



CITY OF TAMPA

Bob Buckhorn, Mayor

CONTRACT ADMINISTRATION DEPARTMENT

David L. Vaughn, AIA, Director

ADDENDUM NO. 4

DATE: April 13, 2011

Contract 11-C-00033; Alline Avenue Stormwater Pump Station

Bidders on the above referenced project are hereby notified that the following addendum is made to the Contract Documents. BIDS TO BE SUBMITTED SHALL CONFORM TO THIS NOTICE.

- Item 1: Replace Section 16266 with the pdf attached hereto entitled 11-C-33 add4 Sec16266.
- Item 2: Replace Plan Sheet E5 with the attached Sheet E.5.
- Item 3: Replace page P-4R with the attached page P-4RR.
- Item 4: Add, to page C-17, the following:

CONTRACT ITEM – 12" HDPE GRAVITY STORM MAIN

01050-11924 – 12" HDPE STORM DRAIN

The Contractor shall furnish all materials and equipment, construct, test, and maintain complete all gravity storm mains as shown on the Plans, specified, and directed by the Engineer.

The work includes all related work and appurtenances required to locate existing utility lines, maintain existing utilities in operation, remove existing systems as shown on the Plans or directed by the Engineer; restore sidewalks, driveways, curbs, curb and gutter, and permanent pavement; provide excavation, short tunnels, backfill, sheeting, shoring, bracing, dewatering, pipe bedding and pipe fittings; make all pipe connections; provide standard pipe cradles and encasements shown on the Plans; install and remove plugs and bulkheads; pressure and leakage testing; special temporary and nonpermanent pavement replacement, nonpermanent sidewalk and driveway replacement; protection, repair and replacement of utilities and house services; maintenance of traffic, including maintaining access across driveways along the line of the work; protection, trimming and removal of trees and shrubs; protection, repair and replacement of culverts and other storm water facilities; reconstruction or regrading of road shoulders and ditches; disposal of surplus excavated material; protection of existing structures; joining pipes and structures and all other work incidental to the installation of the 12" HDPE storm pipe complete in place.

The work does not include sheeting left in place, rock excavation, surface restoration comprising lawn or permanent pavement replacement, additional earth excavation or additional selected fill materials, driveways, sidewalk and curb or curb and gutter replacement and, when shown on the Plans or ordered, such work will be paid for under other appropriate Contract Items.

The quantity of 12" HDPE storm pipe, in linear feet, to be measured for payment shall be the actual length of new pipelines placed in the work, as shown, specified and directed. Pipelines will be measured horizontally along the centerline of the pipe.

Payment for the 12" HDPE Storm Main will be made at the appropriate Contract Unit Price per linear foot of pipe.

Item 5: **PART 2 – CLARIFICATIONS TO BIDDER QUESTIONS**

- 1. Question:** The Geo-Tech report recommends that the Pump Station, Baffle Box and the Hillsborough Bay Outfall Structures be over excavated by 36' to 48" and refilled with 36" 57 Stone and Geo-textile. Is this a requirement or a recommendation as it is not part of the technical specifications.

Response: The geotechnical report prepared for this project has been made available in an earlier addendum. Sheet S-1 of the Contract Drawings requires that the geotechnical report recommendations be followed for foundations.

- 2. Question:** Sheet A-9 Detail 6 calls for Pre-engineered Stop Log System. What is Pre-engineered Stop Log System?

Response: Please refer to Question #12.

- 3. Question:** Section 9901 – Please elaborate as to specifically what steel is referenced to in this section of the specifications?

Response: As noted in Section 09901, 1.1, A, this section addresses painting of process mechanical and electrical work. Steel items associated with equipment furnished (submersible pumps, generator and accessories, electrical equipment, etc.), piping, valves, accessories, plumbing, HVAC and instrumentation) would be governed by this section.

- 4. Question:** Does the W- 10 beams support supportive floor get coated?

Response: This question has been previously addressed. Please reference Addendum #2.

- 5. Question:** The drawings and the specifications for the Bath Accessories are different. Do we figure as per the plans, per the specifications, or a combination of both of them?

Response: The specifications shall take precedence.

6. **Question:** On Sheet A-8 Door 5 is a double door unit with a transom that is embossed. What are the doors embossed with?

Response: The Door Elevation shows vertical lines on the doors and transom panels. It was our intention that these lines be embossed.

7. **Question:** M-12-Air Valve Assembly shows a 36"x12" Tee. On the branch side of the Tee, fittings are shown as 24". M-13 plan view seems to indicate a 12" branch. Please clarify.

Response: Provide a 36 x 24 Tee with additional fittings as illustrated on Sheet M-12.

8. **Question:** Spec sect 07311-3, 1.12 Warranty, A. Material Defects: a., states "The first 30 years, then prorated thereafter for 50 years." We have spoken with a GAF-Elks representative who stated that there is no coverage beyond 40 years on commercial buildings. Please reduce the warranty coverage to coincide with GAF-Elks recommendations.

Response: Per GAF-Elks recommendations the 40 year Warranty is acceptable.

9. **Question:** Sheet C-4 and C-27, shows an existing 6" WM which needs to be offset to accommodate the storm drainage installation. Please specify the material of the existing 6" WM. We are assuming that this line will have to be post-restrained per the table provided. The limits of the post-restrained joints will also affect the brick pavement restoration limits.

Response: The 6" WM was identified as CI during subsurface investigations. The main will need to be post restrained per table provided.

10. **Question:** Dwg. S9 Wet well base slab calls out #6 @ 6" o/c each way top and Bottom S18 calls out #7 @ 6" o/c each way top and bottom. Which is correct?

Response: The correct call-out for the Wet Well base slab reinforcing bars is #7 bars spaced @ 6" o.c.

11. **Question:** Dwg. S9 Valve vault base slab calls out #5 @ 6" o/c each way top and Bottom S18 calls out #6 @ 6" o/c each way top and bottom. Which is correct?

Response: The correct call-out for the Valve Vault base slab reinforcing bars is #6 bars spaced @ 6" o.c.

12. **Question:** Dwg. S15 Electrical building stop log assembly references the architectural drawings for further information & Dwg. A5, Detail A references the structural drawings for further information. However there is no information as to mounting, size, material and so forth for the stop log/sluice gate. Please provide a detail on the stop log/sluice gate along with specifications.

Response: The intent is for an engineered stop log system to be installed. This system may be an aluminum bulk head gate as manufactured by Hydro Gate or an approved equal. The system is to include face mounted guide slots anchored to the interior face of

the cmu block as shown in Door Jamb Detail 2.A-9. In addition the system is to include rubber seals to prevent leakage. It may be required that the system provided will include logs that when installed are placed to the slab instead of 10" to 12" below the top of the knockout blocks as shown in Detail Section 6.A-9.

13. **Question:** Dwg. A5 Electrical building details A & B reference "Flood Proofed, See S11 for Notes & Details". Sheet S11 only references hydrophilic waterstop between the footer & CMU wall. Is the Flood Proofed note referring to the hydrophilic waterstop? Also is there any coating/waterproofing required within the interior walls & floors of the base slab structure?

Response: In regards to structure, the flood proofed note refers to the hydrophilic waterstop, pvc waterstops in base slabs and footing joints and the requirement for cmu wall cells to be concrete filled from El 10.50' to El 2.50' at the top of footing. In addition to these (3) items the exterior cmu wall surfaces are to be coated w/ Sonoshield HLM 5000. Interior cmu wall surfaces are to be coated w/ a minimum of (2) coats Tneme-cryl. Color is to be determined by the Owner.

14. **Question:** Will there be a temporary pedestrian signal requirement for MOT (MOT-4) at Lawn Avenue and Bayshore Boulevard?

Response: If not required by the ROW permit, a temporary pedestrian signal is not required as a part of the project MOT. However, the Contractor should monitor pedestrian traffic and provide a temporary pedestrian signal if public safety becomes an issue. It is the Contractor's responsibility to make provisions for public safety as necessary at no additional cost to the Owner.

15. **Question:** Will existing base material be sufficient for local traffic to drive on during construction for W. Asbury, W. Alline, and W. Coachman?

Response: Ingress and egress must be maintained by the Contractor at all times for local property owners. The Contractor may not leave exposed base course (or other base materials) for extended periods of time and must provide temporary pavement in those areas where the permanent pavement is not in place. It is anticipated that the Contractor will limit areas of disturbed pavement to locations where construction activities are occurring.

16. **Question:** During the Jack and Bore of the 36" line across Bayshore, will the contractor be allowed to detour all traffic around W. Alline around to W. Coachman and Richards Ct.?

Response: Jack and Bore is being used to avoid closure and detour. If performed during off peak or nighttime, short stoppages and detours may be acceptable to the City. Contractor can submit his own MOT plan for approval by the City.

17. **Question:** Will the contractor be allowed to use a suitable FDOT alternate to the 6" type B sub-base and the 8" crushed concrete base?

Response: Any alternate must be approved by the City of Tampa Transportation Department.

18. **Question:** Have the residents been notified regarding the upcoming road work and the work in the temporary construction easement?

Response: The City has notified the residents in the area of the upcoming construction activities.

19. **Question:** Will the contractor be required to replace any existing homeowner property within the ROW that is not mentioned on the plans?

Response: The Contractor will be responsible for replacing, in like kind or better, any private or public property damaged or removed during construction in the project area unless otherwise noted in the Contract Documents.

20. **Question:** Where can we get a copy of the "City of Tampa Standards"?

Response: The Contract Documents are based upon City of Tampa Standards. Further information and detail of City of Tampa Standards will be provided by the City upon request.

21. **Question:** Who will be responsible for the Tree Permits?

Response: The Contractor must submit and obtain the Tree Permits. The City will provide payment for these permits.

22. **Question:** Will additional brick to restore the roadways be available from the City of Tampa?

Response: If available, the City of Tampa will provide additional brick for road restoration upon request and approval.

23. **Question:** See sheet S-19. The "T.O. Concrete Slab Elevation Varies – See Civil Drawing" Please reference the page of the Civil Drawing we are suppose to reference.

Response: The civil drawing to reference is the "Site Grading and Drainage Plan" drawing C-1.

24. **Question:** Will the EPC Permit with the Manatee Requirements be available?

Response: Yes, the EPC permit will be made available to the Contractor upon award of the bid and the requirements were listed in Addendum #2.

25. **Question:** Will the length of time on the project extend past the 365 days as discussed in the pre-bid meeting?

Response: Please see Addendum #2.

27. **Question:** Please verify that a load test will be required for each of the ten (10) helical anchors installed and not just one (1).

Response: Each helical anchor must be load tested for a total of ten (10).

28. **Question:** We have addendum#2, however ,the question forwarded from the landscapers was not answered. Please advise if another addendum is anticipated and if so will there be any change to the bid date.

Response: Sheet LS-1 shows the location and species of the trees to be replaced on the pump station site. The tree table on Sheet LS-2 provides the size of the trees (5 - 4" trees and 25 - 2" trees). LS-1 also shows 39 viburnum along the fence lines and the front of the building and sod in front yard and areas not mulched along sides. The viburnum plants should be 3-gallon in size and sod should be St Augustine.

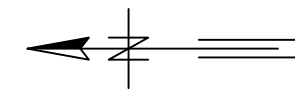
Section 25.2.03 of the specifications addresses the quality of the trees and shrubs. Specification 17 covers the quality of the sod.

With regard to the replacement landscaping on private property, trees, shrubs and grass should be replaced with like kind and size, unless noted otherwise.

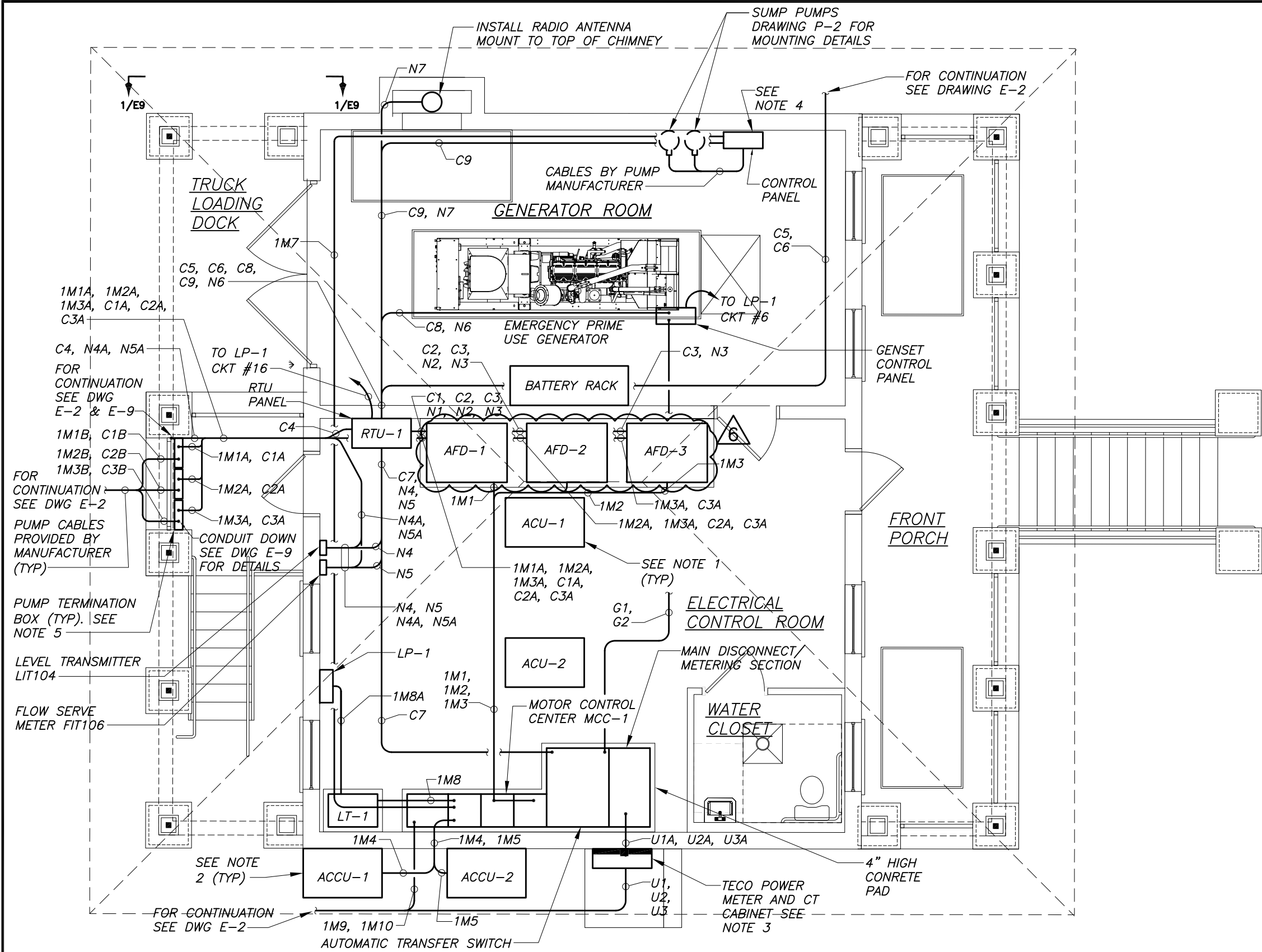
All other provisions of the Contract Documents and Specifications not in conflict with this Addendum shall remain in full force and effect. Questions are to be e-mailed to Contract Administration@tampagov.net.

Jim Greiner

Jim Greiner, P.E., Contract Manager



SW



- NOTES:**
1. MOUNT AIR HANDLING UNITS TO CEILING. SEE HVAC PLANS FOR DETAILS.
 2. MOUNT OUTDOOR AIR HANDLING UNITS TO STRUCTURE AT MINIMUM ELEVATION OF 11.0' SEE HVAC PLANS FOR DETAILS.
 3. PROVIDE TECO APPROVED METER HOUSING AND CT CABINET. PROVIDE CABLE AND CONDUIT FROM SUPPLY SIDE OF METER SOCKET TO TECO PROVIDED HANDHOLE SHOWN ON DRAWING E-2. PROVIDE CABLE AND CONDUITS FROM LOAD SIDE OF METER SOCKET TO MCC. TECO PROVIDES 3-PHASE, 480V POWER METER. MOUNT BOTTOM OF METER ENCLOSURES AT MINIMUM ELEVATION 10.5'. SEE ARCHITECTURAL PLANS SHOWING PLATFORM BELOW HOUSING. CENTER OF METER AND CABINET MUST BE BETWEEN 4'-6" AND 5'-0" ABOVE PAD FOR UTILITY READINGS.
 4. INSTALL SUMP PUMP CONTROL PANEL 60" AFF GENERATOR ROOM ABOVE LOCATION OF PUMPS. PUMPS ARE LOCATED AT GROUND LEVEL BELOW GENERATOR ROOM. USE DEDICATED RECEPTACLE FOR 120V SUPPLY..
 5. PROVIDE 18"W X 30"H X 5"D NEMA 4X RATED TERMINATION BOX WITH TERMINAL BLOCKS FOR TERMINATING CABLES AND INSTALL PHYSICAL BARRIER RUNNING THE LENGTH OF THE BOX TO SEPARATE 480V POWER CABLES FROM INSTRUMENTATION CABLES. PROVIDE SQUARE D, MODEL# LBA365208, OR APPROVED EQUAL FOR TERMINATING 3 PHASE, 480V POWER CABLES. PROVIDE SQUARE D, MODEL# LBA163206, OR APPROVED EQUAL, FOR TERMINATING GROUND CABLES. PROVIDE DIN-RAIL TERMINAL BLOCKS INSTRUMENTATION CABLES.

PUMP STATION ELECTRICAL ROOM

SCALE: 3/16" = 1'-0"

K:\Alline Pump Station\21 CADD\21.05 Working Drawings\Addendum 2\01580E05 1'-0"

GREELEY AND HANSEN
 1715 NORTH WESTSHORE BLVD., STE. 464
 TAMPA, FLORIDA 33607
 CERTIFICATE OF AUTHORIZATION NO. 37

No.	DATE	REVISIONS
6	Apr., 2011	Addendum #4 - Resize AFD Enclosures
5	Feb., 2011	Issue For Bid
4	Jan., 2011	100% Submittal

DES: JK
 DRN: OC
 CKD:
 DATE: 4-11

CITY of TAMPA
 Department of Public Works
 Stormwater Division

ALLINE AVE. AREA DRAINAGE IMPROVEMENTS
 POWER PLAN

WO# 5103
 SHEET
 E-5

Item No.	Description	Unit	Est Qty	Unit Price in Words	Unit Price	Total Price
0448-73	Stormwater Pumping Station	LS	1		\$	\$
0448-74	Hillsborough Bay Outfall	LS	1		\$	\$
0630-1-7	Permanent Curb and Gutter Replacement	LF	700		\$	\$
0522-2	Concrete Sidewalk	SY	100		\$	\$
0526-1-1	Brick Pavement	SY	500		\$	\$
0550-10929	PVC Fence	LF	350		\$	\$
0556-1-6	Jack and Bore 48" Steel Casing	LF	65		\$	\$
0570-1-2	Lawn Replacement with Sod	SY	600		\$	\$
0571-1-12	Root Pruning	LS	1		\$	\$
0580-1-1	Replace Shrubs	LS	1		\$	\$
0580-1-2	Replace Existing Trees	EA	4		\$	\$
1050-11213	6" PVC Sanitary Sewer Laterals	LF	210		\$	\$
1050-11214	8" PVC Sanitary Sewer	LF	1020		\$	\$
1050-11223	6" PVC Water Main	LF	30		\$	\$
1050-11224	12" PVC Water Main	LF	40		\$	\$
1050-11415	36" Ductile Iron Stormwater Force Main	LF	1070		\$	\$
1050-11416	36" PVC DR21 Stormwater Force Main	LF	130		\$	\$
1050-11424	18" PVC Sanitary Sewer	LF	10		\$	\$
1050-11924	12" HDPE Storm Drain	LF	24		\$	\$
1060-11211	4' Diameter Precast Concrete Sanitary Sewer Manhole	EA	6		\$	\$
TOTAL					\$	\$

SECTION 16266 - ADJUSTABLE FREQUENCY DRIVES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing, installing and testing the 480-volt adjustable frequency drives. Provide drives in individual free standing enclosures, wall mounted enclosures, or incorporated into motor control centers, as shown. Furnish harmonic studies as specified. The adjustable frequency drives shall be provided by the pumping equipment supplier specified in Section 11308. The pumping equipment supplier is responsible for coordinating the equipment characteristics of the pumping equipment and adjustable frequency drive equipment to ensure compatibility and trouble-free operation.
- B. Related Work Specified in Other Sections Includes:
1. Section 01783 – Operation and Maintenance Manuals
 2. Section 01820 - Training
 3. Section 09901 – Painting Process Mechanical and Electrical Equipment
 4. Section 11308 – Submersible Stormwater Pumps
 5. Section 16050 - Basic Electrical Materials and Methods
 6. Section 16121 - Wires and Cables - 600 Volts and Below
 7. Section 16055 - Electrical Requirements For Shop-Assembled Equipment
 8. Section 16075 - Electrical Identification
 9. Section 16060 - Grounding
 10. Section 16080 - Electrical Testing Requirements
 11. Section 16491 - Control Components and Devices

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
1. NEMA ICS 1 - General Standards for Industrial Control and Systems
 2. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Not More than 2000 Volts AC or 750 Volts DC.
 3. NEMA ICS 3 - Industrial Control and Systems Factory Built Assemblies

4. NEMA ICS 7 - Industrial Control and Systems: Adjustable Speed Drives
5. NEMA ICS 7.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems
6. NEMA ICS 61800 – Adjustable Speed Electrical Drive Systems
7. NEMA 250 - Enclosures for Electrical Equipment
8. NFPA 70 - National Electrical Code
9. IEEE 85 - Test Procedure for Airborne Sound Measurements on Rotating Electric Machinery
10. IEEE 519 - IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems
11. UL 845 - Motor Control Centers

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. Provide adjustable frequency drives to vary the speed of the submersible motors specified in Section 11308 varying the frequency and voltage applied to the motors.
2. Provide adjustable frequency drives that fit in the space shown. Units exceeding the dimensions shown will not be acceptable.
3. Provide adjustable frequency drives that automatically restart when power is restored after a power outage. Provide control logic so the drive is allowed to restart when power is restored.

B. Rated Output Power: Provide adjustable frequency drives with an output that is at least 3 percent greater than the driven motor's full nameplate rating.

C. Torque Output: Provide variable torque or constant torque output drives as required by driven equipment.

D. ~~12-Pulse Drive~~ Technology: Provide adjustable frequency drives serving motors ~~90+00~~ HP or larger that utilize 12-pulse or 18-pulse drive technology ~~at~~

~~the minimal~~. Adjustable frequency drives with 6-pulse technology will not be approved.

- E. Performance Requirements: Provide adjustable frequency drives to meet the following requirements of IEEE 519:
1. Total harmonic distortion THD (Voltage): Maximum of five percent for general distribution systems as measured at the point of common coupling.
 2. Total current harmonic distortion: Not to exceed the values in Table 10.3, Current Distortion Limits for General Distribution Systems (120 V through 69000 V) of IEEE-519 at the point of common coupling.
 3. Capacitor traps for controlling harmonics that require tuning to the power system are not acceptable.
 4. Operate at a minimum efficiency of 95 percent at rated load.
 5. Operate from a 480-volt, 3-phase, 60-hertz supply with a voltage variation of plus 10-percent or minus 20-percent and a frequency variation of plus or minus 2-hertz.
 6. Input power factor: Maintain a 95 percent minimum power factor over a 20 to 100 percent speed range.
 7. Operate an induction motor as specified, including a high-efficiency, high-power factor, premium-duty motor, with no detriment to motor life.
 8. Operate an induction motor without exceeding a motor sound and power level of 96-decibels, A-weighted, when measured in accordance with IEEE 85.
 9. Operate under the following ambient conditions:
 - a. Ambient Temperature: 0 to 40 degrees C
 - b. Humidity: 0 to 95 percent

1.4 SUBMITTALS

- A. General: Furnish all submittals, including the following, as specified in the General and Specific Provisions and Section 16050.
- B. Product Data and Information: Furnish catalog data including rating and descriptive literature of all components and systems.

- C. Shop Drawings: Furnish the following shop drawings customized for the project:
1. Bill of materials including manufacturers name and catalog number.
 2. Outline drawings showing dimensions, arrangement, elevations, identification of components and nameplate schedule for all units.
 3. Interconnection wiring diagrams.
 4. Individual schematic control diagrams for each unit.
 5. One line diagrams.
 6. Obtain and enter full performance data for all motors shown.
 7. Certification that the adjustable frequency drives are compatible with the motors and the equipment loads to be driven.
- D. System harmonic distortion study: Furnish a system harmonic distortion study as follows:
1. Obtain data on utility services, plant loads and plant operation. Verify electrical service rating including transformer size, short circuit capacity and X/R ratio.
 2. Prepare a harmonic distortion study of plant electrical system to determine voltage and current harmonics at the point of common coupling for worst case speed and load settings.
 3. Confirm that the submitted adjustable frequency drives limit the electrical disturbances below the 5 percent THD (voltage) and below the harmonic current distortion per Table 10.3 as established by IEEE 519.
 4. Point of Common Coupling: The point of common coupling is the motor control center or switchgear directly upstream of the adjustable frequency drive.
 5. Include analysis of all data with recommendations.
- E. Quality Control: Furnish test reports, certificates of inspection and manufacturer's instructions.

- F. Operations and Maintenance Manuals: Furnish operations and maintenance manuals as specified in the General and Specific Provisions and Section 01820.

1.5 QUALITY ASSURANCE

- A. Standards: Provide all adjustable frequency drives manufactured in accordance with referenced standards.
- B. UL Label: Provide a UL Inc. Label or certification of listing by C.S.A. or other recognized testing organization for each adjustable frequency drive.
- C. Codes: Manufacture and install each adjustable frequency drive in accordance with the NEC and local codes.
- D. Failure to Meet the Harmonic Requirement: Failure to meet the harmonic requirement for 12-pulse drives as determined by field measurement: If the installed adjustable frequency drives fail to meet the harmonic limits specified, modify the adjustable frequency drives as follows:
 - 1. Perform work at no additional cost to the CITY.
 - 2. Install additional harmonic reduction equipment until the specified limit is achieved.
 - 3. In the event that harmonic distortion limits cannot be achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.
- E. Warranty: Provide a two-year warranty for the Adjustable Frequency Drives.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in the General and Specific Provisions.
- B. Shipping and Packing: Rigidly brace and protect against weather, damage, and undue strain, all structures, equipment and materials.
- C. Storage and Protection: Furnish clean storage facilities for all equipment delivered but not installed. Provide conditioned air for storage facilities in accordance with the equipment manufacturer's recommendations.
- D. Spare Parts: Furnish spare parts at the same time as pertaining equipment. Deliver the spare parts to the CITY after completion of the work.

1.7 SPARE PARTS

A. General: Furnish the following spare parts per each group of similar sized units:

1. All parts recommended by the manufacturer in published literature as spare parts. As a minimum, provide the following:

a. Six of all sizes and types of power and control fuses

~~b. Six LED displays of each color~~

~~e. One speed indicator meter relay~~

b. Two of each type of push button and selector switch used

~~e. Two keypads of each type used~~

c. ~~One~~Two printed circuit boards of each type used

~~g. Four filter capacitors of each size used~~

~~h. Four diodes of each type used~~

~~i. Four transistors, gate turn off thyristors IGBT's or SCRs of each type used~~

d. ~~One~~Three 12-ounce spray cans of the final finish for touch-up

B. Packaging: Package spare parts in containers bearing labels and identify all spare parts for reordering. Deliver spare parts in original factory packages.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Acceptable manufacturers are listed below. The Stormwater Division has officially standardized on this brand and no alternatives will be considered. The standardization certificate of conditions and circumstances is included hereinafter.

1. Yaskawa Model iQ Pump by ICON Technologies

2.2 DESIGN

- A. Input Disconnect: Provide an input circuit breaker with an interrupting rating of 65,000 rms symmetrical amperes.
- B. Input Reactor: Provide input reactor or isolation transformer, if required, as determined by system harmonic distortion analysis.
- C. Converter Section: Provide input section that converts 480-volts, 60-hertz, 3-phase input to a fixed dc voltage using diodes, bridged rectifiers or SCR's.
- D. Filter Sections: Provide dc link reactor and filter capacitors as required.
- E. Inverter Section: Provide adjustable frequency drive inverter section that converts the fixed dc voltage to an adjustable frequency output utilizing a pulse-width modulation inverter. Maintain a constant volts per hertz ratio on the output with voltage boost for startup as required.
- F. Control Devices: Provide a digital operator keypad located on the front door to allow setting of all programmable parameters and the following control functions:
 - 1. Start push button
 - 2. Stop push button
 - 3. "Local-Remote" control selection
 - 4. Speed control settings
 - 5. Speed meter with hertz and 0-100 percent scales
 - 6. Output ammeter
 - 7. Elapsed time meter
 - 8. Diagnostics package with fault indication and reset push button
- G. Control Features: Provide a control system for each drive that allows the following functions:
 - 1. Remote, isolated 4-20 ma speed control input
 - 2. Isolated 4-20 ma speed output
 - 3. Alarm outputs
 - 4. ON/OFF status output
 - 5. Additional features and controls as specified with the driven equipment
- H. Internal Control Adjustments: Include the following control adjustments for each drive:
 - 1. Acceleration time, 4 to 60 seconds
 - 2. Deceleration time, 4 to 60 seconds

3. Minimum speed limit
4. Maximum speed limit
5. Inverter current limit
6. Supply undervoltage trip

I. Protection Features: Provide the following drive protection features:

1. Input line current limiting fuses rated 200,000 rms symmetrical amperes short circuit current.
2. Electronic overcurrent protection for instantaneous overload
3. AC input line undervoltage protection, adjustable from 60-100 percent nominal voltage with time delay adjustment and low speed override.
4. Overfrequency protection
5. Phase loss protection
6. DC overvoltage protection
7. Logic supply voltage low level protection
8. Line-to-line and line-to-ground output short circuit protection
9. Line-to-line and line-to-ground surge arresters sized for 480-volt 3-phase grounded wye system
10. Overload capability of 110% of the motor FLA based on the NEC ratings for 60 seconds
11. Control circuit fuses
12. Overtemperature protection
13. Diagnostics module to indicate protection trip conditions

J. Communications: Provide an addressable communication card capable of transmitting the following data over a two-wire network to the Plant SCADA System:

1. Status (ON, OFF, TRIPPED, NO RESPONSE)
2. Input and output current in each phase

3. Output frequency
4. Input ~~and output~~ kW
5. Cause of trip

2.3 COMPONENTS

- A. General: Provide circuit breakers, fuses, transformers, push buttons, switches, indicating lights, relays and timers as specified in Section 16491.
- B. Power Solid State Components: Provide power solid state switching components with a one minute current rating greater than 110 percent of rated current for variable torque drives or 150 percent of rated current for constant torque drives.
- C. Control Power Transformer: Furnish a constant voltage control power transformer to maintain control power with supply voltage variations from 70-110 percent nominal.
- D. Printed Circuit Boards: Apply a clear conformal coating of acrylic to all printed circuit boards.

2.4 ENCLOSURES

- A. General: Provide adjustable frequency drive drives in NEMA 12 filtered and gasketed enclosures with full rear cover plates.

2.5 IDENTIFICATION

- A. General: Provide identification of the adjustable frequency drives and their components as specified in Section 16075.
- B. Nameplates: Install nameplates for devices located on doors so they are readable to a person 5'-8" tall standing 3'-0" in front of the equipment.
- C. Location: Locate nameplates so that they are readily associated with items labeled.
- D. Additional Nameplate: Where nameplates are installed on removable relay or device doors, install an additional nameplate within the relay or device.
- E. Additional Engraving: Where nameplates are located on other compartments than those served, add additional engraving to identify units served.

2.6 WIRING:

- A. General: Provide internal wiring with stranded switchboard wire having 600-volt rated, flame-resistant, type ~~MTW/SIS~~ insulation. Use No. 14 AWG wire for control interconnections. Use 18 gauge wiring where required due to wire size limitation of control terminals. Provide power connections as required for the service.
- B. Wire Marker: Provide wire markers at each end of all wires.
- C. Wiring to Door Mounted Devices: Where wiring connections are made to equipment mounted on hinged doors, provide connections with extra flexible wires suitably cabled together and cleated.
- D. Terminal Blocks: Provide wiring of all control connections to all external connections through individual, positive-latch, ~~pull-apart~~stackable type control terminal blocks rated 600-volts. Locate terminal blocks for front access.
- E. Terminal for External Connections: Provide sufficient terminals for all devices external to the adjustable frequency drive.

2.7 SOURCE QUALITY CONTROL

- A. Shop Test: Shop test each adjustable frequency drive in accordance with IEEE and NEMA standards, including high potential tests and other standard tests for that particular class of equipment. Notify the OWNER fourteen (14) days prior to start of factory testing so that the OWNER, at his option, may witness the testing.
 - ~~1. After final assembly, test each adjustable frequency drive at full load with application of line to line and line to ground bolted faults and show that the adjustable frequency drive trips electronically without device failure.~~
 - ~~2. After all tests have been performed, burn in each adjustable frequency drive for 40 hours at 100 percent inductive or motor load.~~
 - ~~3. After the burn in cycle is complete, subject each adjustable frequency drive to a 30 minute cycling motor load test before inspection and shipping.~~
- B. Operational Tests: After the equipment has been completely assembled, perform operational test to determine operating conditions and circuit continuity. Provide pushbuttons and selector switches to simulate all control

input contacts and indicating lights to indicate all control outputs. Provide a 4-20ma signal generator to simulate analog signals.

- C. Test Equipment: Provide all equipment, devices, instrumentation, and personnel required to perform the tests. Upon satisfactory completion of the test, submit two (2) certified copies of the test report to the ENGINEER. Component failure during testing will require repeating any test associated with the failure or modified components to demonstrate proper operation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. General: Install all equipment in accordance with the manufacturer's recommendations and approved shop drawings and as specified in the General and Specific Provisions.
- B. Protective Adjustments: Set all circuit breakers per the approved short circuit and coordination study.
- C. Operational Adjustments: Set all operational devices for proper system operation.
- D. Cable Connections: Terminate and label all field wiring per approved drawings.

3.2 FIELD QUALITY CONTROL

- A. Inspections: Inspect, adjust and check the installation for physical alignment, cable terminations and ventilation.
- B. Tests: Perform the following field tests:
 1. Close and open each circuit breaker to test operation
 2. When site conditions permit, energize and de-energize each equipment item served by each drive, testing the complete control sequence of each item including acceleration and deceleration over complete operating range.
 3. Harmonic Measurement: For 12-pulse drives, pPerform a harmonic system analysis to demonstrate full compliance with IEEE 519 voltage and current harmonic distortion requirements specified. Accurately measure the amplitude of the harmonic current imposed on the 60 hertz sine wave with a harmonic spectrum analyzer. Provide additional

harmonic reduction equipment to meet the specified limits. If the harmonic distortion limits are not achieved, replace the adjustable frequency drive equipment with equipment that conforms to this specification.

4. Provide a field test of 6-8 hours in conjunction with pump testing.
 5. Operate each adjustable frequency drive with driven equipment at full load and test for hot spots.
 6. Test Reports: Furnish detailed test reports of all tests indicating test performed, discrepancies found, and corrective action taken.
- C. Manufacturer's Field Services Representative: Provide the services of a factory-trained service engineer, specifically trained on the adjustable frequency equipment to assist in installation, start-up, testing, calibration, placing into operation and provide training, as specified in Section 01820.
1. Provide a service engineer when each drive is placed into operation.
 2. Provide a service engineer at the jobsite as often as necessary until all problems are corrected and the equipment installation and operation are satisfactory.
 3. Following completion of installation and field testing provide training for 4 employees of the OWNER in the proper operation, troubleshooting and maintenance of the equipment as outlined below. All training will be at the OWNER'S facilities at a time agreeable to the OWNER:
 - a. Operational Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
 - b. Maintenance Training: A minimum of two 4-hour sessions combining both classroom and hands-on instruction, excluding travel time.
 4. Provide service engineer at the job site as often as necessary to assist in the programming of the SCADA system in accessing the memory map of each device.

3.3 CLEANING AND PAINTING

- A. Shop Painting: Paint the adjustable frequency drive equipment as specified in Section 09901.
- | B. Field Painting: Furnish ~~three~~one 12-ounce spray cans of the final finish for touch-up. Touch-up scratched and marred surfaces to meet the requirements of Section 09901.

END OF SECTION