors shall be as specified by the manufacturer. Cables shall be assembled and installed per the manufacturer recommendations.

M. Manufacturers

1. Provide all PLCs from a single manufacturer. If the PLC manufacturer has authorized third party vendors to provide modules that are compatible with their platforms, then products manufactured by these authorized third party vendors will be acceptable.

2. Provide the PLC system by one of the following:

   a. Rockwell Automation Allen-Bradley

      1) 1756-L71 ControlLogix

   b. Or Engineer approved equal

N. Central Processing Unit (CPU)

1. The CPU shall be, at a minimum, a 16-bit microprocessor that provides system timing and is responsible for scheduling I/O updates, with no user programming required to ensure discrete or analog update. It shall execute user relay ladder logic programs, communicate with intelligent I/O modules, and perform on-line diagnostics. The CPU shall consist of a single module which solves application logic, stores the application program, stores numerical values related to the application processes and logic, and interfaces to the I/O.

2. The CPU shall sample all the discrete and analog inputs and outputs including internal coils and registers, and service special function modules every scan. The CPU shall

process the I/O with user program(s) stored in memory, then control the outputs based on the results of the logic operation.

3. Supply the CPU with a battery-backed time of day clock and calendar.

4. The CPU family shall allow for user program transportability from one CPU model to another.

O. Diagnostics

1. The CPU shall perform on-line diagnostics that monitor the internal operation of the PLC. If a failure is detected, the CPU shall initiate system shutdown and fail-over. The following, at a minimum, shall be monitored: Memory failure, memory battery low, and general fault, communications port failure, scan time over run, I/0 failure, and analog or special function I/O module failure.

2. All diagnostic information shall be accessible to the host communications interfaces and to the PLC program.

3. The PLC shall have indicators and on board status area to indicate the following conditions:

   a. CPU run

   b. CPU error or fault

   c. I/O failure or configuration fault.

   d. Battery good

   e. Communications indicator

P. Memory

1. The user program and data shall be contained in non-volatile battery backed memory, of type CMOS RAM program memory.

2. Memory Backup System: provide lithium battery backup capable of retaining all memory for a minimum of three months and a Flash memory system capable of reloading program in the event of memory loss.

   a. Backup Battery: The backup battery shall be capable of being replaced without disrupting memory integrity. Provide a visual indication of low battery voltage and a low battery alarm contact.

   b. Flash Memory Card: Memory card storage capacity shall be a minimum of processor memory capacity. Memory cards shall be installed in processors for factory testing.

3. The operating system shall be contained in non-volatile firmware. The memory containing the operating system shall be field updateable via a separate update tool.

Q. Programming Environment

1. Programming port: The PLC shall utilize a serial USB or Ethernet port for programming.

2. On-Line programming: Application programs may be modified or stored while the CPU is running, with minimal impact on the scan time.

3. Online programming including runtime editing

4. IEC 61131-3 programming languages supported: Ladder logic, function block, sequential function chart, and structure text.

5. Supply all hardware and software necessary to program the CPU in these languages.

R. Communication Ports

1. The CPU shall be expandable and supplied with additional modules to support the required communication interfaces.

S. Remote I/O Communications

1. The CPU shall be capable of communicating with up to 12 remote base locations at a combined distance of 2500 feet. The CPU shall automatically sample and update all local and remote I/O modules each scan cycle of the CPU.

2. The communication link between the CPU and any RIO chassis shall be as recommended by the PLC manufacturer. For racks located on a link of less than 2500 cable feet, the speed of the communications link shall be greater than 230K baud with RIO scan rate of less than 5 millisecond per RIO.

3. Diagnostic and equipment status information shall be available from each RIO.

4. It shall be possible to communicate with remote I/O racks or other PLCs via fiber optic cable.

5. The remote I/O system shall have available a remote input/output arrangement capable of operation at locations physically separated from the PLC CPU by up to 5,000 feet as detailed on the drawings.

6. Communication with the remote I/O arrangement shall be through cable as recommended by the PLC manufacturer and provided by the PLC system supplier under this specification section.

2.02 REDUNDANCY

A. The PLC shall be supplied with all hardware and software required to produce a completely operational redundant system if shown in the Drawings. Redundancy shall be implemented using a minimum amount of user programming. Warm backup, which is not a standard offering from the PLC manufacturer, is not acceptable.

B. The backup system shall consist of redundant controllers located in separate chassis.

C. The back-up system shall provide bumpless switchover for system outputs. All remote I/O shall maintain their last position until either communications is re-established or the remote I/O watchdog timer expires.

D. Switch-over between the on-line PLC and the back-up PLC shall occur within 100 milliseconds if any of the following conditions occurs in the on-line unit: Power failure, CPU fault, communications module fault, or change in the on-line unit's mode from RUN to PROGRAM.

E. The switchover shall be transparent to any devices networked to the redundant controller chassis.

F. The system shall automatically cross-load the primary controller's program to the secondary controller.

G. System diagnostics and debugging tools shall be provided to assist in troubleshooting all redundancy equipment.

2.03 POWER SUPPLIES

A. The PLC shall have chassis mounted power supplies to power the chassis backplane, and provide power for the processor and applicable modules.

B. Power supplies shall have a clearly visible LED to indicate that the incoming power is acceptable and the output voltage is present.

C. Power supplies shall feature over-current and over-voltage protection and should be designed to operate in most industrial environments without the need for isolation transformers.

D. Power supplies shall be sized to accommodate the anticipated load plus 30%.

E. DC power supplies shall be capable of handling ripple up to 2.4V peak to peak.

F. AC Line Voltage rating of 85 to 265Vac, 47-63Hz

G. The power supplies shall allow for brown outs of at least 1/2 of a cycle, a harmonic rate of 10%, and will sustain continuous operation through momentary interruptions of AC line voltage of 10ms or less.

H. Automatically shut down the Programmable Controller system whenever its output power is detected as exceeding 125% of its rated power

I. Provide surge protection, isolation, and outage carry-over up to 2 cycles of the AC line.

J. Redundant power supplies will comply with all the requirements of non-redundant power supplies in addition to the features stated below.

   1. The redundant power supplies shall be designed to share the current required by the chassis. In the event of a failure of one redundant power supply, the remaining supply will accommodate the entire load of the chassis without disruption to the chassis activity.

   2. Provide a failsafe fuse that is not accessible by the customer.

   3. Provide a solid state relay connection to allow for failure annunciation when wired to an input module.

   4. Diagnostic LED status indicators for Power and redundancy.

2.04 CHASSIS

A. Medium and large PLC models shall be chassis based.

B. All system and signal power to the CPU and support modules shall be distributed on the backplane. No interconnecting wiring between these modules via plug-terminated jumpers shall be acceptable.

C. All system modules, main and expansion chassis shall be designed to provide for free air flow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be permitted.

D. All system modules including the processor shall be removable from the chassis or inserted in to the chassis while power is being supplied to the chassis without faulting the processor or damaging the modules.

E. Modules shall be designed to plug into a chassis and to be keyed to allow installation in only one direction. The design must prohibit upside down insertion of the modules as well as safeguard against the insertion of a module into the wrong slot or chassis via an electronic method for identifying a module. Electronic keying shall perform an electronic check to insure that the physical module is consistent with what was configured.

2.05 DISCRETE INPUT AND OUTPUT MODULES

A. General

1. Digital input and output modules shall provide ON/OFF detection and actuation.

2. The I/O count and type shall be as required to implement the functions specified plus an allowance for active spares, as noted below.

3. Modules shall be designed to be installed or removed while chassis power is applied.

4. Modules shall have indicators to display the status of communication, module health and input / output devices.

5. Each module shall have the following status indicators.

   a. The On/Off state of the field device.

   b. The module's communication status.

6. I/O modules shall contain a maximum of 16 points per module.

B. Module Specifications (120Vac Isolated Input Module)

1. Nominal Input Voltage of 120V ac

2. On-State Current of 15inA @132V ac, 47-63Hz maximum

3. Maximum Off-State Voltage of 20V

4. Maximum Off-State Current of 2.5mA

C. Module Specification (120Vac Isolated Output Module)

1. Each triac type discrete output shall have an associated interposing relay located in the same control panel. 120 VAC power for relay outputs shall be provided from the associated motor starter control circuit (when used with motor starters) or other 120 VAC source (when I/O is not associated with a particular motor starter).

2. Output Voltage Range of 74-265V ac, 47-63Hz.

3. Output Current Rating:

   a. Per Point - 2A maximum @ 30 degrees C; 1.0A maximum @ 60 degrees C; Linear Derating

   b. Per Module - 5A maximum @ 30 degrees C; 4A maximum @ 60 degrees C; Linear Derating

4. Surge Current Per Point of 20A for 43ms each, repeatable every 2s @ 60 degrees C
5. Minimum Load Current of 10mA per point
6. Maximum On-State Voltage Drop of 1.5V peak @2.0A and 6V peak @load less than 50mA
7. Maximum Off-State Leakage of 3mA per point

D. Module Specifications (Contact Output Module)

1. Output Voltage Range of 10-265V ac, 47-63Hz
2. Output Current Rating:
   a. Resistive - 2A @ 125V ac
   b. Inductive - 2A Steady State, 15A make @125V ac
3. Power Rating (Steady State) of 250VA maximum for 125V ac inductive output
4. Maximum Off-State Leakage of 0 mA per point
5. Configurable States
   a. Fault Per Point - Hold Last State, ON or OFF
   b. Program Mode Per Point - Hold Last State, ON or OFF

2.06 ANALOG INPUT AND OUTPUT MODULES

A. General

1. Analog input modules shall convert an analog signal that is connected to the module's screw terminals into a digital value. The digital value representing the magnitude of the analog signal shall be transmitted on the backplane. Analog output modules shall convert a digital value that is delivered to the module via the backplane into an analog signal on the module's screw terminals.
2. Modules shall be designed to be installed or removed while chassis power is applied.
3. Modules shall have indicators to display the status of communication, module health and input / output devices.
4. Each analog module shall provide both hardware and software indication when a module fault has occurred. Each module shall have an LED fault indicator and the programming software shall display the fault information.
5. Analog modules shall be software configurable through the I/O configuration portion of the programming software.
6. The following status shall be capable of being examined in ladder logic
   a. Module Fault Word — Provides fault summary reporting.
   b. Channel Fault Word — Provides under-range, over-range and communications fault reporting.

c. Channel Status Words — Provides individual channel under-range and over-range fault reporting for process alarm, rate alarms and calibration faults.

7. The 24 VDC power for analog instrument loops shall be provided as a part of the system. The 24 VDC power supply shall be derived from the 120 VAC input power circuit to the PLC. The field side of the 24 VDC power sources(s) shall have individual or grouped (of logically associated circuits) fusing and be provided with a readily visible, labeled blown fuse indicator.

B. Isolated Analog Input Module

1. Input Range of 4-20 Ma
2. Resolution of approximately 16 bits across range
3. Input Impedance of Greater than 249 Ohms
4. Overvoltage Protection: 8V ac/dc with on-board current resistor
5. Normal Mode Rejection of 60dB at 60Hz
6. Common Mode Noise Rejection of 120dB at 60Hz, 100dB at 50Hz
7. Isolation Voltage
   a. Channel to Channel - 100% tested at 1700V dc for Is based on 250V ac
   b. User to System - 100% tested at 1700V de for is based on 250V ac

C. Isolated Analog Output Current Module

1. Output Current Range of 4 to 20 mA
2. Current Resolution of 12 bits across 20 mA
3. Open Circuit Detection — None
4. Output Overvoltage Protection - 24V ac/dc maximum
5. Output Short Circuit Protection — 20 mA or less (electronically limited)
6. Calibration Accuracy - Better than 0.1% of range from 4mA to 20 mA
7. Calibration Interval - 12 months typical

2.07 COMMUNICATION INTERFACES

A. The PLC will be capable of the following communication protocols as shown on the drawings:

1. 10BASE-T/100BASE-TX Ethernet communication.
2. Modbus (RTU and ASCII) for up to 247 slaves
3. Rockwell Automation's RIO Protocol
4. DeviceNet

5. Asynchronous serial link capable of communicating up to 19.2Kbps

B. When required provide a Communications Interface Module mounted in the chassis or the equivalent port directly on the CPU.

2.08 PLC SOFTWARE

A. Provide a PLC configuration and application development software package complete with documentation and disks (RSLogix 5000, latest version). The PLC software package and associated licensing and/or activation shall be installed on the PLC's shown on the drawings.

B. The software package shall allow on-line/off-line program development, annotation, monitoring, debugging, uploading, and downloading of programs to the PLCs.

C. All required hardware (including cables, cable adapters, etc.) for connection to PLCs shall be furnished.

D. All software licenses required to achieve the functionality described in the Specifications shall be provided.

E. The software package shall include a software license agreement allowing the Owner the right to use the software as required for any current or future modification, documentation, or development of the PLCs furnished for this project.

F. The software provided shall be capable of the following IEC 61131-3 functions:

1. Ladder logic.

2. Function block.

3. Sequential function chart.

4. Structure text.

G. In addition to the above editors, an add-on instruction editor shall work with any of the above-mentioned editors to create custom reusable function blocks. This software shall allow any of the derived function blocks to be modified on-line.

H. The software shall be Microsoft Windows-based and run on the supplied computers.

I. The software shall include a security feature to prevent unauthorized personnel from modifying and downloading the programs.

J. Provide an I/O simulator which allows the PLC application load program to be tested on a PC with simulated analog and digital inputs and outputs, allowing I/O testing and debugging to be performed in a safe, isolated environment without the need for running the PLC CPU and process I/O boards.

2.09 OPERATOR INTERFACE TERMINALS (OIT)

A. OITs shall be mounted on control panels and shall run interface software separate from the existing SCADA HMI software.

B. Manufacturers

1. Provide operator interface terminals (OIT) from one of the following:

a. Allen-Bradley Panel View Plus 6 series

b. Or equal

C. Software

1. The Operator Interface Terminal shall be pre-packaged with all configuration and programming software necessary to perform functions as shown on drawings and within the specifications.

2. The integrated OIT software shall have the following features

a. Trending

b. Data Logging

c. Alarms

d. Graphic Symbols

e. Animations

D. I/O Ports and Devices

1. The OIT shall have a minimum of one Ethernet 10/100 Mbps for connectivity or programming

2. The OIT shall have a minimum of one Serial RS232 port.

3. Include the following communication expansion modules in the selected OIT: a. ControlNet, DeviceNet, RIO, DH+, DH485, Modbus Plus and PROFIBUS

4. Compact flash ports shall be Type 2.

5. The OIT shall have a minimum of one USB port.

E. Display

1. The OIT display size shall be 6.5"

2. The type of display for the OIT shall be Color Active Matrix TFT.

3. The display resolution shall be a minimum of 640 x 480.

4. Display shall support touch screen input.

F. Environmental

1. Rating: OIT shall be rated to maintain the rating of the control panel it will be mounted in.

2. Operating Temperature: 0-50 degrees C.

G. Manufacturers:

1. Rockwell Automation Allen-Bradley Panel View Plus 6

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

A. Maintain area free of dirt and dust during and after installation of programmable controller products.

B. Anchor PLCs within enclosures as recommended by the PLC manufacturer.

C. Ventilation slots shall not be blocked, or obstructed by any means.

D. Examine areas, surfaces, and substrates to receive PLCs for compliance with requirements, installation tolerances, and other conditions affecting performance.

Proceed with installation only after unsatisfactory conditions have been corrected.

E. Install in accordance with manufacturer's instructions.

F. Unload, unpack and transport equipment to prevent damage or loss.

G. Replace damaged components as directed by Engineer.

3.02 PANEL LAYOUT

A. Coordinate size and configuration of enclosure to meet project requirements. Drawings indicate maximum dimensions for PLCs, minimum clearances between PLCs, and adjacent surfaces and other items.

B. Comply with indicated maximum dimensions and clearances, or with PLC vendors required distances if they are greater than the distances indicated.

1. Provide spacing around PLC as required by the PLC manufacturer to insure adequate cooling. Insure that the air surrounding the PLC has been conditioned to maintain the required temperature and humidity range.

2. Wires entering and exiting PLC components shall be sized to comply with the PLC manufacturers requirements. Doors on all components shall be able to be fully closed when all the wires are installed.

3. For chassis mounted PLCs, no wiring, wire ducts, or other devices shall obstruct the removal of cards from the rack.

4. PLC lights, keys, communication ports, and memory card slots shall be accessible at all times. Lights shall be visible at all times when enclosure door is opened.

C. Control panel designer shall provide independent line fuses or circuit breakers, per the PLC manufacturer recommendation, for each power supply, input module, output module, and other modules with separately derived power requirements.

D. Control panel designer shall insure that communication signals, 4-20mA signals (including those with embedded HART), are properly conditioned for the PLC and protected from all sources of radiated energy or harmonics.

E. Each PLC (including all I/O) shall be powered from the UPS power conditioning system in Section 17430.

F. Where multiple mechanical components are provided for process redundancy, their field connections to I/O modules shall be arranged such that the failure of a single module will not disable all mechanical components associated with the process redundancy (e.g., inputs and outputs for redundancy device 1 shall reside on different modules than the inputs and outputs for redundancy device 2, etc.), irrespective of the number of used points resulting from this configuration.

G. Provide all required cables, cords, and connective devices for interface with other control system components.

END OF SECTION

SECTION 17410 - BASIC MEASUREMENT AND CONTROL INSTRUMENTATION MATERIALS AND METHODS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish all materials, labor, tools, equipment, supplies and services necessary to install all process control and instrumentation equipment complete as specified herein and shown on the Drawings. The Contractor shall be responsible for the expense of changing Drawings or structures, or any other expense necessitated by reason of installing alternative equipment. The Contractor will assume the responsibility for the satisfactory operation of any and all equipment offered.

B. The following equipment specification is included to establish the quality of equipment to be obtained. It is the intent of these Specifications to obtain industrial quality instrumentation and control equipment. Equipment furnished shall be accepted by the Engineer, prior to purchase by the Contractor.

C. Auxiliary and accessory devices necessary for system operation or performance, such as transducers or relays to interface with equipment provided under other Sections of this Specification, shall be included whether specified or not, at no extra cost.

D. In order to ensure proper integration and compatibility of the plant instrumentation and control systems, the systems must be supplied by a single provider of instrumentation and control equipment. This is not to say that all equipment being supplied shall be manufactured by a single manufacturer, but rather that a single provider of instrumentation and control equipment shall be responsible for supplying the complete system. To facilitate the Owner's future operation and maintenance, products performing the same function shall all be of the same manufacturer, type, and model number.

E. Substitutions on functions or equipment specified will not be acceptable. In order to ensure the interchangeability of parts, the maintenance of quality, the ease of interfacing between the various subsystems, and the establishment of minimums with regard to ranges and accuracy, strict compliance with the above requirements shall be maintained. In order to ensure compatibility between all equipment, it shall be the responsibility of the system supplier hereunder to coordinate all interface requirements with mechanical and electrical system suppliers and furnish any signal isolation devices that might be required.

F. Equipment shall be fabricated, assembled, installed, and placed in proper operating condition in full conformity with detail drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer as accepted by the Engineer.

G. The instrument supplier for this Contract shall be responsible for making the modifications shown on the Drawings and for calibrating all instruments and placing them in proper working order.

H. The Contractor shall be responsible for subcontracting out and managing the System Integration (programming) services and including this cost in the bid, to be paid for under an allowance. Refer to specification section 01210 on allowances.

1.02 RELATED WORK

A. The following Sections of this Specification Division contain requirements on instrumentation and control equipment and software which are considered to be covered by applicable

requirements of this section (and shall be included in the bid by a single Instrumentation Supplier for this Project):

SECTION 17311 – PLC HARDWARE AND SOFTWARE
SECTION 17420 - INSTRUMENTS
SECTION 17430 - BOXES, PANELS AND CONTROL CENTERS
SECTION 17480 - INSTRUMENT LISTS AND REPORTS
SECTION 17490 - MEASUREMENT AND CONTROL COMMISSIONING

B. The following Divisions of these Specifications contain requirements on equipment furnished by other suppliers that must interface with the instrument system, or on methods and materials to be performed/used in the installation and/or wiring of the instrumentation system.

DIVISION 1 - GENERAL REQUIREMENTS
DIVISION 11 - EQUIPMENT
DIVISION 16 - ELECTRICAL

1.03 QUALITY ASSURANCE

A. The system supplier shall be required to demonstrate a minimum of 4 years recent, past experience in the design, manufacture, and commissioning of instrumentation and control systems of comparable size, type, and complexity to the proposed project. Further, the manufacturer must have at least 10 similar systems in operation currently. The system supplier shall be required to have his own in-house capability to handle complete system engineering, fabrication, and testing.

B. The system supplier shall have in his employ the capable personnel for detail engineering, coordination, drafting, procurement and expediting, scheduling construction, testing inspection, installation, start-up service for calibration and commissioning, and warranty compliance for the period specified.

1.04 REFERENCES

A. The Contractor is referred to Standards and Practices for Instrumentation published by the International Society of Automation (latest edition), for terminology, symbols, methods and practices used or described herein or on the Drawings.

1.05 SUBMITTALS

A. General

1. Complete detail Drawings of the instrumentation and control systems and all components shall be submitted in 3 copies in a 3-ring loose-leaf cardboard reinforced vinyl binder to the Engineer for preliminary review. They shall include installation instructions, operation and maintenance instructions, descriptive literature, connection drawings, and parts list for each item as well as individual control schematic drawings for each item.

2. The Contractor shall make any corrections or changes required by the Engineer, within the scope of the Drawings and Specifications, and return copies in 3-ring loose-leaf cardboard reinforced vinyl binders for final review and distribution. Number of copies shall be as specified in Special conditions and as agreed at the pre-construction conference.

3. Should any system submitted in the shop drawings not meet with the Engineer's acceptance as to conformity with requirements of the Drawings and Specifications, it

shall be the responsibility of the successful Contractor to make whatever changes are necessary for acceptance at no extra cost to the Owner.

B. Detailed Requirements - Instruments/Hardware

1. Detailed information for each instrument or control device shall be submitted, including manufacturer's descriptive literature and a specific data sheet for each device which shall include as a minimum:

   a. Tag number assigned by the Contract Documents.

   b. Product (item) name used herein and on the Contract Drawings.

   c. Manufacturer's complete model number.

   d. Location of the device.

   e. Input - output characteristics.

   f. Electrical characteristics.

   g. Range, size, and graduations.

   h. Physical size with dimensions, enclosure NEMA classification, and mounting details.

   i. Materials of construction of all components.

   j. Instrument or control device sizing calculations where applicable.

   k. Certified calibration data on all flow metering devices.

2. Submit a detailed loop diagram, for each monitoring or control loop, each on a single 8 ½ in. X 11 in. sheet. The format shall be the Instrument Society of America, Standard for Instrument Loop Diagrams, ISA-S5.4.

3. The data sheets shall be provided with an index and proper identification and cross-referencing. Partial submittals will be rejected.

4. Submit detailed drawings concerning control panels and/or enclosures including:

   a. Cabinet assembly and layout drawings to scale.

   b. Fabrication and painting specifications.

   c. I/O layout.

   d. Elementary panel wiring diagrams

   e. Point to point wiring diagrams depicting wiring within the panel as well as connections to external devices.

   f. Color samples for paint selection by the Engineer and/or Owner.

   g. Panel submittal drawings shall be on 11 in X 17 in. sheets.

5. Exceptions to the Specifications or Drawings shall be clearly indicated in the submittal by the system supplier. Data shall contain sufficient details so a proper evaluation may be made by the Engineer.

6. Prior to final acceptance, the final shop drawing submittal, which is to include Installation, Operation, and Maintenance instructions, shall be updated to reflect "As Constructed" status, and shall provide at least the following as a minimum:

   a. A comprehensive index.

   b. A complete "As Constructed" set of accepted shop drawings.

   c. A complete list of the equipment supplied, including serial numbers, ranges, and pertinent data.

   d. Full specifications on each item.

   e. System schematic drawings "As Constructed", illustrating all components, piping and electrical connections of the systems supplied under this Section.

   f. Detailed service, maintenance, and operation instructions for each item supplied.

   g. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

   h. The operating instructions shall also incorporate a functional description of the entire system, with reference to the systems schematic drawings and instructions.

   i. Complete parts lists with stock numbers and name, address, and telephone number of the local supplier.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Shipping Precautions:

1. After completion of shop assembly, factory test, and acceptance, all equipment, cabinets, panels, and consoles shall be packed in protective crates and enclosed in heavy duty polyethylene envelopes or secured sheeting to provide complete protection from damage, dust, and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing, and handling at the job site.

2. Special instructions for proper field handling, storage and installation required by manufacturer for proper protection, shall be securely attached to each piece of equipment proper to packaging and shipment.

B. Identification:

1. Each component shall be tagged to identify its location, tag number and function in the system. Identification shall be prominently displayed on the outside of the package.

2. A permanent stainless steel or other non-corrosive material tag firmly attached and permanently and indelibly marked with the instrument tag number, as given in the tabulation, shall be provided on each piece of equipment supplied under this Section.

C. Storage:

1. Equipment shall not be stored out-of-doors. Equipment shall be stored in dry permanent shelters including in-line equipment, and shall be adequately protected against mechanical injury. If any apparatus has been damaged, such damage shall be repaired

by the Contractor at his own cost and expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such tests as directed by the Engineer. This shall be at the cost and expense of the Contractor, or the apparatus shall be replaced by the Contractor at his own expense.

1.07 WARRANTY (MAINTENANCE CONTRACT)

A. A written total instrument maintenance contract shall be provided to the Owner, executed by the system supplier as a part of the work under this Section. The maintenance contract shall include all labor, parts, and emergency calls providing on-site response within 48 hours, to provide complete instrument system maintenance for a period of one year after the date of final acceptance of the system. The maintenance contract shall also include a minimum of 2 semi-annual preventive maintenance visits by a qualified serviceman of the supplier who is familiar with the type of equipment provided for this project. Each preventive maintenance visit shall include routine adjustment, calibration, cleaning, and lubrication of all system equipment and verification of correct operations. Emergency maintenance procedures or plant visits may coincide with a scheduled preventive maintenance visit, however, they shall not replace the work intended to be performed during a preventive maintenance visit. The system supplier shall have full responsibility for the preventive and corrective maintenance including replacing of defective components, maintaining sufficient spare parts on-site, and complete calibration of all components under this section, all at no cost to the Owner. The maintenance contract shall not begin until both the instrumentation training course and the system acceptance test have been successfully completed, at which time the Owner shall be capable of performing necessary preventive maintenance, and all instruments shall be functional.

B. During the one-year maintenance period, observation of maintenance operations by designated Owner personnel, and the instruction of said personnel in the details of the maintenance work being performed shall be provided.

C. A complete written report shall be furnished the Engineer and Owner after each scheduled and unscheduled visit, giving problems corrected, systems needing recalibration, and recommendations to prevent recurrence, if applicable.

D. The costs for the one-year maintenance service contract shall be included in the Contract price.

1.08 TRAINING

A. A training program shall be set up and conducted by the major equipment manufacturer furnishing the instrumentation package. The training session shall be for a minimum period of 1 day uninterrupted and shall be conducted at the pump station.

B. A course outline showing the material to be covered shall be submitted to the Engineer for review. The training program shall include both classroom and "hands-on" instruction for each instrument supplied under this group of the Specifications and shall furthermore include operational training, maintenance training, and training on use of calibration equipment.

C. As the equipment installed at the plant shall be used for the "hands-on" training, the training program shall not be conducted until all of the systems are operational, and operational related "punch list" items are corrected.

D. Training on equipment supplied by a manufacturer other than the major equipment manufacturer shall be by the original equipment manufacturer, and shall be scheduled in the training programs by the major equipment manufacturer. Exceptions may be granted if the instructor demonstrates adequate knowledge on the care and operation of the other manufacturers' equipment.

E. The training programs shall be conducted at a time mutually agreeable to the Engineer, Owner, Contractor, and Supplier. The Owner shall decide how many of his personnel shall attend the training. A representative of the Engineer may observe the training in progress. The Owner shall have the right to videotape all training as it is conducted.

F. The supplier shall make use of audio-visual aids in the training courses and shall provide the OWNERS staff his undivided attention (i.e., shall not conduct his company business during training hours) for the full 1 day. The supplier shall furnish training participants with written handouts, preferably copies of the shop drawing submittal books, up to a maximum of 6 copies, for purposes of familiarization with the shop drawings, and to assist in explanations.

PART 2 - PRODUCTS

2.01 GENERAL

A. All instrumentation supplied shall be of the manufacturer's latest design and shall produce or be activated by signals which are established standards for the water industry.

B. All electronic instrumentation shall be of the solid-state type and shall utilize linear transmission signals of 4 to 20 mAdc (milliampere direct current), however, signals between instruments within the same panel or cabinet may be 0-10 V.d-c (volts direct current), or other manufacturer standard.

C. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero based signals will be allowed for remote transmission.

D. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks as shown on the Drawings or as required.

E. All indicators and LED readouts shall be linear, direct reading in process units, unless otherwise noted. Percentage scales and indicators are prohibited.

F. All transmitters shall be provided with either integral indicators or conduit mounted indicators in process units, accurate to two percent, unless otherwise noted.

G. Electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and suitably coated to prevent contamination by dust, moisture and fungus. Solid state components shall be conservatively rated for their purpose, to assure optimum long term performance and dependability over ambient atmosphere fluctuations and 0 to 95 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

H. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single manufacturer, in-so-far as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.

I. All equipment shall be designed to operate on a 60 Hertz alternating current power source at a nominal 115 volts, plus or minus 10 percent, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

J. All analog transmitter and controller outputs shall be 4-20 milliamperes into a load of 0-750 ohms, unless higher load capacity is required.

K. All switches shall have double-pole double-throw contacts rated at a minimum of 600 VA, unless specifically noted otherwise.

L. Materials and equipment used shall be UL listed (or other independent lab listed) wherever such listed equipment and materials are available.

M. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

N. All circuit boards in instruments mounted in damp locations or mounted outdoors shall be fungus proofed. All field transmitters mounted outside shall be equipped with sunshields and shall be capable of operation to -20° Fahrenheit.

O. Equipment installed in a hazardous area shall meet Class, Group and Division as shown on the contract drawings, to comply with the National Electrical Code. All power supply and signals coming from and going to hazardous areas shall have intrinsic safety barriers provided.

2.02 INSTRUMENTS AND ACCESSORY EQUIPMENT

A. Refer to other Division 17 Instrumentation Specification Sections for equipment requirements for field mounted primary devices, transmitters and secondary instruments, receivers and central control equipment.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

SECTION 17420 - INSTRUMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install all primary devices, transmitters, primary and secondary receivers, analyzers and accessory items as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK

A. The following Sections of this Specification Division contain requirements on instrumentation and control equipment and software which are considered to be covered by applicable requirements of this section (and shall be included in the bid by a single Instrumentation Supplier for this Project):

SECTION 17311 – PLC HARWARE AND SOFTWARE
SECTION 17410 - BASIC MEASUREMENT AND CONTROL INSTRUMENTATION MATERIALS AND METHODS
SECTION 17430 - BOXES, PANELS AND CONTROL CENTERS
SECTION 17480 - INSTRUMENT LISTS AND REPORTS
SECTION 17490 - MEASUREMENT AND CONTROL COMMISSIONING

B. The following Divisions of these Specifications contain requirements on equipment furnished by other suppliers that must interface with the instrument system, or on methods and materials to be performed/used in the installation and/or wiring of the instrumentation system.

DIVISION 1 - GENERAL REQUIREMENTS
DIVISION 11 - EQUIPMENT
DIVISION 16 - ELECTRICAL

PART 2 - PRODUCTS

2.01 INSTRUMENTS AND ACCESSORY EQUIPMENT

A. Product Descriptions

1. Loop Isolator/Signal Converter:

   a. Loop isolators or signal converters shall be furnished and installed where indicated, to isolate signals or to increase the load capacity of a system required to have many devices in the loop. Isolators shall provide 3-way isolation, and shall have a power supply voltage of 115 VAC unless otherwise indicated. 2 wire style isolators are not acceptable. Isolators shall be Moore SCT, AGM, RIS, or equal, enclosed as appropriate for the application, or as indicated.

2. Computing Relays/Integrators:

   a. Computing relays or integrators for such purposes as batching, summing, totalization, etc., shall be Moore Industries, AGM, RIS, or equal.

3. Transient/Lightning Suppressors:

   a. Device Locations: As a minimum, provide surge protection devices at the following locations:

1) At any connections between ac power and electrical and electronic equipment, including panels, assemblies, and field mounted analog transmitters.

2) At both ends of all analog signal circuits that have any portion of the circuit extending outside of a protecting building.

3) At both ends of all copper-based communications cables which extend outside of a building, including at field instruments and the field side of analog valve position signals.

4) On all external telephone communications lines.

b. Surge protection device assemblies for connections to AC power supply circuits shall:

1) Be provided with two 3-terminal barrier terminal strips capable of accepting No. 12 AWG solids or stranded copper wire. One terminal strip shall be located on each end of the unit.
2) Have a nonflammable enclosure that meets or exceeds UL 94 V0 flammability requirements. The surge protection device shall be provided with provisions for mounting to interior of equipment racks, cabinets, or to the exterior of freestanding equipment.
3) Be constructed as multistage devices consisting of gas tube arrestors, high energy metal oxide varistors, or silicon avalanche suppression diodes. Assemblies shall automatically recover from surge events, and shall have status indication lights.
4) Comply with all requirements of UL 1449, second edition.

5) Be able to withstand a peak surge current of 10,000 amps based on a test surge waveform with an 8-microsecond rise time and a 20-microsecond exponential decay time, as defined in UL 1449.

6) Have the following characteristics:

a) Maximum Continuous Operating Voltage: 150VAC

b) Maximum Operating Current: 20 amps

c) Ambient Temperature Range: -20 degrees C to +65 degrees C

d) Response Time: 5 nanoseconds

c. Surge protection device assemblies for analog signal circuits shall:

1) Have four lead devices with a threaded mounting/grounding stud or DIN Rail mounting.

2) Have a nonflammable enclosure that meets or exceeds UL 94 V0 flammability requirements.

3) Be constructed as multistage devices consisting of gas tube arrestors and silicon avalanche suppression diodes. Gas tube arrestors and diodes shall be separated by a series impedance of no more than 20 ohms. Assemblies shall automatically recover from surge events.

4) Comply with all requirements of UL 497B.

5) Be able to withstand a peak surge current of 10,000 amps based on a test surge waveform with an 8-microsecond rise time and a 20-microsecond exponential decay time, as defined in UL 1449.

6) Limit line-to-line voltage to 40 volts on 24VDC circuits.

7) Have the following characteristics:

a) Maximum Continuous Operating Voltage: 28VDC

b) Ambient Temperature Range: -20 degrees C to +65 degrees C

c) Response Time (Line-to-Line): 5 ns

d. Acceptable manufacturers shall be Phoenix Contact, Weidmuller, Transtector, or equal.

4. Altitude and Pressure Gauges:

a. All indicating gauges are pipe mounted with male and brass threaded pipe connections. Gauges shall be 4 1/2 inch liquid filled for maximum vibration and corrosion protection. Gauges shall have phosphor bronze Bourdon tubes, white laminated phenol dials. Gauges shall have micrometer adjustment of pointers and black phenol, black cast iron, brass, or aluminum case and ring, original rotary gear design, corrosion resistant, stainless steel movement, blowout protection, and bronze socket with wrench flats. Accuracy shall be within 1/2 of 1 percent of the scale range. They shall be as manufactured by Helicoid Gage Division, "410"; Ashcroft; U.S. Gauge; Wika; or equal.

b. All gauges shall be piped with provisions for venting pressure to allow calibration (zero) checks. Valves for gauge shutoff and zeroing shall be 1/4 turn ball valves with lever handle, corrosion-resistant.

c. Liquid filled diaphragm seals shall be installed on all gauges as indicated in the Gauge Schedule in Section 17480 of the Specifications. Diaphragm seals shall be of the continuous duty type, 3 piece construction with 1/4 inch flushing connection, 1/4 inch fill connection, 316 stainless steel lower housing and diaphragm material 1/4 inch gauge connection and 1/2 inch lower connection. Housing bolts shall also be stainless steel. Acceptable models are Marsh 42-01, Helicoid 100H, Ashcroft, or equal. Viton diaphragms are required on low range pressure applications (less than 15 psig). To prevent accidental loss of fluid, diaphragm seals shall be permanently attached to gauges by installation of a lead sealed wire connecting the two. Fill fluid shall be factory installed silicone. All gauges shall be precalibrated, as an assembly, with the seal.

5. Eccentric Weight Float Type Level Sensors

a. The level monitor shall be the integral eccentric weight non-mercury float switch type, Flygt Model ENM-10, or equal.

6. Gas Detection System

a. Combustible Gas Detector

1) The combustible gas monitor shall be a combination sensor/transmitter with LED display, and shall operate on an infrared sensing technology. The unit shall utilize an infrared light source which is directed through two wavelength filters, providing a dual-beam concept with a reference beam and a target gas beams which are directed back to the corresponding detector. The difference in IR intensity shall be proportional to the gas concentration.

2) The sensor shall provide a 4-20 mADC output which is proportional to the measured gas concentration.

3) Input voltage shall be 24VDC.

4) The sensor/transmitter shall be UL listed for Class I, Division 1, Group D hazardous locations. Enclosure shall also have a NEMA 4X rating.

5) The combustible gas detection system shall be Sierra Monitor Model 5100-28-IT, or equal.

b. Toxic Gas Detector

1) The toxic gas detector shall be of the same "IT" series by Sierra Monitor to match the combustible gas detector specified above.

2) Provide Model 5100-03-IT for detecting low oxygen levels.

3) Provide Model 5100-05-IT for detecting hydrogen sulfide.

c. Controller

1) Provide a Sierra Monitor Sentry IT Controller for 16 points, NEMA 1enclosed, suitable for 115 VAC power supply. Provide local HMI in controller and an Ehternet/IP communications port for connection of the system to the WWTP SCADA system.

d. Supplies

1) Provide all necessary fittings, accessories, and calibration gases for maintenance and setup.

7. Non-Contact Sonic Type

a. Where non-contact level measurement is indicated, the system shall consist of an integral sensor/transmitter assembly complete with housing, transmitter, microwave module and Wave-Guide (antenna). The radar assembly will transmit energy in the form of microwave pulses, target the microwave pulses returning to the antenna, measure the transit time of the microwave pulses and calculate the distance to the target. The radar assembly shall have the following features: integral level indicator and adjustment module for field calibration and display of process variable: 3"-10" ANSI 150# 316SS process connection with 316SS cone antenna 4-Wire Universal power supply (24VDC or 120VAC) with 4-20 mA HART output; programmable electronics shall provide linear 4-20mA output signal proportional to level or flow. The housing shall be a dual chamber aluminum style rated Class I, Division I Explosion Proof .

b. Radar assemblies shall be 4-Wire (or 2 wire as shown on P&ID's) with D-Housing for level and open channel flow measurement; PLICSCOM adjustment module for integral display and field calibration; use optional Waveguide Extension for applications that require a longer antenna length to protrude into the tank/channel (mounting through concrete slabs, etc.).

c. Non-contact radar level measuring systems shall be Ohmart Vega PS66 series, or equal.

d. Where local field indicators are called out in the P&ID's, they shall be two wire condulet style, DC milliameter with a range of 4-20 mAdc, thermally compensated, explosionproof and weatherproof, for mounting on rigid conduit. The housing shall be aluminum with a glass viewing window, and connections shall be made through screw terminals. Accuracy shall be +/- 2 percent of full scale, with 0.1 percent repeatability. The indicators shall be linear, scaled in engineering units (not percent). Actual display may be analog or digital LCD.

8. Single Station Smoke Detectors

a. The detector shall be photo-electric type with 2.5% normal sensitivity.

b. The alarm shall utilize an infrared LED sensing circuit which pulses in 4 to 5 second intervals; when subjected to smoke the pulse rate shall increase 8 times. After 2 consecutive pulses in smoke, the detector will alarm.

c. The alarm shall provide minimum 5-to-1 signal-to-noise ratio in the optics frame to assure stability of operation in environments of high RF and transient conditions.

d. The sensing chamber shall be fully protected to prevent entrance of small insects, thus reducing the probability of false alarms.

e. A solid state piezo alarm rated at 90dBA at 10ft.

f. A visual LED monitor (condition indicator) will pulse in normal operation and will remain solid in alarm.

g. An easily accessible test knob shall be provided. The test knob in the TEST position will simulate an actual smoke condition of approximately 3.4% causing the detector to alarm within 20-36 seconds. It will also have the capability of testing to 0.85% as a required minimum. A magnetic switch closure or other switch closure, or smoke generating equipment which does not scatter the light beam or test sensitivity is not sufficient.

h. The alarm shall have a tandem interconnect capability of up to 12 units or 6 units with relay.

i. The manufacturer shall provide other compatible alarm models with the following optional features: 1) auxiliary Form A/Form C relay contacts for the initiating remote functions and annunciation; 2) relay option that is capable of activation by tandem interconnect wire. Thermal sensor shall be self-restoring.

j. Unit must be UL 217 listed for both wall and ceiling mount.

k. All equipment shall be completely factory assembled, wired and tested, and the contractor shall be prepared to submit a certified letter testifying to this condition.

l. The Photoelectric Smoke Alarm shall be a Gentex Model 7100F, or equal.

9. Temperature Switch

a. Provide a temperature switch for monitoring high temperature in the Electrical Building.

b. Switch shall be United Electric 100 Series, 0- 225 degrees Fahrenheit (or equal), set at 120 degrees.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

SECTION 17430 - BOXES, PANELS, AND CONTROL CENTERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install all boxes, panels and control centers and accessory items as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK

A. The following Sections of this Specification Division contain requirements on instrumentation and control equipment and software which are considered to be covered by applicable requirements of this section (and shall be included in the bid by a single Instrumentation Supplier for this Project):

SECTION 17311 – PLC HARDWARE AND SOFTWARE
SECTION 17410 – BASIC MEASUREMENT AND CONTROL INSTRUMENTATION MATERIALS AND METHODS
SECTION 17420 – INSTRUMENTS
SECTION 17480 – INSTRUMENT LISTS AND REPORTS
SECTION 17490 – MEASUREMENT AND CONTROL COMMISSIONING
SECTION 16900 – CONTROLS

B. The following Divisions of these Specifications contain requirements on equipment furnished by other suppliers that must interface with the instrument system, or on methods and materials to be performed/used in the installation and/or wiring of the instrumentation system.

DIVISION 1 - GENERAL REQUIREMENTS
DIVISION 11 - EQUIPMENT
DIVISION 16 - ELECTRICAL

PART 2 - PRODUCTS

2.01 FABRICATION

A. Instrument Panels

1. Furnish and install the following UL508 listed (as an assembly) instrument panels:

   a. PLC-WWS

   b. Safety Stop Relay Box

   The instrument panels shall be similar in design to that shown on the Drawings or as specified herein. The panels shall be of all-welded stainless steel construction, shall be rated NEMA 12. Panels shall be suitable for surface wall mounting, unless indicated as freestanding.

2. The panel shall have double doors. Doors shall have a triple latch with continuous hinge with chrome plated handle and lock. The top of the panel shall be covered. The panel shall mount on the floor and be anchored down, similar to the way Motor Control Centers are anchored.

3. Panels shall contain an interior light with switch by the door inside, and an interior GFCI duplex receptacle. The duplex receptacle shall be powered upstream of the UPS.

4. The panels shall be sized to provide heat dissipation such that the maximum operating temperature for the lowest rated component is not exceeded with an ambient temperature of 100 deg F. Calculation shall include direct mid-summer sun exposure for exterior-mounted panels.

5. All conductors running from the field to the panels shall be a single, continuous length, without splices, except at accepted junction boxes. Junction boxes shall have terminal blocks with 20 percent spares in addition to terminals for all wires including spare wires. Special care shall be exercised to carry grounding lines through such junction boxes with the least possible resistance.

6. All panel equipment shall be mounted and wired on or within the cabinet. Wiring shall comply with the latest National Electrical Code. All wiring within the panel shall be grouped together with harnesses or ducts and secured to the structure. All wiring shall be numbered in accordance with the numbering system used on the wiring/connection diagrams. Power wiring shall be routed in separate wireways from low voltage DC signal wiring. Where crossing power and low voltage DC wiring is necessary, crossing shall be at right angles. Parallel troughs for different voltages shall be separated by a minimum of 12 inches. Power wire shall be 12 AWG type THWN stranded, insulated for not less than 600 volts, unless specified otherwise. Signal wire shall be 16 AWG, THW stranded, insulated for not less than 600 volts.

7. Wire color shall be as follows:

    a. Line Power – Black

    b. Neutral or common – White

    c. AC Control – Red

    d. DC Control – Blue

    e. Equipment or Chassis Ground – Green

    f. Externally powered circuits - Yellow.

8. Wiring and connection diagrams shall conform to ISA S5.4 Instrument Loop Diagrams and shall be submitted by the manufacturer as part of the shop drawings for review by the ENGINEER.

9. All wiring in the panels shall terminate in a terminal blocks. Terminal blocks shall have a minimum of 25 percent spares of each type. Terminal blocks shall be arranged in vertical rows and separated into groups (Power, AC control, DC signal, alarm). Terminal blocks shall be barrier type with the appropriate voltage rating (600 volts minimum). They shall be the raised channel mounted type. Wiring trough for supporting internal wiring shall be plastic type with snap-on covers. The sidewalls shall be open top type to permit wire changing without disconnecting. Wire connectors shall be the hook fork type with non-insulated barrel for crimp type compression connection to the wire. Wire and tube markers shall be the sleeve type with heat impressed letters and numbers. Terminal strips shall be provided for the purpose of connecting all control and signal wiring. Direct interlock wiring between equipment will not be allowed. Only one side of a terminal block row shall be used for internal wiring. The field wiring side of the terminal shall not be within 6 inches of the side panel or adjacent terminal. Wiring troughs shall not be filled to more than 60 percent visible fill. Wiring trough covers shall be match marked to identify

placement. If component identification is shown on covers for visibility, the ID shall also appear on the mounting sub-panel.

10. All wiring to hand switches and devices which are live circuits independent of the panel's normal circuit breaker protection shall be clearly identified as such.

11. Nameplates shall be provided for all flush mounted equipment. The nameplates shall be approximately 1 inch by 3 inch constructed of black and white laminated, phenolic material having engraved letters approximately 1/4 inch high, extending through the white face into the black layer. Nameplates may be omitted if a nameplate of approximately the same dimension is more conveniently and suitably located on the instrument door or face. Nameplates shall be attached to panels by self-tapping screws.

12. Print storage pockets shall be provided on the inside of each panel. Its size shall be sufficient to hold all of the prints required to service the equipment.

13. The instrument panel shall be factory-tested prior to shipment. Field installation by the Subcontractor shall consist only of setting the panel in place and making necessary electrical connections.

14. All components shall be mounted in a manner that shall permit servicing adjustment, testing and removal without disconnecting, moving or removing any other component. All gages, meters, receivers, switches, pushbuttons and accessories shall be flush mounted.

15. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Component mounting shall be oriented in accordance with the component manufacturer's and industries' standard practices. All internal components shall be identified with suitable plastic or metal engraved tags attached with drive pins adjacent to (not on) each component identifying the component in accordance with Drawings, Specifications, and Supplier's data.

16. Pushbuttons shall be heavy-duty, oil tight, 30.5 mm, with momentary contacts. Switches shall be supplied with the number of poles required for the application, an escutcheon plate, and contacts rated for 10 amperes at 120 volts AC.

17. Relays shall be double pole, double throw, octal plug-in type with a transparent dust cover. The relay shall be equipped with an indicating light to indicate when its coil is energized. The relays shall have contacts rated for 10 amperes at 120-volts AC. The mechanical life of the relay shall be 10,000,000 operations minimum (ampere rating shall be increased as necessary for load handling capacity where needed.)

18. Timing relays shall be solid-state plug-in type with a dust and moisture resistant case. The timers shall be of the multi-range/analog or digital type with selectable ranges, between 1 second and 10 hours full scale. The output contacts shall be rated at 2.5 amperes minimum at 120 volts AC. The timing relay shall have a "timing in progress" indication. The mechanical life shall be 10,000,000 operations minimum.

19. Selector switches shall be heavy-duty 30.5 mm, oil tight. Switches shall be supplied with the number of poles required for the application, an escutcheon plate, and contacts rated for 10 amperes at 120 volts AC.

20. General layout of instruments and controls are shown on the Drawings. Minor deviations from the layout may be allowed after review by the ENGINEER.

21. The instrument panels shall be furnished by the instrumentation and control system supplier. Complete shop drawings, including wiring diagrams and panel structural drawings, shall be required for review prior to shipment.

22. Furnish Cutler-Hammer Oxidation Inhibitors and install one in each panel at time of start-up.

23. Instrument panel power supply shall wire to a cord end inside the panel. A properly sized UPS system as specified elsewhere shall sit inside the enclosure and be plugged into the receptacle. UPS output shall power the instrument panel.

24. Loop isolators called out or intrinsic safety barriers shall mount inside the instrument panels.

25. A 1.5 KVA uninterruptible power supply, Liebert GXT3, or equal shall be provided for power to all PLC equipment, as well as field instruments. Provide alarm relay card.

26. The main Ethernet switch in PLC-WWS shall be an Allen Bradley Stratix 8300 or equal, Layer 3 managed switch. Provide the base switch with ten copper ports and two additional 8-port copper expansion modules, for a total of 26 copper ports. Provide redundancy module and redundant 24-volt power supplies. Two fiber optic ports shall be provided to operate in a redundant ring topology.

27. The Contractor shall provide a fiber cross connect cabinet to be bracket-mounted in PLC-WWS enclosure as shown on the Network Block Diagram. The Contractor shall provide fiber optic patch cables which meet the performance characteristics of the primary plant network fiber optic cabling. Fiber patch cables shall be obtained from the primary fiber optic cable manufacturer. The Contractor shall provide all appurtenances necessary to complete a functional fiber run to the fiber transceivers via the fiber cross connect cabinet. The fiber cross connect cabinet shall be as manufactured by Fiber Optic X or Black Box.

PART 3 - EXECUTION

3.01 FACTORY TEST

A. General: Prior to the delivery and installation of PLC-WWS at the job site, but after the procurement, assembly, and configuration of all components, the Contractor shall conduct a factory test. This test shall be witnessed by representatives of the Owner and the Engineer. The factory test shall demonstrate the functionality and performance of specified features of the PLC. The test shall include verification of all new PLCs, and remote I/O systems and I/O points. A complete system checklist shall be available during the test for recording point test results.

B. Test Setup: The complete PLC system as shown on, or referenced by, the Network Diagram shall be assembled and interconnected on the Contractor's factory floor. The test shall be conducted as a joint effort between the Contractor's panel vendor and the Contractor's System Integrator. The interconnection shall include communication cable segments for the LAN to simulate as closely as possible the eventual job site installation. The PLCs, PLC programming terminal, field terminals, and communication devices shall be loaded with their applicable software packages and configuration programming. PLC input and output modules shall be installed in their assigned housings and wired to field termination points in the enclosures. The Contractor shall have a complete up to date set of wiring diagrams, a PLC register list and I/O list for review throughout the test. One Devicenet valve actuator shall be connected for the test.

C. Contractor shall schedule the factory test after receiving approval of the factory test procedures submittal. The Contractor shall provide the Engineer with written notice of the start and expected duration of the factory test at least 30 days prior to the start of the test.

D. Test Procedure: The factory test shall be conducted in accordance with the previously submitted and approved test procedures. The test procedures shall include written descriptions of how individual tests shall be performed and shall incorporate testing the following features as a minimum. All testing shall be completed in one continuous factory test which may extend over several continuous days if necessary.

1. Communication: Verify all network components are able to communicate over the control system network using the contract required protocols and mediums.

2. Power Failure: External power to each enclosure shall be cycled in order to test the operation of the UPS units.

3. Redundant Systems: Proper configuration and operation of the redundant PLC processors, and PLC panel power supplies shall be confirmed.

4. I/O Verification: All I/O terminal point wiring shall be verified. The Contractor shall provide a means of easily introducing a discrete or variable analog signal to any and all I/O points and shall have the means of detecting or measuring PLC generated output signals at the terminal blocks. Signals shall be verified at the associated PLC register.

5. Alarm handling: Verification of alarm logging, summary display, configuration, outputs to horn, lights, and the ability to disable alarms. Silencing and acknowledging of alarms shall also be tested.

6. All components shall be individually inspected to confirm adherence with contract specification documents.

E. Test Report: The Contractor shall record the results of all factory testing on preapproved test forms which the Owner's and Engineer's representatives shall sign. A copy of the completed test forms and a report certifying the results shall be provided to the Engineer within 10 days of completing the test.

F. Rework and Retest: If the PLC does not operate as required, the Contractor shall make whatever corrections are necessary, and the failed portion of the test shall be repeated. If, in the opinion of the Engineer's representative, the changes made by the Contractor to effect such a correction are sufficient in kind or scope to effect parts of system operation already tested, then the effected parts shall be retested also. If a reliable determination of the effect of changes made by the Contractor cannot be made, then the Engineer's representative may require that all operations be retested. The Contractor shall bear all of its own costs for the factory test, including any required retesting.

G. All of the Engineer's and Owner's travel and per diem costs for factory retesting shall be borne by the Contractor.

END OF SECTION

SECTION 17480 - INSTRUMENT LISTS AND REPORTS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install all instrumentation equipment and accessory items as shown on the Contract Drawings and as specified herein.

B. Final program settings and functionality shall be as agreed by LFUCG staff during meetings with the System Integrator at an appropriate time to affect their input to the process. This specification is a starting point for those discussions.

1.02 RELATED WORK

A. The following Sections of this Specification Division contain requirements on instrumentation and control equipment and software which are considered to be covered by applicable requirements of this section (and shall be included in the bid by a single Instrumentation Supplier for this Project):

SECTION 17311 – PLC HARDWARE AND SOFTWARE
SECTION 17410 – BASIC MEASUREMENT AND CONTROL INSTRUMENTATION MATERIALS AND METHODS
SECTION 17420 – INSTRUMENTS
SECTION 17430 – BOXES, PANELS AND CONTROL CENTERS
SECTION 17490 – MEASUREMENT AND CONTROL COMMISSIONING

B. The following Divisions of these Specifications contain requirements on equipment furnished by other suppliers that must interface with the instrument system, or on methods and materials to be performed/used in the installation and/or wiring of the instrumentation system.

DIVISION 1 - GENERAL REQUIREMENTS
DIVISION 11 - EQUIPMENT
DIVISION 16 - ELECTRICAL

1.03 LOOP DESCRIPTIONS

A. Miscellaneous Monitoring

1. Refer to ISA format P & ID's in the Drawings for additional information on required monitoring.

2. Refer to point list in Instrument Drawings for PLC I/O requirements at new PLC-WWS.

B. General Functionality

1. Runtimes for all equipment with run status feedback to the SCADA system shall be monitored. The runtimes shall be stored in non-volatile PLC registers so that they are available for display by any workstation and information will not be lost upon workstation database re-initialization or restart of the PLC. Runtimes shall be recorded in hours and shall be incremented at least every 0.1 hour.

2. Failure of the PLC shall result in a safe shutdown of the equipment.

3. Analog values shall be scaled in engineering units and checked to see if process signal from the field devices is within acceptable range (4-20 mA ± 0.5 mA). Signals outside of this range shall be alarmed. All analog variables shall be set up for trending.

4. Whenever called to operate, the equipment must provide a run status signal back to the Plant SCADA system. If a run status has not been detected after 30 seconds, a failure alarm shall be generated in the Plant HMI.

5. All alarm elevations, flow setpoints and level setpoints shall be adjustable in the PLC and SCADA system by the operator.

C. Miscellaneous Monitoring – P&ID 100

1. The MCC shall be equipped with power meters that shall connect to the PLC and energy and demand data shall be uploaded to the SCADA system for display on the local HMI at the PLC as well as in the plant work stations in the main control room. The Contractor shall setup and program the meters and calibrate them locally. The System Integrator shall configure and program the local PLC HMI device. The System Integrator shall address the communications to the upstream plant SCADA system..

2. The local HMI for the PLC shall have a page created that displays all the data monitored.

3. The generator and automatic transfer switch shall be monitored as indicated on the drawings.

4. The PLC shall have the surge protection devices monitored as well as the power coming from the UPS system.

5. Smoke and heat detectors specified as part of this Division of the specifications and mounted in the Electrical Building shall be monitored.

6. Valve Vaults shall have high sump levels alarmed.

7. The System Integrator shall be responsible for implementing all monitoring and control at the SCADA Work Station level in the Administration Building.

D. Fill Pump Monitoring and Control – P&ID 200

1. The local HMI for the PLC shall have pages created that display a graphic of the Pump Station, including a symbol for each of the four fill pumps and their respective tag. Run status of each pump shall be indicated by either a virtual indicator lamp or by a change in color of the pump symbol (or as mutually agreed with LFUCG staff). Alarm conditions shall also be indicated for seal leak, bearing and motor overtemperature, and VFD fault.

2. The pumps shall be controlled via adjustable frequency drives (VFD's). All four pumps shall be monitored and controlled at the supervisory level by the PLC in the Electrical Building. The PLC shall include an Ethernet Switch, which shall be cabled in to each VFD. The VFD manufacturer shall be responsible for programming the VFD's themselves and the System Integrator shall be responsible for implementing communications with the PLC and Plant SCADA system.

3. The VFD's shall be setup with local HMI for local control and display of status and alarm conditions, and shall connect to the Ethernet network through a communication module. The VFD's shall include Hand--Off-Automatic selector switches in the HMI. In Hand, control of the pump shall be from start/stop pushbuttons in the HMI of the VFD with speed adjustment locally by virtual potentiometer in the VFD HMI. The plant SCADA system shall be signaled when the VFD is in Hand mode. In Automatic, the pump shall be started and controlled remotely through the PLC. When the switch is placed in Automatic, the PLC shall be signaled that it is in control. The PLC shall provide for

manual starting and stopping of each pump. The PLC shall also allow for remote resetting of the VFD, in case of a controller fault. A virtual potentiometer in the PLC shall allow for remote speed adjustment when in manual control from the PLC.

4. The PLC shall also include an automatic sequence of control in addition to the remote manual sequence. In automatic, each pump speed shall be automatically controlled directly proportional to the wetwell level, based on plant influent flow conditions. The PLC HMI shall provide for operator selection of control modes.

5. The PLC shall allow operators to set lead-lag-lag pump arrangements manually or automatically and shall indicate the pump operating speed based on an analog signal from the VFD.

6. The System Integrator shall be responsible for implementing monitoring and control at the SCADA Work Station level in the Administration Building.

7. An overall sequence description herein shall define how all the various equipment items shall operate together.

8. Float sensors in the pump wetwell shall be hardwired to each VFD to lockout the pumps on low level, intended as a backup emergency shutoff system in case the radar level device fails to shutoff the pumps.

E. Low Level Drain Pump Monitoring and Control – P&ID 400

1. The local HMI for the PLC shall have a page created that displays a graphic of the Pump Station, including a symbol for each of the two low level fill pumps and their respective tag. Run status of each pump shall be indicated by either a virtual indicator lamp or by a change in color of the pump symbol (or as mutually agreed with LFUCG staff). Alarm conditions shall also be indicated for seal leak and motor overtemperature.

2. The pumps shall be controlled via full voltage non-reversing motor starters. Both pumps shall be monitored and controlled at the supervisory level by the PLC in the Electrical Building.

3. The starters shall be setup with switches and indicator lamps for local control and display of status and alarm conditions, and shall connect to the PLC via hardwired connections from each starter. The starters shall include Hand--Off-Automatic selector switches in the door. In Hand, the pump shall run continuously. In Automatic, the pump shall be started and controlled remotely through the PLC. When the switch is placed in Automatic, the PLC shall be signaled that it is in control. The PLC shall provide for manual starting and stopping of each pump. The PLC shall also monitor when the Hand-Off-Automatic selector switch is in Hand position. The SCADA system shall be able to then detect and show an out of service condition if in the Off position.

4. The PLC shall also include an automatic sequence of control in addition to the remote manual sequence. In automatic, each pump shall be automatically controlled directly proportional to its respective wetwell level, based on plant influent flow conditions. The PLC HMI shall provide for operator selection of control modes.

5. The PLC shall allow operators to set lead-lag pump arrangements manually or automatically.

6. The System Integrator shall be responsible for implementing monitoring and control at the plant SCADA work station level in the Administration Building.

7. An overall sequence description herein shall define how all the various equipment items shall operate together.

8. Float sensors in the pump wetwell shall be hardwired to each motor starter to lockout the pumps on low level, intended as a backup emergency shutoff system in case the radar level device fails to transmit wetwell level to the SCADA system.

F. Valve and Gate Monitoring and Control – P&ID 500

1. The local HMI for the PLC shall have a page created that displays a graphic of the Pump Station, gravity sewer flow diversion structure and the force main control valve vault, including a symbol for each of the three modulating valves and gates and their respective tag. Valve position shall be indicated on the HMI as well as whether the valve actuator is in local or remote control mode. Each valve and/or gate shall be capable of being manually or automatically positioned by the PLC at the pump station and upstream plant SCADA system if in remote.

2. The existing plant influent flow is measured by two existing influent meters that are summed in the plant SCADA system. This existing signal shall be used to control the whole wet weather storage system. The System Integrator shall set up the programming to allow the existing plant effluent flowmeter to be substituted as the controlling flowmeter, should the influent flowmeters be offline.

3. The influent gravity sewer flow diversion structure shall have a radar continuous level transmitter installed for remote monitoring of the influent sewer level and alarming of high level in the sewer. On high level, in addition to alarming, the normal control scheme for Gate G-1 and Valve V-1 shall be overridden and they shall both be driven to 100% open.

4. Gate G-3 is part of the flow return system. The system shall have provisions for G-4, a future control gate for when a second ground storage tank is installed in the future.

5. An overall sequence description herein shall define how all the various equipment items shall operate together.

G. WWS Level Monitoring – P&ID 600 and 700

1. The local HMI for the PLC shall have a page created that displays a graphic of the Pump Station and Wet Weather Storage Tank, showing the water level in both tanks. The pump station wetwell and storage tank level radar transmitters shall be input to the PLC and level displayed at both the PLC and plant SCADA work stations. A high level alarm shall be provided. Both the wetwell and the Wet Weather Storage Tank level, which are critical to proper control of this process area of the plant, shall be monitored by parallel radar level transmitters that shall have their level signals averaged. The system shall monitor and control off the average level of the two meters. Separate high water levels shall be alarmed for the wetwell and WWS tank.

2. Should high level alarm be initiated for the wet weather storage tank and pump station wetwell at the same time, then Gate G-1 and Valve V-1 shall both open to 100% and the fill pumps shutoff.

3. The pump station wetwell shall have two different low level lockout float systems, one level for the fill pumps and a lower one for the low level drain pumps. The floats shall be wired through a relay panel and intrinsic safety barriers, with relay outputs connected to each pump motor controller. The relay panel shall be powered from the PLC UPS system. Both low level signals shall also independently alarm into the PLC and plant SCADA system.

4. When the system is in a "ready" mode, with an empty tank and plant flow below 60 MGD (not filling or draining), the low level drain pumps shall be allowed to operate on the low level shutoff float and reset float (1 foot higher) to keep the wetwell pumped down during periods of non-operation. Small volumes of water will enter the diversion system during surges in the sewer system occasionally, that do not represent a sustained high flow event.

H. Gas Detection System – P&ID 900

1. A gas detection system shall be provided to monitor hazardous conditions in all the major structures, with a controller in the Electrical Building at the pump station. For reliability, each sensor shall have its own transmitter and be hardwired to the controller as individual analog signals. Combustibles and Hydrogen Sulfide shall be monitored in each structure and Oxygen shall also be monitored in the valve vault. Ethernet communications shall be provided to the plant SCADA system allowing full access to all data that is available at the controller.

2. The local HMI for the PLC shall have pages created that display a graphic of the various structures with sensors, showing the status and current analog values for each one, as well as monitoring, alarm and fault conditions shall show up at all levels in the SCADA system.

3. The equipment manufacturer shall be responsible for calibrating and programming the controller and all sensors. The System Integrator shall be responsible for programming the communications to this device and upstream monitoring in PLC-WWS and monitoring at the plant SCADA work stations. The vendor shall cooperate and coordinate with the System Integrator to accomplish all monitoring and control.

I. Screen System – P&ID 1000

1. There is one screen cleaning mechanism inside the Influent Sewer Flow Diversion Structure. A closed circuit hydraulic control system shall operate the screen. A hydraulic unit mounted in a weatherproof housing shall sit on top of the structure. The local control panel which contains the vendor PLC that controls the hydraulic unit and the screen shall be located at the structure.

2. The local HMI for the PLC shall have a page created that displays a graphic of the Flow Diversion Structure, showing the screen mechanism inside. The PLC HMI shall mimic the display on the manufacturer (vendor furnished) PLC in the local control panel. Status indicators for the screen, as well as monitoring and fault conditions shall show up at all levels in the SCADA system.

3. Ultrasonic level transmitters furnished with the equipment shall automatically control the screen mechanism. The plant SCADA system shall monitor only.

4. The equipment manufacturer shall be responsible for programming the vendor furnished CompactLogix PLC and the System Integrator shall be responsible for programming the communications to this device and upstream monitoring in PLC-WWS and monitoring at the plant SCADA work stations. The vendor shall cooperate and coordinate with the System Integrator to accomplish all monitoring.

J. Overall Operating Sequence of Wet Weather Flow Storage System

1. Gate G-1 and Control Valve V-1 shall be normally open. Gate G-2 shall be normally closed. Gate G-3 shall be normally closed and valve V-2 will be normally closed. When the wastewater treatment plant influent flow exceeds 70 MGD, a fill sequence shall be initiated; Gate G-2 will open fully and Gate G-1 shall start to modulate closed to try and maintain 70 MGD into the plant. This will cause a backup in the diversion structure.

When Gate G-1 reaches 50% closed, then Control Valve V-1 shall start to modulate closed with it.

2. Once the flow backs up in the sewer, it shall overflow the weir and screen in the diversion structure and flow by gravity into the Wet Weather Storage (WWS) pump station. A radar level transmitter in the influent sewer (separate from the ultrasonic controls for the screen cleaning mechanism) shall continuously monitor influent sewer level. A high level alarm in the influent sewer shall be triggered at Elevation 911.00 and the Gate G-1 and Control Valve V-1 shall both open fully at that elevation, to allow full flow to the treatment plant, as either the WWS tank is full or there is a problem with the pump station.

3. The flow is pumped into the WWS tank. Two radar level transmitters are provided in the pump station wetwell and their levels are averaged for control of equipment. Three fill pumps shall come on (sequentially) and modulate to attempt to draw down and hold the water level in the wetwell at a control elevation of 898.00 based on two averaged radar level transmitters in the wetwell. The speed and number of pumps that remain online shall be determined by the flow matching, pumping out whatever flows in to hold the wetwell Elevation of 898.00 as closely as possible with the minimum number of pumps. As water level drops and pumps are taken offline, when the wetwell level finally drops to Elevation 892.00, the last fill pump shall be shutoff. Control elevations for starting each pump shall be determined during programming and after pump shop drawings have been reviewed. When a fill cycle is in progress, low level drain pumps shall be locked out.

4. Two radar level transmitters are provided in the WWS tank and their levels are averaged for control of equipment.

5. At Elevation 903.00 in the wetwell, a high water level alarm shall be generated. At Elevation 975.12 in the WWS tank a high water level alarm shall be generated and at Elevation 976.67 in the WWS tank an emergency high water level alarm shall be generated and Gate G-1 and Control Valve V-1 shall be driven full open and fill pumps shall be locked off. Gate G-1 and Control Valve V-1 shall close and open one time each 7 day period to exercise the mechanism – but never during a fill event or at the same time. The closing and opening time shall be minimum, so as not to obstruct the flow to the WWTP.

6. Upon receding influent flow to the treatment plant, the control system shall convert from a fill cycle to a drain cycle, returning flow from the WWS tank to the treatment plant for processing. To make the control system stable (prevent excessive cycling), the drain cycle shall not be initiated until influent flow has dropped to 60 MGD or less.

7. When flow drops to 60 MGD or less for at least 15 minutes and if there is water stored in the WWS tank, Control Gate G-3 shall open and modulate to maintain 65 MGD flow to the plant. This valve eventually will open fully as the level in the WWS tank drops and return flow will reduce until the level in the WWS tank drops to Elevation 922.00. At that elevation, Control Gate G-3 shall close after a programmable time delay (initially set at 2 hours). Gate G-3 shall open and close automatically one time each 7 day period to exercise the mechanism – but never during a fill event.

8. At Elevation 892.00, the selected low level drain pump shall be started, pumping down the wetwell until pump stop Elevation 885.00 is reached. At the same time as the pump starts, Control Valve V-2 shall open, draining the fill pump force main back into the wetwell. Valve V-2 shall remain open for a programmable time (initially set at 60 minutes), then shall close back. The low level drain pump shall be allowed to operate as long as the fill pumps are not running. The pump operation shall be enabled by the SCADA system during the drain cycle only, but the low level float switches suspended in the sump shall actually control the pump off. The low level reset float will serve as an on float at this low level. Valve V-2 open and close automatically one time each 7 day period to exercise the mechanism – but never during a fill event.

9. Ten minutes after the low level drain pumps shut off, the entire system shall be reset to initial conditions before the fill cycle initiated. At that point, Gate G-2 shall close to isolate the system for odor control. When the system is "ready" with no fill or drain event in progress, Gate G-2 shall open and close automatically one time each 24 hour period to allow small quantities of water accumulated in the diversion structure to pass to the wetwell, where it can be pumped back into the plant by the low level drain pumps.

10. Should a surge of flow reach the plant while in the process of draining the WWS tank, when plant influent flow goes over 70 MGD and the gravity sewer diversion structure starts overflowing into the wetwell, the system shall shutoff the low level drain pumps, close Gate G-3, and revert to the fill sequence, throttling Gate G-1 and Valve V-1.

1.04 GAUGE SCHEDULE

Quantity	Location Required	Range					Accessories
		Combination			Compound		
		Size	PSI	Feet	Vacuum (ft)	Altitude (ft)	
4	Fill Pump Discharge	4-1/2"	0-100	0-230			A, B, C
2	Low Level Drain Pump Discharge	4-1/2"	0-100	0-230			A, B, C

Pressure Gauge Accessory Code:

A - Gauge Liquid Filled
B - Diaphragm Seal, Liquid Filled
C - Ball Valves for Shutoff and Vent
* - Viton Diaphragm

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION

SECTION 17490 - MEASUREMENT AND CONTROL COMMISSIONING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install all instrumentation equipment and accessory items as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK

A. The following Sections of this Specification Division contain requirements on instrumentation and control equipment and software which are considered to be covered by applicable requirements of this section (and shall be included in the bid by a single Instrumentation Supplier for this Project):

SECTION 17311 – PLC HARDWARE AND SOFTWARE
SECTION 17410 – BASIC MEASUREMENT AND CONTROL INSTRUMENTATION MATERIALS AND METHODS
SECTION 17420 – INSTRUMENTS
SECTION 17430 – BOXES, PANELS AND CONTROL CENTERS
SECTION 17480 – INSTRUMENT LISTS AND REPORTS

B. The following Divisions of these Specifications contain requirements on equipment furnished by other suppliers that must interface with the instrument system, or on methods and materials to be performed/used in the installation and/or wiring of the instrumentation system.

DIVISION 1 - GENERAL REQUIREMENTS
DIVISION 11 - EQUIPMENT
DIVISION 16 - ELECTRICAL

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

3.01 SEQUENCE OF CONSTRUCTION

A. Installation and startup of the new pump station PLC shall be coordinated with the Owner, as the equipment will communicate over an existing SCADA system.

B. Delivery, startup, and programming of new equipment furnished under this Division shall be coordinated with process equipment installation. A qualified technician shall be present on site during pump startup.

3.02 INSTALLATION/APPLICATION/ERECTION

A. Instrumentation and accessory equipment shall be installed in accordance with the manufacturer's instructions. The locations of equipment, transmitters, alarms and similar devices shown on the Drawings are approximate only. Exact locations shall be as accepted by the Engineer during construction. Obtain in the field all information relevant to the placing

of process control work, proceed as directed by the manufacturer and furnish all labor and materials necessary to complete the work in an acceptable manner.

B. The instrumentation installation details on the Drawings indicate the designed installation for the instruments specified. Where specific installation details are not specified or shown on the Drawings, the manufacturer's recommended practice shall be followed.

C. All work shall be executed in full accordance with codes. Should any work be performed contrary to said codes and/or regulations, the Contractor shall bear full responsibility for such violations and assume all costs arising therefrom. All equipment used in areas designated as hazardous shall be designed for the Class, Division, and Group as required on the Drawings for the locations.

D. Unless specifically shown in the Contract Documents, direct reading or electrical transmitting instrumentation shall not be mounted on process piping. Instrumentation shall be mounted on instrument racks or stands. All instrumentation connections shall be provided with shutoff and drain valves.

E. All piping to and from field instrumentation shall be provided with necessary unions, test tees, couplings, adaptors, and shut-off valves.

F. Field instruments requiring power supplies shall be provided with local electrical shut-offs and fuses as required.

G. Brackets and hangers required for mounting of equipment shall be provided. They shall be installed in a workmanlike manner and not interfere with any other equipment.

H. The system supplier shall investigate each space in the building through which equipment must pass to reach its final location. If necessary, the system supplier shall be required to ship his material in sections sized to permit passing through restricted areas in the building. The system supplier shall also investigate, and make any field modifications to the allocated space for each cabinet, enclosure and panel to assure proper space and access (front, rear, side).

I. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded as directed by the manufacturer of the instrumentation equipment but in no case shall more than one ground point be employed for each shield.

J. Lifting rings shall be removed from cabinets/assemblies. Hole plugs shall be provided for the holes of the same color as the cabinet.

K. The system supplier, acting through the Contractor, shall coordinate the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Engineer's acceptance. He shall be responsible to ensure that all field wiring for power and signal circuits are correctly done in accordance with best industry practice and provide for all necessary system grounding to ensure a satisfactory functioning installation. The Contractor hereunder shall schedule and coordinate his work under this Section with that of the electrical work specified under applicable Sections of Division 16.

3.03 FIELD QUALITY CONTROL

A. After equipment and materials have been shipped to the job site, the Supplier shall furnish the services of a factory-trained service technician or engineer to assist and advise the Contractor during installation and to provide programming/calibration/ adjustment at initial startup. A minimum period of 2 calendar days on the job site is required, and expenses associated with additional days necessary shall be at no cost to the Owner.

B. Following installation, checkout, and final adjustment of all panels, instruments, meters, monitoring, and control devices, the Contractor shall schedule a performance test in the presence of the Engineer on all equipment. The Contractor shall furnish the services of the system supplier's servicemen, all special tools, calibration equipment, and labor to perform the tests.

C. Meters shall be tested at 0 percent, 25 percent, 50 percent, 75 percent, and 100 percent of scale, if possible. All status and alarm switches as well as all monitoring and control functions shall also be checked, including logging at printers and change of state on graphics. Testing shall be done from the signal source to the final element or device including all field wiring. Results of all testing shall be submitted to the Engineer in writing.

D. As much as possible, points shall be checked "end-to-end". For example, valve status inputs shall be checked by stroking the valve, and a pump start output shall be checked by using it to start to start the pump. Simulated testing shall be allowed only when no practical alternative exists. Workstation displays shall be verified for correctness at the same time. An I/O checklist shall be used to record test results and a copy provided to the Engineer upon completion. During system testing, the Contractor shall have a representative onsite continuously who is capable of troubleshooting and modifying system configuration programming.

E. If, during running of the tests, one or more points appear to be out by more than the system accuracy statement, or fails to perform in accordance with agreed strategies, the system supplier's servicemen shall make such adjustment or alterations as are necessary to bring equipment/programming up to specification performance. Following such adjustment, the tests shall be repeated for all specified points to ensure compliance.

3.04 PERFORMANCE TEST

A. Subsequent to the full system implementation, the Contractor shall conduct a successful 30 day final acceptance test for the system furnished and installed under this Contract. In this test, the entire system must operate continuously for 24 hours per day, 7 days per week during the test period, with zero downtime resulting from system failures. If a system failure occurs, the 30-day test period will be repeated, starting over at time zero, from the time that the system failure is repaired. The Contractor shall repeat the test until it is satisfactorily completed. The system will only be acceptable to the Owner after all equipment and software has satisfied the performance test requirements.

B. The Contractor shall submit a final acceptance test completion report which shall state that all Contract requirements have been met and which shall include a summary of maintenance/repair efforts that were required during the test period. Final acceptance of the system by the Owner until this has occurred.

3.05 ADJUSTING AND CLEANING

A. All equipment furnished under this Section of the Specifications shall be adjusted/calibrated as defined elsewhere this Section/Division.

B. All instruments and equipment shall be left free from shipping stickers, paint splatter, dirt, grease, etc., and shall be clean and in like new condition at final acceptance. Touch-up paint shall be furnished as needed to repair blemishes and scratches in finish paint on panels and enclosures, which shall be corrected by the Contractor.

3.06 EXTRA STOCK/SPARE PARTS

A. The following supplies and spare parts shall be furnished:

1. Ten fuses for each type/size in the system.

2. Four Cutler-Hammer C799L2 oxidation inhibitors; install one in each cabinet.

3. 48 lamps for each type/size used.

4. One relay of every size and type provided in the project

B. Other spare parts are listed in specific instrument technical specifications in the appropriate Division 17 Specification Section herein. All spare parts shall be packaged in an acceptable manner for long-term storage and adequately protected against corrosion, humidity and temperature extremes. All items shall be tagged externally with what they are; both a written description and a manufacturer brand/part number.

END OF SECTION

APPENDICES

APPENDIX A

WESTECH
Process Equipment. Process Driven.

Thursday, September 18, 2014

Mr. Joe Henry, PE
GRW
801 Corporate Drive
Lexington, KY 40503

RE: Town Branch Wet Weather Storage Facility
Lexington-Fayette Urban County Government
Division of Water Quality
Remedial Measures Plan ID No. G2-TB-1
LFUCG Bid No. 137-2014
Specification Section 11252 – Vertical Mounted Mechanical Screen

Dear Mr. Henry,

WesTech acknowledges that LFUCG is specifying the proposed equipment as a sole source item for the specific project and thus we agree to the following additional terms and conditions for supplying the specified equipment per our final cost proposal.

- Proposal price is guaranteed to LFUCG for use by all contractors bidding the specified project and will not change to any general contractor.
- Proposal price is guaranteed for the duration of the contract and will not change if the project proceeds in an orderly manner.
- Proposal price includes all costs for the equipment including O&M submittal, startup and training, and warranty per the related specifications and drawings in the Contract Documents.
- WesTech acknowledges and agrees that the purchase order for the specified equipment will be issued by the general contractor to which the LFUCG awards the contract for the construction of the specified project, and that the general contractor shall be solely responsible for payment.

Please do not hesitate to contact me if you have any questions or require additional information. We look forward to working with you on this project to provide the Lexington-Fayette Urban County Government the best possible treatment solution.

Sincerely yours,
WesTech Engineering, Inc.

James R. Hanson, VP
National Sales Manager

c: Katie Avera, Eco-Tech, Inc.

An Employee-Owned Company

3665 S. West Temple, Salt Lake City, UT 84115 Tel: 801.265.1000 Fax: 801.265.1080 www.westech-inc.com

Conformance Set

RE: Town Branch Wet Weather Storage Facility
Lexington-Fayette Urban County Government
Division of Water Quality
Remedial Measures Plan ID No. G2-TB-1
LFUCG Bid No. 137-2014
Specification Section 11252 – Vertical Mounted Mechanical Screen

State of Utah)

§

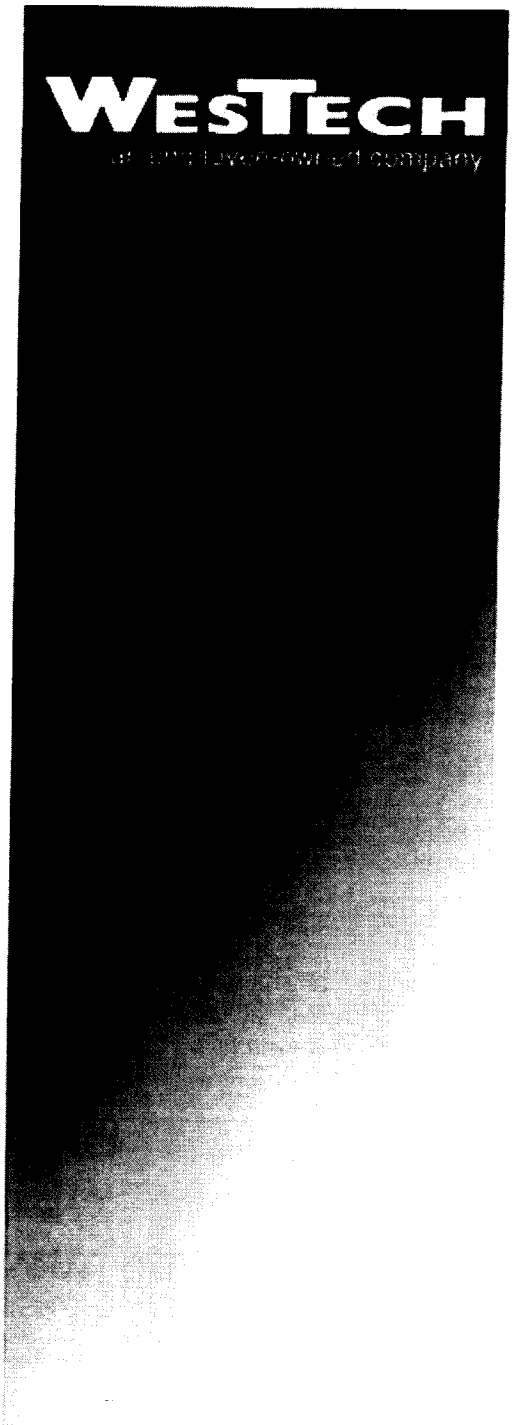
County of Salt Lake)

On this 18th day of September, 2014, before me Catarina N. Garcia, a notary public, appeared James R. Hanson, personally known to me to be the person whose name is subscribed to on this instrument, and acknowledged that he executed the same.

Notary Public

My Commission Expires 08.21.16

CATARINA N. GARCIA
Notary Public State of Utah
My Commission Expires on:
August 21, 2016
Comm. Number: 658177



Proposal For:
Town Branch Wet Weather Storage Facility
Lexington Municipal Utilities

Equipment:
11252 Vertical Mounted Mechanical Screen

Engineer:
GRW

Represented By:
Katie Avera
Eco-Tech, Inc
kavera@eco-tech.net
606-682-0887 – Cell

Furnished By:
WesTech Engineering, Inc.
Salt Lake City, Utah 84115
Contact: Steve Rioux
Direct: 801.290.6449
Phone: 801.265.1000
Fax: 801.265.1080

WesTech Proposal: 1360606
Thursday, September 18, 2014

Conformance Set

WESTECH

REFERENCE ENGINEER'S SPECIFICATION

SECTION: **11252 – Vertical Mounted Mechanical Screen**
ADDENDA: **None**

ITEM: "A" - One (1) CleanFlo™ ROMAG Deflection Screen Model RSW 6x8/4

BASIS OF DESIGN (EACH)

Application:	Combined Sewer Overflow
Screen Mount:	Vertical
Max Design Flow:	57 MGD
Screen Opening:	4 mm

EACH UNIT FURNISHED COMPLETE BY WESTECH WITH THE FOLLOWING COMPONENTS:

MECHANICAL FINE SCREEN (EACH)

- Vertically mounted with control weir.
- Screen consisting of:
    1. Support frame.
    2. Vertically mounted screening area, composed of 4mm pre-stressed bars.
    3. Cleaning carriage assembly including hydraulic cylinder and piston, slide bearings and cleaning tines
- Overflow cover mounted to protect downstream side of screen and direct overflow beyond screen.
- Four (4) 48-inch long hydraulic synthetic rubber hose pig tails; two (2) mounted at screen, two (2) mounted at hydraulic power pack. JIC swivel fittings from stainless steel. *(Interconnecting hydraulic tubing between screen, and power pack is to be provided by the installing contractor).*

- Screen frame: 304L stainless steel
- Screen bars: 304L stainless steel
- Traveling cleaning carriage: 304L stainless steel
- Cleaning tines: UHMW PE
- End cleaning Tines: Bronze alloy
- Hydraulic cylinder: Stainless steel, piston chrome plate
- Hydraulic power pack: Painted carbon steel
- Support Struts: 304L stainless steel

HYDRAULIC POWER PACK (EACH)

- One (1) hydraulic power pack. The power pack shall contain the following:
    1. Fixed displacement hydraulic gear pump.
    2. Replaceable suction and oil filters.
    3. 10 gallon oil reservoir.
    4. Pressure limiting/relief valve.
    5. 0-3000 psi pressure gauge.
    6. Pressure transducer with 4-20mA output.
    7. Directional solenoid valve, NEMA 4.
    8. Filler breather cap with strainer.
    9. Oil level and temperature switch, NEMA 4.
    10. Air/oil return line heat exchanger.

Conformance Set

11. Sight level/temperature gauge.
12. Reservoir drain valve.

- One (1) 5HP, 1800 rpm, TEFC severe duty motor suitable for 230/460/3/60 electrical supply.
- Hydraulic fluid for the Hydraulic Power Pack, 3x5 gal pails.

HARDWARE (EACH)
- Assembly fasteners from type 304 stainless steel.
- Anchor rods from type 304 stainless steel.

CONTROLS AND ELECTRICAL DEVICES (EACH)
- One (1) NEMA 12 painted steel wall mount main control panel suitable for 480/3/60 electrical supply. Control panel shall contain the following devices for operation of the screen unit:
  1. Main circuit breaker disconnect with through door interlock handle.
  2. Step down control transformer.
  3. TVSS – 120 vac.
  4. Branch circuit protection.
  5. Hydraulic pack motor starter – NEMA 1.
  6. Emergency stop pushbutton.
  7. Hour meter for screen motor.
  8. Control power and run indicating lights.
  9. Oil Temperature, low oil level, carriage reduced/blocked fault lights
  10. Loss of pressure fault light.
  11. High screen level fault light.
  12. Alarm light indicating overcurrent and starter overload.
  13. Alarm reset pushbutton.
  14. Allen-Bradley PLC – CompactLogix.
  15. Allen-Bradley Operator Interface – PanelView C400.
  16. Ethernet Switch, unmanaged
  17. Panel heater with thermostat.
  18. Run and alarm auxiliary contacts & via Ethernet communication.
  19. UL Label.

- One (1) Milltronics HydroRanger 200 ultrasonic level controller supplied in a windowed NEMA 4X polycarbonate enclosure including handheld programmer for mounting near the main control panel.
- One (1) Milltronics ultrasonic level transducer with type 316 stainless steel mounting bracket and integral 10m cable. Suitable for installation in a Class 1, Division 1. Group C and D location.

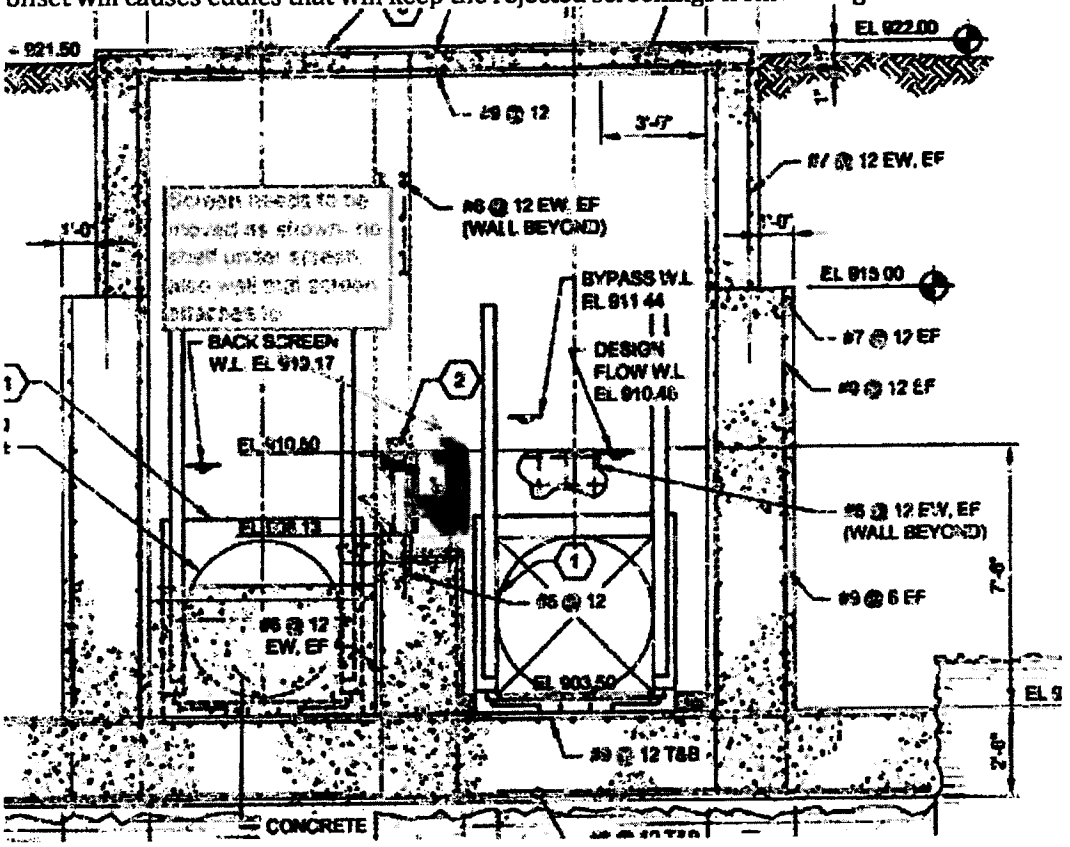
SPARE PARTS (TOTAL)
- Two (2) cleaning tine sections (standard).
- Two (2) cleaning tine section (end).
- Two (2) replacement oil filters.

FIELD SERVICE (TOTAL)
- One (1) trip and one (1) day for concrete inspection prior to equipment installation.
- Two (2) trips and three (3) days for equipment installation inspection, start up, and instruction of plant personnel.

WESTECH

CLARIFICATIONS/COMMENTS

- Unit anchorage designed around RedHead A7 adhesive system. Adhesive and applicator by others.
- The concrete weir that the screen will be mounted to needs to be level and horizontal with the perpendicular side walls.
- Plan Sheet I-3-102: The PID drawing used depicts the bending weir PID which needs hydraulic hoses for the cylinders on the weir and the flushing gate. The fixed weir Romag Screen specified only needs lines for the cleaning carriage cylinder, so only 2 hydraulic lines are needed.
- Plan Sheet I-3-102: The fixed weir specified only needs 1 transducer, as correctly noted in the specification.
- Plan Sheet C-3-101: The screen needs to be moved as I have shown below (no offset) and cannot have a shelf under it. As shown screening will accumulate below the screen and the offset will causes eddies that will keep the rejected screenings from leaving the chamber.



OPTIONAL ITEMS

- None.

NOTE: ANY ITEM NOT LISTED ABOVE TO BE FURNISHED BY OTHERS:

ITEMS NOT BY WESTECH: Electrical wiring, conduit or electrical equipment, piping, valves, or fittings, shimming material, lubricating oil or grease, shop or field painting, field welding, erection, detail shop fabrication drawings, performance testing, unloading, storage, concrete work, hoist or lifting apparatus, grating, platforms, stairs, handrailing, or field service (except as specifically noted).

This proposal section has been reviewed for accuracy and is approved for issue:
By: Stephen Rioux Date: September 18, 2014

Conformance Set

WESTECH

PRICING

SECTION	ITEM	EQUIPMENT	PRICE (U.S.)
11252	"A"	(1) CleanFlo™ ROMAG Deflection Screen RSW 6x8/4	$290,000
		Estimated Sales Tax	$ 17,400
		Total:	$307,400

Sales Tax: Taxes are included in WesTech's proposal; however, WesTech is not registered to collect taxes in the state of Kentucky. Contractor will need to pay the required tax at the current rate to the Taxing Authority directly.

Please ensure to reference this quotation number and date on your purchase order. Please make order to: WesTech Engineering, Inc. 3665 S. West Temple Salt Lake City, Utah 84115 Attn: Catarina N. Garcia cgarcia@westech-inc.com.

We appreciate the opportunity to offer our equipment. Upon award of an order, we assure you of our continued interest and service. At WesTech we realize that only the best possible equipment will be accepted, and we trust we will exceed your expectations.

This proposal, including all terms and conditions contained herein, shall become part of any resulting contract or purchase order. Changes to any terms and conditions, including but not limited to submittal and shipment days, payment terms, and escalation clause shall be negotiated at order placement, otherwise the proposal terms and conditions contained herein shall apply.

The above mentioned equipment was designed according to the information which we received. The dimensions may vary slightly depending upon the plant's actual design parameters. Assumed values may have been used, therefore, all information shall be verified by the engineer.

Unless otherwise indicated, prices listed are for equipment only. All optional items will be offered with the purchase of the scoped equipment only. No optional items will be sold separately.

Terms: Terms for equipment are 15 percent payment of the purchase price with submittal drawings, 35 percent upon release for fabrication, and 50 percent net **30 days** from shipment. Retentions are not allowed.

Freight: Prices quoted are **F.O.B. shipping point** with freight allowed to a readily accessible location nearest to jobsite. All claims for damage or loss in shipment shall be initiated by purchaser.

Submittals: Submittals will be made approximately **6 to 8 weeks** after purchase order is received in our office.

Shipment: Estimated shipment time is **18 to 20 weeks** after approved submittal drawings are received in our office.

Field Service: Prices do not include field service unless noted in equipment description. Additional field service is available at $960.00 per day plus expenses.

Paint: If your equipment has paint included in the price, please take note of the following. Primer paints are designed to provide only a minimal protection from the time of application (usually for a period not to exceed 30 days). Therefore, it is imperative that the finish coat be applied within 30 days of shipment on all shop primed surfaces. Without the protection of the final coatings, primer degradation may occur after this period, which in turn may require renewed surface preparation and coating. If it is impractical or impossible to coat primed surfaces within the suggested time frame, WesTech strongly recommends the supply of bare metal, with surface preparation and coating performed in the field. All field surface preparation, field paint, touch-up and repair to shop painted surfaces are not by WesTech.

One Year Warranty

WesTech equipment is backed by WesTech's reputation as a quality manufacturer, and by many years of experience in the design of reliable equipment.

Equipment manufactured or sold by WesTech Engineering, Inc., once paid for in full, is backed by the following warranty:

For the benefit of the original user, WesTech warrants all new equipment manufactured by WesTech Engineering, Inc. to be free from defects in material and workmanship, and will replace or repair, F.O.B. its factories or other location designated by it, any part or parts returned to it which WesTech's examination shall show to have failed under normal use and service by the original user within one (1) year following initial start-up, or eighteen (18) months from shipment to the purchaser, whichever occurs first.

Such repair or replacement shall be free of charge for all items except for those items such as resin, filter media and the like that are consumable and normally replaced during maintenance, with respect to which, repair or replacement shall be subject to a pro-rata charge based upon WesTech's estimate of the percentage of normal service life realized from the part. WesTech's obligation under this warranty is conditioned upon its receiving prompt notice of claimed defects, which shall in no event be later than thirty (30) days following expiration of the warranty period, and is limited to repair or replacement as aforesaid.

This warranty is expressly made by WesTech and accepted by purchaser in lieu of all other warranties, including warranties of merchantability and fitness for particular purpose, whether written, oral, express, implied, or statutory. WesTech neither assumes nor authorizes any other person to assume for it any other liability with respect to its equipment. WesTech shall not be liable for normal wear and tear, corrosion, or any contingent, incidental, or consequential damage or expense due to partial or complete inoperability of its equipment for any reason whatsoever.

This warranty shall not apply to equipment or parts thereof which have been altered or repaired outside of a WesTech factory, or damaged by improper installation, application, or maintenance, or subjected to misuse, abuse, neglect, accident, or incomplete adherence to all manufacturer's requirements, including, but not limited to, Operations & Maintenance Manual guidelines & procedures.

This warranty applies only to equipment made or sold by WesTech Engineering, Inc.

WesTech Engineering, Inc. makes no warranty with respect to parts, accessories, or components purchased by the customer from others. The warranties which apply to such items are those offered by their respective manufacturers.

QF-00-032E Rev. 2005AUG18

Terms and Conditions appearing in any order based on this proposal which are inconsistent herewith shall not be binding on WesTech Engineering Inc. The sale and purchase of equipment described herein shall be governed exclusively by the foregoing proposal and the following provisions:

1. SPECIFICATIONS: WesTech Engineering Inc. is furnishing its standard equipment as outlined in the proposal and as will be covered by final approved drawings. The equipment may not be in strict compliance with the Engineer's/Owner's plans, specifications, or addenda as there may be deviations. The equipment will, however, meet the general intention of the mechanical specifications of these documents.

2. ITEMS INCLUDED: This proposal includes only the equipment specified herein and does not include erection, installation, accessories, nor associated materials such as controls, piping, etc., unless specifically listed.

3. PARTIES TO CONTRACT: WesTech Engineering Inc. is not a party to or bound by the terms of any contract between WesTech Engineering Inc.'s customer and any other party. WesTech Engineering Inc.'s undertakings are limited to those defined in the contract between WesTech Engineering Inc. and its direct customers.

4. PRICE AND DELIVERY: All selling prices quoted are subject to change without notice after 30 days from the date of this proposal unless specified otherwise. Unless otherwise stated, all prices are F.O.B. WesTech Engineering Inc. or its supplier's shipping points. All claims for damage, delay or shortage arising from such equipment shall be made by Purchaser directly against the carrier. When shipments are quoted F.O.B. job site or other designation, Purchaser shall inspect the equipment shipped, notifying WesTech Engineering Inc. of any damage or shortage within forty-eight hours of receipt, and failure to so notify WesTech Engineering Inc. shall constitute acceptance by Purchaser, relieving WesTech Engineering Inc. of any liability for shipping damages or shortages.

5. PAYMENTS: All invoices are net 30 days. Delinquencies are subject to a 1.5 percent service charge per month or the maximum permitted by law, whichever is less on all past due accounts. Pro rata payments are due as shipments are made. If shipments are delayed by the Purchaser, invoices shall be sent on the date when WesTech Engineering Inc. is prepared to make shipment and payment shall become due under standard invoicing terms. If the work to be performed hereunder is delayed by the Purchaser, payments shall be based on the purchase price and percentage of completion. Products held for the Purchaser shall be at the risk and expense of the Purchaser. Unless specifically stated otherwise, prices quoted are for equipment only. These terms are independent of and not contingent upon the time and manner in which the Purchaser receives payment from the owner.

6. PAYMENT TERMS: Credit is subject to acceptance by WesTech Engineering Inc.'s Credit Department. If the financial condition of the Purchaser at any time is such as to give WesTech Engineering Inc., in its judgment, doubt concerning the Purchaser's ability to pay, WesTech Engineering Inc. may require full or partial payment in advance or may suspend any further deliveries or continuance of the work to be performed by the WesTech Engineering Inc. until such payment has been received.

7. ESCALATION: If shipment is, for any reason, deferred by the Purchaser beyond the normal shipment date, or if material price increases are greater than 5% from proposal date to material procurement date, stated prices set forth herein are subject to escalation. The escalation shall be based upon increases in labor and material and other costs to WesTech Engineering Inc. that occur in the time period between quotation and shipment by WesTech Engineering Inc. Purchaser agrees to this potential escalation regardless of contradicting terms in the contract, except when an agreed upon escalation adder is included in the price.

(a) The total quoted revised price is based upon changes in the indices published by the United States Department of Labor, Bureau of Labor Statistics. Labor will be related to the Average Hourly Earnings indices found in the Employment and Earnings publication. Material will be related to the Metal and Metal Products Indices published in Wholesale Prices and Prices Indices.

(b) Price revision for items furnished to, and not manufactured by WesTech Engineering Inc., which exceed the above escalation calculation, will be passed along by WesTech Engineering Inc. to Purchaser based upon the actual increase in price to WesTech Engineering Inc. for the period from the date of quotation to the date of shipment by WesTech Engineering Inc. Any item that is so revised will be excluded from the index escalation calculations set forth in subparagraph (a) above.

8. APPROVAL: If approval of equipment submittals by Purchaser or others is required, a condition precedent to WesTech Engineering Inc. supplying any equipment shall be such complete approval.

9. INSTALLATION SUPERVISION: Prices quoted for equipment do not include installation supervision. WesTech Engineering Inc. recommends and will, upon request, make available, at WesTech Engineering Inc.'s then current rate, an experienced installation supervisor to act as the Purchaser's employee and agent to supervise installation of the equipment. Purchaser shall at its sole expense furnish all necessary labor equipment, and materials needed for installation.

Responsibility for proper operation of equipment, if not installed by WesTech Engineering Inc. or installed in accordance with WesTech Engineering Inc.'s instructions, and inspected and accepted in writing by WesTech Engineering Inc., rests entirely with Purchaser; and any work performed by WesTech Engineering Inc. personnel in making adjustment or changes must be paid for at WesTech Engineering Inc.'s then current per diem rates plus living and traveling expenses.

WesTech Engineering Inc. will supply the safety devices described in this proposal or shown in WesTech Engineering Inc.'s drawings furnished as part of this order but excepting these, WesTech Engineering Inc. shall not be required to supply or install any safety devices whether required by law or otherwise. The Purchaser hereby agrees to indemnify and hold harmless WesTech Engineering Inc. from any claims or losses arising due to alleged or actual insufficiency or inadequacy of the safety devices offered or supplied hereunder, whether specified by WesTech Engineering Inc. or Purchaser, and from any damage resulting from the use of the equipment supplied hereunder.

10. ACCEPTANCE OF PRODUCTS: Products will be deemed accepted without any claim by Purchaser unless written notice of non-acceptance is received by WesTech Engineering Inc. within 30 days of delivery if shipped F.O.B. point of shipment, or 48 hours of delivery if shipped F.O.B. point of destination. Such written notice shall not be considered received by WesTech Engineering Inc. unless it is accompanied by all freight bills for said shipment, with Purchaser's notations as to damages, shortages and conditions of equipment, containers, and seals. Non-accepted products are subject to the return policy stated below.

11. TAXES: Any federal, state, or local sales, use or other taxes applicable to this transaction, unless specifically included in the price, shall be for Purchaser's account.

12. TITLE: The equipment specified herein, and any replacements or substitutes therefore shall, regardless of the manner in which affixed to or used in connection with realty, remain the sole and personal property of WesTech Engineering Inc. until the full purchase price has been paid. Purchaser agrees to do all things necessary to protect and maintain WesTech Engineering Inc.'s title and interest in and to such equipment; and upon Purchaser's default, WesTech Engineering Inc. may retain as liquidated damages any and all partial payments made and shall be free to enter the premises where such equipment is located and remove the same as its property without prejudice to any further claims on account of damages or loss which WesTech Engineering Inc. may suffer from any cause.

13. INSURANCE: From date of shipment until the invoice is paid in full, Purchaser agrees to provide and maintain at its expense, but for WesTech Engineering Inc.'s benefit, adequate insurance including, but not limited to, builders risk insurance on the equipment against any loss of any nature whatsoever.

14. SHIPMENTS: Any shipment of delivery dates recited represent WesTech Engineering Inc.'s best estimate but no liability, direct or indirect, is assumed by WesTech Engineering Inc. for failure to ship or deliver on such dates.

WesTech Engineering Inc. shall have the right to make partial shipments; and invoices covering the same shall be due and payable by Purchaser in accordance with the payment terms thereof. If Purchaser defaults in any payment when due hereunder, WesTech Engineering Inc. may, without incurring any liability therefore to Purchaser or Purchaser's customers, declare all payments immediately due and payable with maximum legal interest thereon from due date of said payment, and at its option, stop all further work and shipments until all past due payments have been made, and/or require that any further deliveries be paid for prior to shipment.

If Purchaser requests postponements of shipments, the purchase price shall be due and payable upon notice from WesTech Engineering Inc. that the equipment is ready for shipment; and thereafter any storage or other charge WesTech Engineering Inc. incurs on account of the equipment shall be for the Purchaser's account.

If delivery is specified at a point other than WesTech Engineering Inc. or its supplier's shipping points, and delivery is postponed or prevented by strike, accident, embargo, or other cause beyond WesTech Engineering Inc.'s reasonable control and occurring at a location other than WesTech Engineering Inc. or its supplier's shipping points,

WesTech Engineering Inc. assumes no liability in delivery delay. If Purchaser refuses such delivery, WesTech Engineering Inc. may store the equipment at Purchaser's expense. For all purposes of this agreement such tender of delivery or storage shall constitute delivery.

15. WARRANTY: WESTECH ENGINEERING INC. WARRANTS EQUIPMENT IT SUPPLIES ONLY IN ACCORDANCE WITH THE WARRANTY EXPRESSED IN THE ATTACHED COPY OF "WESTECH WARRANTY" AGAINST DEFECTS IN WORKMANSHIP AND MATERIALS WHICH IS MADE A PART HEREOF. SUCH WARRANTY IN LIEU OF ALL OTHER WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE, WHETHER WRITTEN, ORAL, EXPRESSED, IMPLIED OR STATUTORY, WESTECH ENGINEERING INC. SHALL NOT BE LIABLE ANY CONTINGENT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES FOR ANY REASON WHATSOEVER.

16. PATENTS: WesTech Engineering Inc. agrees that it will, at its own expense, defend all suits or proceedings instituted against Purchaser and pay any award of damages assessed against it in such suits or proceedings, so far as the same are based on any claim that the said equipment or any part thereof constitutes an infringement of any apparatus patent of the United States issued at the date of this Agreement, provided WesTech Engineering Inc. is given prompt notice in writing of the institution or threatened institution of any suit or proceeding and is given full control of the defense, settlement, or compromise of any such action; and Purchaser agrees to give WesTech Engineering Inc. needed information, assistance, and authority to enable WesTech Engineering Inc. so to do. In the event said equipment is held or conceded to infringe such a patent, WesTech Engineering Inc. shall have the right at its sole option and expense to a) modify the equipment to be non-infringing, b) obtain for Purchaser the license to continue using said equipment, or c) accept return of the equipment and refund to the Purchaser the purchase price thereof less a reasonable charge for the use thereof. WesTech Engineering Inc. will reimburse Purchaser for actual out-of-pocket expenses, exclusive of legal fees, incurred in preparing such information and rendering such assistance at WesTech Engineering Inc.'s request. The foregoing states the entire liability of WesTech Engineering Inc., with respect to patent infringement; and except as otherwise agreed to in writing, WesTech Engineering Inc. assumes no responsibility for process patent infringement.

17. SURFACE PREPARATION AND PAINTING: If furnished, shop primer paint is intended to serve only as minimal protective finish. WesTech Engineering Inc. will not be responsible for the condition of primed or finish painted surfaces after equipment leaves its shops. Purchasers are invited to inspect paint in shops for proper preparation and application prior to shipment. WesTech Engineering Inc. assumes no responsibility for field surface preparation or touch-up of shipping damage to paint. Painting of fasteners and other touch-up to painted surfaces will be by Purchaser's painting contractor after mechanism installation.

Motors, gear motors, and other components not manufactured by WesTech Engineering Inc. will be painted with that manufacturer's standard paint system. It is WesTech Engineering Inc.'s intention to ship major steel components as soon as fabricated, often before drive, motors, and other manufactured components. Unless Purchaser can ensure that shop primed steel shall be field painted within thirty (30) days after arrival at the job site, WesTech Engineering Inc. encourages the Purchaser to order these components without primer.

WesTech Engineering Inc.'s prices are based on paints and surface preparations as outlined in the main body of this proposal. In the event that an alternate paint system is selected, WesTech Engineering Inc. requests that Purchaser's order advise of the paint selection. WesTech Engineering Inc. will then either adjust the price as may be necessary to comply or ship the material unpainted if compliance is not possible due to application problems or environmental controls.

18. CANCELLATION, SUSPENSION, OR DELAY: After acceptance by WesTech Engineering Inc., this proposal, or Purchaser's order based on this proposal, shall be a firm agreement and is not subject to cancellation, suspension, or delay except upon payment by Purchaser of appropriate charges which shall include all costs incurred by WesTech Engineering Inc. to date of cancellation, suspension, or delay plus a reasonable profit. Additionally, all charges related to storage and/or resumption of work, at WesTech Engineering Inc.'s plant or elsewhere, shall be for Purchaser's sole account; and all risks incidental to storage shall be assumed by Purchaser.

19. RETURN OF PRODUCTS: No products may be returned to WesTech Engineering Inc. without WesTech Engineering Inc.'s prior written permission. Said permission may be withheld by WesTech Engineering Inc. at its sole discretion.

20. BACKCHARGES: WesTech Engineering Inc. will not approve or accept backcharges for labor, materials, or other costs incurred by Purchaser or others in modification, adjustment, service, or repair of WesTech Engineering Inc.-furnished materials unless such back charge has been authorized in advance in writing by a WesTech Engineering Inc. employee, by a WesTech Engineering Inc. purchase order, or work requisition signed by WesTech Engineering Inc.

21. INDEMNIFICATION: Purchaser agrees to indemnify WesTech Engineering Inc. from all costs incurred, including but not limited to court costs and reasonable attorney fees, from enforcing any provisions of this contract, including but not limited to breach of contract or costs incurred in collecting monies owed on this contract.

22. ENTIRE AGREEMENT: This proposal expresses the entire agreement between the parties hereto superseding any prior understandings, and is not subject to modification except by a writing signed by an authorized officer of each party.

23. MOTORS AND MOTOR DRIVES: In order to avoid shipment delays of WesTech Engineering Inc. equipment, the motor drives may be sent directly to the job site for installation by the equipment installer. Minor fit-up may be required.

24. EXTENDED STORAGE: Extended storage instructions will be part of information provided to shipment. If equipment installation and start-up is delayed more than 30 days, the provisions of the storage instructions must be followed to keep WARRANTY in force.

25. LIABILITY: Professional liability insurance, including but not limited to, errors and omissions insurance, is not included. In any event, liability for errors and omissions shall be limited to the lesser of $100,000USD or the value of the particular piece of equipment (not the value of the entire order) supplied by WesTech Engineering Inc. against which a claim is sought.

26. ARBITRATION NEGOTIATION: Any controversy or claim arising out of or relating to the performance of any contract resulting from this proposal or contract issued, or the breach thereof, shall be settled by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the arbitrator(s) may be entered to any court having jurisdiction.

ACCEPTED BY PURCHASER

Customer Name: _____

Customer Address: _____

_____

_____

Contact Name: _____

Contact Phone: _____

Contact Email: _____

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Addenda

Addendum 1

Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #1

Bid Number: **#137-2014**

Date: September 10, 2014

Subject: Town Branch Wet Weather Storage Tank

Address inquiries to:
Sondra Stone
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced Bid:

A **mandatory** pre-bid conference for the above referenced project is being held Thursday, September 11, 2014, 10:00 am, 125 Lisle Industrial Ave, Lexington, KY. The meeting has been moved from the 2nd Floor Conference Room to the 1st Floor Training Room.

Todd Slatin, Director
Division of Central Purchasing

All other terms and conditions of the Bid and specifications are unchanged.
This letter should be signed, attached to and become a part of your Bid.

COMPANY NAME:_____

ADDRESS: _____

SIGNATURE OF BIDDER: _____

Addendum 2

Lexington-Fayette Urban County Government
DEPARTMENT OF FINANCE & ADMINISTRATION

Jim Gray
Mayor

William O'Mara
Commissioner

ADDENDUM #2

Bid Number: **#137-2014**

Date: September 15, 2014

Subject: Town Branch Wet Weather Storage Facility

Address inquiries to:
Sondra Stone
(859) 258-3320

TO ALL PROSPECTIVE SUBMITTERS:

Please be advised of the following clarifications to the above referenced Bid:

Questions	Answers
1. Are you going to coat the exterior of the tank or even better, line the interior?	No. There are no exterior or interior coatings specified as part of this project for the surfaces of the prestressed tank. (No action required)
2. Please provide project value range in dollars for Bid Bond considerations.	The project has a value range of $22 to $27 million. (No action required)
3. Will there be an addendum listing Precon Corporation as an approved tank construction company?	Yes (See Addendum items below)
4. Specification Section 01010, paragraph 1.8.B states that Contractor must employ a licensed surveyor to complete the work. Is this required for the layout of the drilled caissons or can the Contractor perform the layout with his own qualified personnel?	Yes, a licensed surveyor is required. (No action required)
5. Specification Section 02475, paragraph 3.01.A states instructs the Contractor to "Excavate holes for closely spaced Drilled Shaft, and those occurring in fragile or sand strata's, only after adjacent holes are filled with concrete and allowed to set." What is the engineer's definition of "closely spaced"?	Closely spaced shall be determined by the Contractor. It is not the intent of the Engineer to instruct the Contractor as how to construct the drilled shafts. The Contractor shall be responsible for constructing the drilled shafts in accordance with the Construction Plans and Specifications. (No action required)
6. Does the engineer agree that the burden soils detailed in the geotechnical reports would not be classified as "fragile or sand strata"?	Generally the soils are not characteristic of 'fragile or sand strata'. However, the Contractor is responsible for excavation of the drilled shafts through all earthen, rock, concrete over burden materials. (No action required)
7. The typical drilled shaft section on Drawing S-5-301 shows a 6' rock socket. However, specification section 02475, para. 3.01.A calls for a 3' rock socket. Which is correct?	Sheet S-5-301, a 6-foot rock socket is correct. (See Addendum items below)
8. Please confirm that all excess excavated earthen materials are to be kept on site and graded in a manner similar to what is shown on drawing C-0-103.	See revised Construction Drawing Sheet C-0-103. (See Addendum item below)

9. Does the note that begins, "Use of Fill Limitations:" require that all rock larger than 10" in diameter be disposed of at a permitted landfill?	See revised Construction Drawing Sheet C-0-103. (See Addendum item below)
10. Sheet No. C-4-101, Keynote 18 states, "1-1/2" Aluminum Grating." Sheet No. S-4-101 states, "2" Aluminum Grating." Please clarify.	Sheet C-4-101 is correct, 1-1/2" Aluminum Grating (See Addendum item below)
11. 13201, 2.10, Tanks Accessories does not match what is illustrated on Sheet No. C-5-101. Please clarify.	Specification Section 13201-2.10 has been revised to reflect the Construction Drawings. (See Addendum item below)
12. Please confirm that the contractor is not required to provide 'Builder's Risk' insurance coverage, or that the owner is providing this coverage.	Contractor is required to provide a Builder's Risk endorsement to ensure all new construction (including (buildings, materials and equipment) left onsite is protected from all risks. (No action required)
13. The Umbrella Liability endorsement limit shown on page 00600-20, 1.05.D.1.h is blank. Please provide this limit	The umbrella limit is $25,000,000.00. (See Addendum item below)
14. There does not appear to be a requirement in the insurance provisions for 'Railroad Protective Liability' insurance. There is work being performed within 50' of the existing RJ Corman rail line bordering the project site. Please confirm if this coverage is required.	A Railroad Protective Liability coverage endorsement is not required for this project. The Contractor is required to notify/contact the RJ Corman Railroad Company a minimum of one week prior to the start of construction. (No action required)
15. Please confirm that a separate 'Pollution Liability and/or Environmental Casualty' policy is acceptable in lieu of the endorsement specified on page 00600-19, 1.05.D.1.e.	A Pollution Liability and/or Environmental Casualty endorsement is acceptable as long as it has the required coverage limits - $1M/$2M aggregate. (See Addendum item below)
16. There is a note in the center of Plan Sheet C-0-102 which states the intent of demolition. Since the Contractor has no idea what might exist but not be shown, please confirm that the intent is to demolish all items within the limits of demolition, that are shown on this plan sheet and that anything that may be discovered/not shown will be treated as a changed condition.	The Contractor shall be responsible for all demolition within the construction limits/limits of demolition. (No action required)

17. Please refer to Plan Sheet C-0-103. The 2 notes located on the left side of the plan sheet address how suitable and unsuitable surplus soil is to be handled. The first note advises that excess excavated earth material shall be placed onsite on a minimum grade of 2%, for drainage considerations. It goes further to say that the grading contours are provided "for example". Therefore, we interpret this to mean that the grading contours shown on the referenced Plan Sheet may not be a true indication of the final site grades and can/will be adjusted, based on the quantity of excess earth material that is available. Please confirm our interpretation of this note.	See revised Construction Drawing Sheet C-0-103. (See Addendum item below)
18. Please refer to Plan Sheet C-0-103. The 2 notes located on the left side of the plan sheet address how suitable and unsuitable surplus soil is to be handled. The second note addresses the requirements for offsite disposal of the existing unsuitable fill material. It appears that the only material that would have to be disposed of offsite and not placed onsite, would be that material described in the last sentence of the first note… "All rock larger than 10"in diameter and other debris, such as wood, steel, etc." This material will be disposed in a permitted landfill. Please confirm our interpretation of the offsite disposal requirements and also please provide a list of the permitted landfills in Fayette County that are authorized to receive this material.	See revised Construction Drawing Sheet C-0-103. (See Addendum item below)
19. Specification Section 02300, 3.04, A indicates that "all existing fill below structures and paved areas must be stripped." The Revised Geotechnical Report dated July 24, 2014, page 10 of 24 indicates that the thickness of previously placed fill ranged from approximately 1 ½ to 24 feet. Additionally, throughout this report and the project specifications the existing subsurface conditions at this site are discussed and it appears obvious that the intent is for the existing fill to remain in-place beneath the new wet weather storage tank. Therefore, please clarify exactly what areas require removal of existing fill and confirm that the volume of existing fill removed and replaced will be paid for under Unit Price Item 9.	It is not anticipated to remove fill under structures except for what is required by the excavation specifications. Any foundation conditions found to be unsuitable will be excavated and filled with crushed stone on a case by case basis. Unit Price Item 9 does not apply under any structure other than the prestressed concrete tank, Structure No. 5. (No action required)

20. Referring to the previous question, Unit Price Item 9 will likely require a significant quantity of clean borrow material to refill the void left from rubble/debris removal. Please advise if the Owner has access to or knows of a suitable source of borrow material in close proximity to the site that could be used for this purpose. This will enable all bidders to provide a lower unit price for this line item which will reduce the bid price for the project.	It is not anticipated to remove fill under structures except for what is required by the excavation specifications. Any foundation conditions found to be unsuitable will be excavated and filled with crushed stone on a case by case basis. Unit Price Item 9 does not apply under any structure other than the prestressed concrete tank, Structure No. 5. (No action required)
21. Please refer to Plan Sheet C-0-402. Please confirm what type of pipe the existing 54" Concrete Gravity Sewer line is. Is it PCCP or RCP and if so what class of pipe?	From LFUCG As-Built Drawings, the existing 54" concrete pipe is Class IV, RCP. (No action required)
22. Please refer to the Revised Geotechnical Report dated July 24, 2014, page 15, paragraph 9-Foundations. The second sentence of this paragraph states "To avoid differential settlement occurring between the CROM tanks and the additional structures (i.e. – the Diversion Structures, the Pump Station, and/or the Flow Control Vault), we recommend that these structures also be constructed with rock bearing foundations (either drilled shafts or shallow spread foundations)." It appears all do with the exception of the Tank Drain Flow Control Vault shown on Plan Sheet C-6-101. Please review and advise if Drilled Shaft Foundations will in fact be required to support the Tank Drain Flow Control Vault.	Drilled shafts will not be required beneath the Flow Control Vault, Structure 6. (No action required)
23. No specifications were found for the 1500 psi lean concrete that is to be placed between the rock face and pump station walls as detailed on Sheet S-4-301 or the grout inverts shown in the diversion structures. Please provide a material specification for these products.	No specifications are provided for 1500 psi lean concrete. All grout shall be specified under Specification Section 03600, Precision Grouting. (No action required)

1. ADDITIONAL INFORMATION – PRECONSTRUCTION PHOTOS

30 photographs of the construction site foundation conditions are attached for your information. The original .tif images will be available for view on the LFUCG Economic Engine site.

2. ADDITIONAL INFORMATION – HISTORICAL FLOWS – TOWN BRANCH WWTP

A. The following chart provides historical flow information at the Town Branch WWTP"

Year	Average Daily Flow (MGD)	Peak Daily Flow (MGD)	Minimum Daily Flow (MGD)
2010	17.2	75.5	10.4
2011	23.4	75.8	11.8
2012	17.0	46.9	9.8
2013	21.3	61.7	11.5
2014*	20.2	56.9	10.5

*8 months 2014

B. The flows above are the received flows at the WWTP. The 54" existing gravity sewer only provides a portion of these flows to the WWTP. For peak flow purposes, it has been estimated that the 54" bypass pumping capacity shall be 50 MGD. In addition, the Cane Run Force Main may be diverted to the 36" force main prior to further reduce flows in the 54" gravity sewer.

3. ADDITIONAL INFORMATION – EPA/KIA FUNDED PROJECTS

LFUCG MWDBE Forms 00300-12 through 00300-17 are not applicable to this project.

EPA/KIA Funded Projects

Thank you for you interest in working on LFUCG Projects. This particular bid # 137-2014 Town Branch Wet Weather Storage Tank is funded all or in part by EPA/KIA federal funds. This funding requires special paperwork and record keeping that is different from other LFUCG projects.

Fair Share Objectives:
The Fair Share Objectives for Kentucky have already been negotiated and are broken into 4 categories. Per our agreement with the EPA office in Atlanta, they will accept a 10% fair share objective for this project. That 10% objective can be reached by utilizing certified MBEs or certified WBEs or a combination of both.

Six Good Faith Efforts:
You are required to employ each of the 6 Good Faith Efforts outlined in your bid documents. These efforts have to be done whether you reach the 10% goal or not. Goal #5 can be met through the new KPAP program. You can advertise your solicitation for MWBE companies for the project at bidmatch@ksbdc.org

What are the Good Faith Efforts?
The Good Faith Efforts are required methods implored by all EPA financial assistance agreement recipients to ensure that all Disadvantaged Business Enterprises (DBEs) have the opportunity to compete for procurements funded by EPA financial assistance dollars.

The Six Good Faith Efforts Are:

1. Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, state and local government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.

2. Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.

3. Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, state and local government recipients, this will include dividing total requirements, when economically feasible, into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.

4. Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.

5. Use the services and assistance of the Small Business Administration (SBE) and the Minority Business Development Agency of the Department of Commerce. (locally KPAP Bid Match at bidmatch@ksbdc.org)

6. If the prime contractor awards subcontracts, require the prime contractor to take the above steps.

Finding Capable Minority and Women Owned Businesses:
Please contact me early in the bidding process by email at mclark@lexingtonky.gov
Send me a specific list of the kind of work areas you plan to sub out to MWBE subcontractors. I will send you an excel spreadsheet of suppliers and contractors from the LFUCG Economic Engine data base. It is up to you to contact them to solicit quotes. Keep records of your interactions with each company.

You can also find a link to the Kentucky DBE list and the Kentucky MWBE certified businesses on my web page at www.lexingtonky.gov/MWBE

Send your advertised solicitation to KPAP at bidmatch@ksbdc.org You will receive a receipt after your solicitation has been advertised. Keep that receipt for your records.

LFUCG Economic Engine
We will follow the progress of this project from beginning to completion. All prime contractors and all subcontractors should be registered in the LFUCG Economic Engine data base. The process is quick and simple. The link can be found at
https://lfucg.economicengine.com

Forms:
The following forms should be included with your bid documents:
1) Disadvantaged Business Enterprise Participation Policy
2) EPA Form 6100-2 (DBE Subcontractor Participation Form)
3) EPA Form 6100-3 (DBE Subcontractor Performance Form)
4) EPA Form 6100-4 (DBE Subcontractor Utilization Form)

Forms to be submitted with your bid:
1) Disadvantaged Business Enterprise Participation Policy
2) EPA 6100-3
3) EPA 6100-4
4) Certification document(s) or letters for each minority or woman subcontractor participating on the project.

Required throughout the project:
1) Six Good Faith Efforts should be used to secure any new DBE subcontractors or when substituting any DBE subcontractors throughout the project.
2) The Bidder's List should be maintained throughout the entire project period.

Apparent Low Bidder will work with the engineers and project managers assigned to this project to meet all the requirements and record keeping required by KIA in Frankfort.

Best regards,
Marilyn Clark, CCDP
Minority Business Enterprise Liaison
LFUCG Division of Central Purchasing
200 East Main Street, Room 341
Lexington, KY 40507
859-258-3323
mclark@lexingtonky.gov
www.lexingtonky.gov/MWBE

4. DRAWINGS
SITE GRADING PLAN – REPLACE SHEET

Construction Drawings Sheet C-0-103

Replace Construction Drawing C-0-103 in its entirety with the revised attached drawing.

5. DRAWINGS
STRUCTURAL DRAWINGS CLARIFICATIONS

Construction Drawing Sheet C-5-303
Delete "Typical Pipe Encasement At Footing" detail in its entirety. Pipe encasement shall be per Sheet S-5-301.

Construction Drawing Sheet C-5-502

Revise the two (2) notes on 48" DIP Inlet Detail: "EL. FIN. FL. 910.67 AT 125'-0" RADIUS" to the following "EL. FIN. FL. 920.67 AT 125'-0" RADIUS".

Construction Drawing Sheet S-5-301

Revise NOTES: 1 to the following:

1. For additional information for 30" Dia. And 48" Dia. Pipes, See Sheets C-5-502 and C-5-303.

Construction Drawing Sheet S-9-101

Revise T/SLAB note on Electrical Building Slab/Foundation Plan to the following: 922.00.

6. DRAWINGS
PUMP STATION – ALUMINUM GRATING

Construction Drawing Sheet S-4-101

All grating within Pump Station valve vault shall be 1-1/2–inch aluminum grating.

7. DRAWINGS
ADDITIONAL INFORMATION FOR CONSTRUCTION METHODS

Construction Drawing Sheet C-1-101
Delete General Note 3 and add the following notes:

3. In lieu of the design indicated, the Contractor may elect to provide a precast structure or provide alternate construction methods to expedite construction and reduce costs. It is not the intent of the Engineer to limit the Contractor's methods.
4. All precast structures shall be constructed in accordance with specification section 03415, Precast Utility Structures.
5. The Contractor may elect to construct the structure around the existing 54"gravity sewer and leave a "blockout" for the future new pipe. Upon completion of the structures, temporary bypass pumping would be initiated, old gravity sewer removed, new pipe installed, and then the "blockout" grouted around the new pipe.
6. When the "blockout" method is utilized, in lieu of the A-lok style gasket indicated, Sika Greenstreak products may be utilized. A double layer side by side, of Hydrotite CJ-0725-3K waterstop on the concrete perimeter and a double layer side by side, of the Hydrotite DSS-0420 waterstop on the pipe material shall be utilized. Leakmaster LV-1 sealant shall be utilized for all joints and other areas of concern.
7. For the "blockout", #6 rebar dowels, shall be installed into the concrete 8" and shall extend 8" into the opening prior to grouting.
8. A concrete bonding compound shall be applied to the surface of the material prior to grouting.
9. Temporary support for existing gravity sewer piping provided as required.

Construction Drawing Sheet C-2-101
Delete General Note 2 and add the following notes:

2. In lieu of the design indicated, the Contractor may elect to provide a precast structure or provide alternate construction methods to expedite construction and reduce costs. It is not the intent of the Engineer to limit the Contractor's methods.
3. All precast structures shall be constructed in accordance with specification section 03415, Precast Utility Structures.
4. The Contractor may elect to construct the structure around the existing 54"gravity sewer and leave a "blockout" for the future new pipe. Upon completion of the structures, temporary bypass pumping would be initiated, old gravity sewer removed, new pipe installed, and then the "blockout" grouted around the new pipe.
5. When the "blockout" method is utilized, in lieu of the A-lok style gasket indicated, Sika Greenstreak products may be utilized. A double layer side by side, of Hydrotite CJ-0725-3K waterstop on the concrete perimeter and a double layer side by side, of the Hydrotite DSS-0420 waterstop on the pipe material shall be utilized. Leakmaster LV-1 sealant shall be utilized for all joints and other areas of concern.
6. For the "blockout", #6 rebar dowels, shall be installed into the concrete 8" and shall extend 8" into the opening prior to grouting.
7. A concrete bonding compound shall be applied to the surface of the material prior to grouting.
8. Temporary support for existing gravity sewer piping provided as required.

Construction Drawing Sheet C-3-101
Add the following notes:

3. In lieu of the design indicated, the Contractor may elect to provide a precast structure or provide alternate construction methods to expedite construction and reduce costs. It is not the intent of the Engineer to limit the Contractor's methods.
4. All precast structures shall be constructed in accordance with specification section 03415, Precast Utility Structures.
5. The Contractor may elect to construct the structure around the existing 54"gravity sewer and leave a "blockout" for the future new pipe. Upon completion of the structures, temporary bypass pumping would be initiated, old gravity sewer removed, new pipe installed, and then the "blockout" grouted around the new pipe.
6. When the "blockout" method is utilized, in lieu of the A-lok style gasket indicated, Sika Greenstreak products may be utilized. A double layer side by side, of Hydrotite CJ-0725-3K waterstop on the concrete perimeter and a double layer side by side, of the Hydrotite DSS-0420 waterstop on the pipe material shall be utilized. Leakmaster LV-1 sealant shall be utilized for all joints and other areas of concern.
7. For the "blockout", #6 rebar dowels, shall be installed into the concrete 8" and shall extend 8" into the opening prior to grouting.

8. A concrete bonding compound shall be applied to the surface of the material prior to grouting.
9. Temporary support for existing gravity sewer piping provided as required.

Construction Drawing Sheet C-7-101
Add the following notes:

2. In lieu of the design indicated, the Contractor may elect to provide a precast structure or provide alternate construction methods to expedite construction and reduce costs. It is not the intent of the Engineer to limit the Contractor's methods.
3. All precast structures shall be constructed in accordance with specification section 03415, Precast Utility Structures.
4. The Contractor may elect to construct the structure around the existing 54"gravity sewer and leave a "blockout" for the future new pipe. Upon completion of the structures, temporary bypass pumping would be initiated, old gravity sewer removed, new pipe installed, and then the "blockout" grouted around the new pipe.
5. When the "blockout" method is utilized, in lieu of the A-lok style gasket indicated, Sika Greenstreak products may be utilized. A double layer side by side, of Hydrotite CJ-0725-3K waterstop on the concrete perimeter and a double layer side by side, of the Hydrotite DSS-0420 waterstop on the pipe material shall be utilized. Leakmaster LV-1 sealant shall be utilized for all joints and other areas of concern.
6. For the "blockout", #6 rebar dowels, shall be installed into the concrete 8" and shall extend 8" into the opening prior to grouting.
7. A concrete bonding compound shall be applied to the surface of the material prior to grouting.
8. Temporary support for existing gravity sewer piping provided as required.

Construction Drawing Sheet C-0-402
Add the following notes:

4. It is not the intent of the Engineer to limit the Contractor's methods. Temporary bypass piping, as indicated on this drawing, is not mandatory. However, if temporary bypass piping is installed, it shall be removed prior to backfilling.

8. SPECIFICATIONS
ALTERNATE EQUIPMENT INFORMATION ADDITION

Specification Section 00410, Bid Form

Replace paged 5-7, Bid Schedule and Alternate Equipment Information in it's entirely with the attached pages.

9. SPECIFICATIONS
INSURANCE REQUIREMENTS

Specification Section 00600, Bonds and Certificates

Add the following language to Specification Section 00600-1.03, Erosion and Sedimentation Control Performance Bond:

[One hundred thousand][ADD#1] dollars ($*100,000.00*[ADD#1]), for the payment of whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

Deleted the following from Specification Section 00600-1.05-D-1-e, Pollution and/or Environmental:

e. The General Liability Policy shall include a Pollution Liability and/or Environmental Casualty endorsement. ~~unless it is deemed not to apply by Owner.~~[ADD#1]

Add the following language to Specification Section 00600-1.05-D-1-h, Umbrella Liability endorsement to the CGL policy:

h. Owner requests that the Bidder obtain an Umbrella Liability endorsement to the CGL policy for a limit of liability of *$25,000,000*[ADD#1] and that this CGL policy endorsement be renewed for one (1) year after completion of this project.

10. SPECIFICATIONS
DRILLED SHAFT – ROCK SOCKET DEPTH

Specification Section 02475, Dilled Shafts

Replace paragraph 02475-3.01-A with the following:

General: Excavate holes for Drilled Shaft to required bearing elevation, which includes a *6-foot*[ADD#1] ~~3-foot~~ socket into unweathered bedrock, as indicated on the project plans and in the Geotechnical Report. Excavate holes for closely spaced Drilled Shaft, and those occurring in fragile or sand strata's, only after adjacent holes are filled with concrete and allowed to set.

11. SPECIFICATIONS
SECTION 02532 – SANITARY SEWER MANHOLE, FRAMES AND COVERS – REPLACE

Replace Specification Section 02532 in its entirety.

12. SPECIFICATIONS
CONCRETE ADMIXTURES

Specification Section 03300, Cast In Place Concrete

Add the following paragraph to the Specification Section 03300-2.05-D

D. Structures 1, 2, 3, 6 & 7 will require Xypex C-1000 RED cementitious crystalline admixture at a dosage of 3.5% by weight of cement.

13. SPECIFICATIONS
RETAINING WALL – COLOR SCHEME REVISION

Specification Section 03410, Precast Modular Block Retaining

Replace paragraph 03410-2.01-J with the following:

J. The precast modular block unit face texture shall be "Ledgestone" or equal approximating the appearance of stacked, cut field stones. The face texture shall exhibit minimum relief of 3 to 5 inches. Each textured block facing unit shall be a minimum of 5.75 square feet with a unique texture pattern that repeats with a maximum frequency of once in any 50 square feet of wall face. The block unit face texture shall be manufactured with ~~a custom color blend selected by the Owner from the manufacturer's full range of color options.~~ *Lexington Limestone stock color scheme or equal.*[ADD#1]

14. SPECIFICATIONS
ACCEPTABLE PRESTRESSED CONCRETE STORAGE TANK COMPANIES

Specifications Section 13201, Prestressed Concrete Storage Tank

Replace paragraph 13201-1.05-B-3 with the following:

1. The following are acceptable tank construction companies:
   a. The Crom Corporation, Gainesville, Florida.
   b. Precon Corporation, Newberry, Florida[ADD#1]

15. SPECIFICATIONS
EXTERIOR PRESTRESSED CONCRETE TANK - ACCESSORIES

Specification Section 13201

Replace Specification Section 13201-2.10-A through C with the following:

2.10 TANK ACCESSORIES

A. Access manhole: Minimum of ~~three~~ *six (6)*[ADD#1] Type 316 stainless steel wall manholes ~~– two 1'5" x 4'4: rectangular manholes and one 2'9" x 4'5½" rectangular dog hatch manhole~~ *52" x 24" rectangular wall manholes with hinged cover*[ADD#1] – for access to the interior of the tank. The cover and all hardware shall also be of Type 316 stainless steel. The wall manhole shall be designed to resist hydraulic loading without excessive deflection.

B. Exterior ~~Spiral Staircase~~ *Aluminum Ladder*[ADD#1]: One exterior ~~spiral staircase~~ *aluminum ladder*[ADD#1] shall be provided. The ~~staircase~~ *ladder*[ADD#1] shall be fabricated from 6061-T6 and 6063-T6 aluminum (mill finished) with Type 316 stainless steel fasteners and shall conform with all applicable OSHA standards. Acceptable

manufacturer: Duvinage, LLC (or equal), 60 West Oak Ridge Drive, Hagerstown, MD 21741-0828. Toll Free Tel: 800-541-2645; Tel: 301-733-8255; Email: info@duvinage.com; Web: www.duvinage.com. ~~Spiral staircase~~ *Aluminum Ladder*[ADD#1] is not to be provided by the Tank Contactor.

C. Exterior aluminum platform with a minimum ~~3'0" x 4'0"~~ *4'0" x 6'0"*[ADD#1] area shall be provided at exterior ~~staircase~~ *ladder*[ADD#1] location. Platforms shall be fabricated from 6061-T6 aluminum with Type 316 stainless steel fasteners.

16. SPECIFICATIONS
SECTION 11310 – NON-CLOG SEWAGE SUBMERSIBLE PUMPS

Replace Specification Section 11310 in its entirety.

17. PRE-BID MEETING MINUTES AND ATTENDANCE ROSTER

Pre-bid meeting minutes and attendance roster are attached.

18. BID OPENING HAS BEEN CHANGED TO OCTOBER 2, 2014, 2:00 PM.

Todd Slatin, Director
Division of Central Purchasing

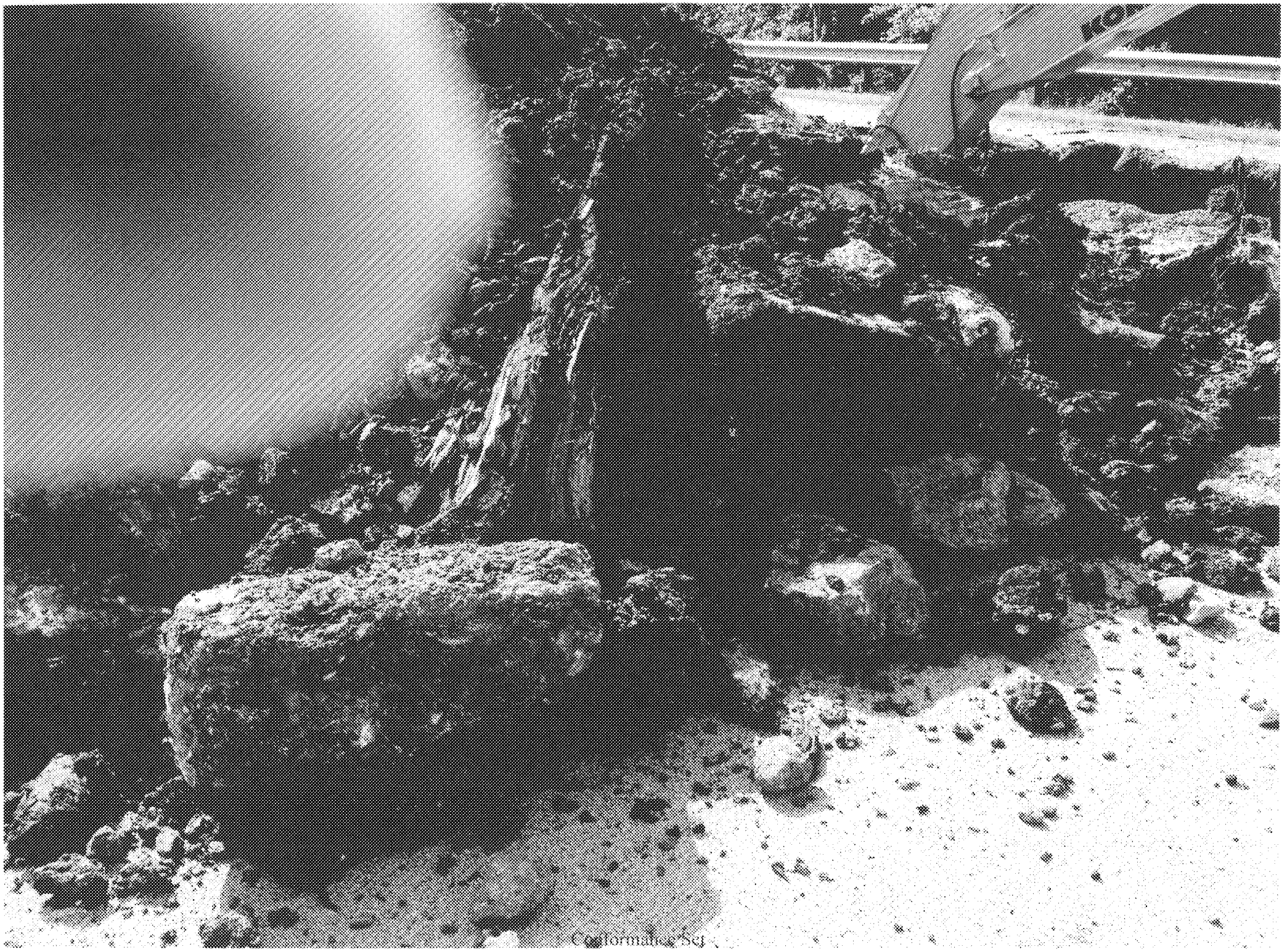
Attachments:
31 Geotechnical Photographs
Drawing C-0-103
Specification Section 00410 – Bid Form, Page 5 -7 – Bid Schedule and Alternate Equipment
Specification Section 02532 – Manholes, Frames, and Covers
Specification Section 11310-Non-Clog Sewage Submersible Pumps.
Pre-bid meeting minutes
Pre-bid attendance roster

All other terms and conditions of the Bid and specifications are unchanged.
This letter should be signed, attached to and become a part of your Bid.

COMPANY NAME: _____

ADDRESS: _____

SIGNATURE OF BIDDER: _____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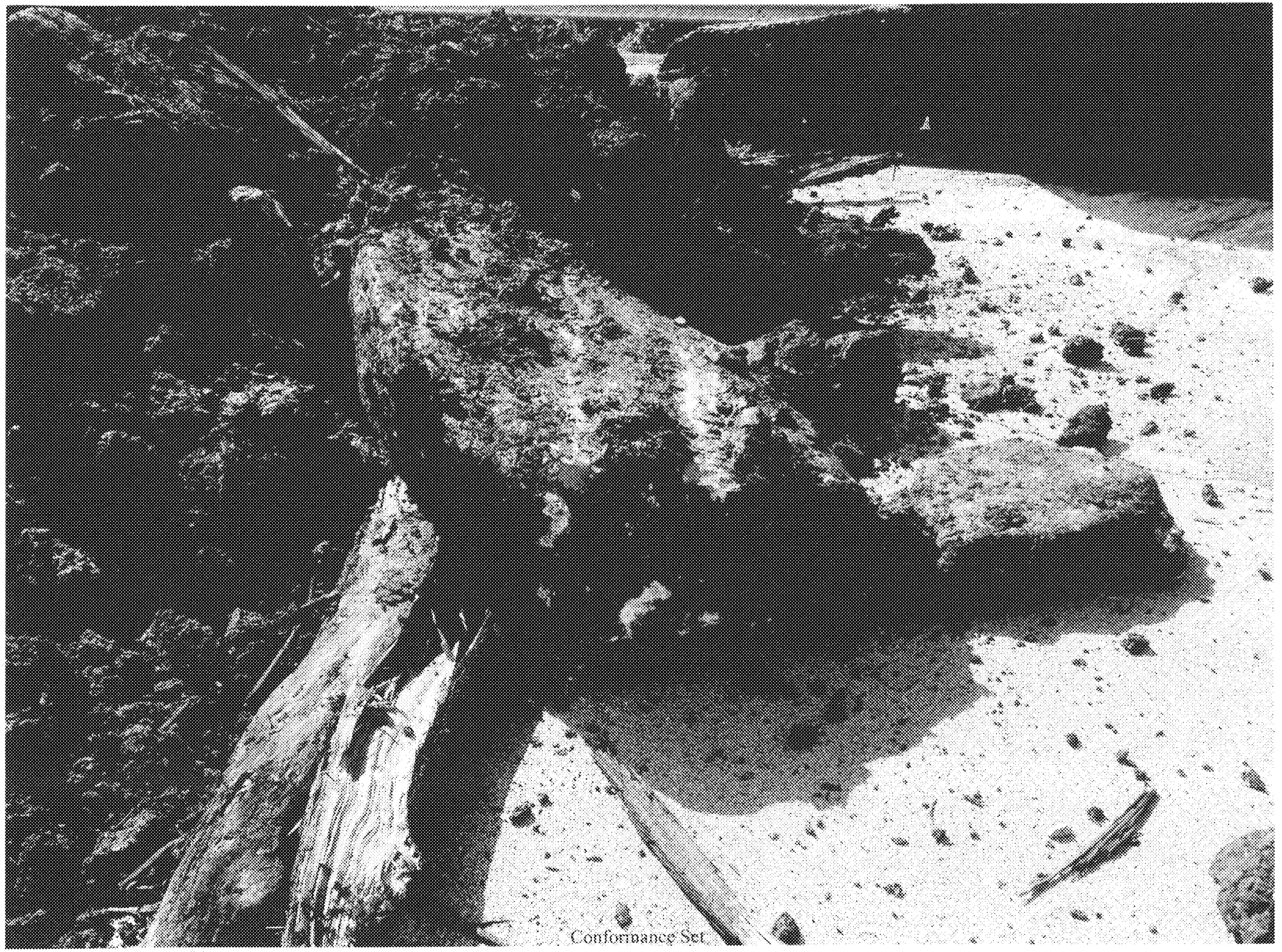
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