To: All Vendors Bidding on The College of New Jersey
Chiller Plant Improvements for STEM Building Project

From: Roselle Horodeski
Finance & Business Services

Date: May 15, 2015

ADDENDUM NO. 1

REFERENCE: The College of New Jersey
Chiller Plant Improvements for STEM Building Project
Project No. AB150036

Date of Original Bidding Documents: April 26, 2015

INTENT: This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents and Prior Addenda if any, as identified above. Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject Bidder to disqualification.

SPECIAL NOTICE OF BID EXTENSION:
Not used

CHANGES TO PRIOR ADDENDA:
Not used

REVISED CONSTRUCTION BID PROPOSAL FORM:
Not used.

CONTRACTOR QUESTIONS:

1. Reference page 13 of the specifications, item K “Project Signs”. This section states to provide 2 signs as described in the contract documents. We cannot find any of the requirements (size, color, lettering, etc.) for what goes on the sign. Please advise.
   Response: No Signs Required.

2. Drawing M-404 details for the Kendall Bldg. shows no valves around the check valve, is this correct? All other buildings have valves both sides. Please advise.
   Response: Valves to be added on both sides. See attached M-404.
3. Is the contractor responsible for draining and filling systems or will the college maintenance personnel be doing this?
   Response: Contractor is responsible.

4. We are aware the contractor is responsible to obtain permits; however who is responsible to pay for the permits, the College of the contractor?
   Response: The College pays.

5. Does the existing condenser water get insulated that is currently not insulated? For instance the pipe outdoors on the stands from the towers to the chiller? Also condenser piping currently uninsulated in the chiller rooms?
   Response: The condenser water pipes (existing and new) inside the chiller room are not insulated. All pipes outside the chiller room will be insulated.

6. Please provide a contact name and phone number for the “Comverge Company” we are to be using as called out on drawing E-902, note #7.
   Response: The “Comverge Company” was provided by the Owner at a coordination meeting as the sole supplier of the electric meters used campus wide at TCNJ. The contact is Jim DiSabato, email Jim.DiSabato@cpowercorp.com, cell 610-813-6357.

7. Can we have another site visit to see the main plant only with our crane and rigging company?
   Response: Yes, the site is open. Call Laji George 609-462-2260, however, no further questions will be entertained.

8. What is allowable pressure drop on each side of the heat exchanger.
   Response: Maximum allowable pressure drop is 10 psi on each side. See attached M-600 and HX specification.

9. Which side of the heat exchanger requires titanium nozzles for river/brackish water.
   Response: Titanium nozzles are not required. Use standard carbon steel. River/brackish water application removed. See HX specification.

CHANGES TO BIDDING REQUIREMENTS:
The HVAC contractor or subcontractor shall have a minimum DPMC rating of $5,000,000 in either C032 (HVACR) and C039 (HVAC). If HVAC contractor or subcontractor possesses C039 (HVAC), proof of application toward the HVACR licensing shall be provided.

CHANGES TO AGREEMENT AND OTHER CONTRACT FORMS:
Not used.

CHANGES TO CONDITIONS OF THE CONTRACT:
Not used.
## CHANGES TO SPECIFICATIONS:

<table>
<thead>
<tr>
<th>Specification No.</th>
<th>Page</th>
<th>Addendum 1</th>
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<tbody>
<tr>
<td>09900</td>
<td>09900-2</td>
<td>Added &quot;or equivalent&quot; in 2.1 A 8</td>
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<tr>
<td>15110</td>
<td>15110-3</td>
<td>Changed motorized valve operator Voltage to 120 volt in 2.4 C Deleted 2.4 D</td>
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<td>15110-4</td>
<td>Revised control input signal to &quot;4-20mA DC&quot; in 2.4E</td>
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<tr>
<td>15172</td>
<td>15172-1</td>
<td>Removed &quot;under provisions of Section 01610 in 1.6 A</td>
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<td></td>
<td>15172-2</td>
<td>Changed 2.1 A 1 to &quot;ABB (Basis of Design) Model ACH550&quot;</td>
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<td>15172-9</td>
<td>Changed warranty to &quot;two years from date of beneficial use&quot;.</td>
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<tr>
<td>15200</td>
<td>15200-4</td>
<td>Added &quot;warranty of 2 years from the date of beneficial use&quot; in 2.04.</td>
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<tr>
<td>15680</td>
<td>15680-3</td>
<td>Revised the warranty of cooling tower structure and internal components to &quot;24 months from beneficial use by the College&quot; in 1.10 A1</td>
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<td>15680-4</td>
<td>Revised gear drives warranty to &quot;two years&quot; in 2.2 A 8.b</td>
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<tr>
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<td>15680-5</td>
<td>Revised warranty of mechanical equipment assembly to &quot;two years&quot; in 2.2 A 14.</td>
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<td>15685</td>
<td>15685-2</td>
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Added Section 1.6 C for shipment of chiller in parts and assembly at the site as follows.

C. For Chillers to be shipped in parts and assembled at the installation location:

1. Chiller shall be fully assembled and tested before it is disassembled and prepared for shipment.
2. All disassembly work is to be performed at the manufacturer’s factory prior to shipment.
3. No insulation shall be applied at the factory. Under a separate contract, field insulate chiller per manufacturer’s insulation diagram and bill of materials.
4. Ship chiller knocked-down into three major assemblies
   a. Driveline (motor and compressor)
   b. Evaporator Shell
   c. Condenser Shell
5. Ship refrigerant separately. Mechanical contractor shall rig refrigerant into equipment room and place adjacent to the chiller. Manufacturer’s technician shall charge unit at startup. Mechanical contractor shall remove and return empty refrigerant vessels.
7. Separate the evaporator and condenser shells. Close all refrigerant lines between the shells with steel cover plates. Charge with dry nitrogen at 2-3 psig.
8. Prepare and protect each piece for shipment per specification.
9. Installing contractor to perform all rigging work with rigging contractor’s labor. Chiller manufacturer to supervise rigging activities with a technician who is factory trained and employed by the chiller manufacturer. The technician (as a minimum) shall be present when the shells are set in place and leveled, and when the driveline, starter, and suction elbow are lowered into position on the shells.
10. The manufacturer’s technician shall supervise complete re-assembly by installing contractor’s labor, including tightening of bolts to their recommended torque ratings, reconnection of intra-chiller electrical wiring, control wiring and refrigerant lines, etc.
11. The manufacturer’s technician shall leak test the unit, checking thoroughly for leaks. Any leaks must be fixed before the technician charges machine with refrigerant and oil.
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<tr>
<td>15730-2</td>
<td>15730-2</td>
<td>Revised warranty to 2 years in section 1.05 A.</td>
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<td>15730-3</td>
<td>15730-3</td>
<td>Added allowable and design pressure drop on both sides of the heat exchanger in 2.02 A. Deleted statement about &quot;river/brackish water&quot; in 2.02 C. Replaced &quot;Titanium&quot; with &quot;Stainless Steel, type 304&quot; in 2.03 A, Plates.</td>
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<tr>
<td>15730-4</td>
<td>15730-4</td>
<td>Replaced &quot;Hard chrome-plated carbon steel&quot; with &quot;Painted carbon steel&quot; in 2.03 D, Guide bars. Replaced &quot;will be by others&quot; with &quot;will be done per manufacturer's recommendation&quot; in 3.01, Installation.</td>
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<tr>
<td>15735-1</td>
<td>15735-1</td>
<td>Added &quot;for condenser water&quot; in 1.2 A.</td>
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<td>15735-3</td>
<td>15735-3</td>
<td>Added warranty of 2 years in 2.2 A Revised the section 3.1 Installation</td>
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<td>15900-4</td>
<td>15900-4</td>
<td>Deleted Item 7 in 1.4 D</td>
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<td>26000-12</td>
<td>260000-12</td>
<td>Reference 19 a deleted.</td>
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**IT SPECIFICATIONS:**
1. Specification Division 27 specification section 271500- Communications Horizontal Cabling deleted.

**CHANGES TO DRAWINGS:**

**T-1:**
- Deleted M-504. Contents of M-504 is moved to a new dwg C-501.
- Added C-101. This drawing includes the substation and transformer foundation layout from M-109
- Added C-501. This drawing includes the foundation details from M-504.

**M-106:**
- Revised Key Note 2 to “Demolish the 10 inch steam supply back to PRV Station located in boiler room above boiler 2. Keep the valves in two PRV and one bypass pipes. See image for PRV station in this sheet. Blind flange the valves. Demolish the condensate piping associated with the chiller to the nearest point of connection. Contractor to verify the extent of the demolition of the pipes back to the PRV Station.”
- Added Image “PRV in Boiler Room-Demolition” and associated note.
- Added a note on 14” CHWR pipes to CH-1 and CH-2.
- Deleted a note not related to the project.

**M-107:**
- Shown motorized valves on 14”CHWR to CH-1 and CH-2
- Modified the note on 14” CHWR pipes to CH-1 and CH-2.
- Deleted a note not related to the project.
- Added VFD Location for P-4, P-5 and P-6.
M-109: Deleted Transformers 1, 2 and Substation Control House Layouts. These layouts are shown on a new drawing C-101.

M-404: Added valves around the check valve in Kendall Basement MER.

M-600: Pump Schedule: Added Drive Basis of Design and VFD-No Bypass on Remarks.
Cooling Tower Schedule: Added VFD with bypass on Remarks
Heat Exchanger Schedule: Added pressure drops.
Added Chilled Water Pump VFD Schedule

E-050: Modified note 24 to pertain to “CG-A;1” in lieu of “CG-A;6”.
Added Note 25 pertaining to new VFDs for existing Pumps P-4, P-5 & P-6.
Added Note 26 pertaining to 120 volt circuits for motorized valves.
Re-routed conduits pertaining to specified CG-B & CG-C control wiring routed directly to the new Honeywell BMS Panel instead of through the existing pull box used exclusively for CG-A;1.
Added 120 volt circuits to motorized valves as indicated on plan.

E-201: Added new 2’x2’x8” IT Equipment Enclosure with routing of both CG-A;1 & CG-B;1 as indicated on plan.
Added Note 20 pertaining to 120 volt circuits for motorized valves.
Added 120 volt circuits to motorized valves as indicated on plan.

E-301: Modified the “Electrical Control Wiring Schedule” to indicate that the Fiber Cabling shall be the responsibility of the TCNJ/IT department.
Modified the “Electrical Control Wiring Schedule” to indicate control wiring for new VFDs pertaining to Pumps P-4, P-5 & P-6, respectively.
Revised panel schedule for Panel “RP-1” to include motorized valve circuits.

E-402: Modified the single line diagram to indicate new PTs for the 4.16 kV Switchgear.

E-503: Indicated the location of the new 2’x2’x8” IT Equipment Enclosure within the PDC-1.
Deleted Key Note 2 and modified Key Note 3.
Deleted wall data jack since it is no longer required.
Indicated the routing of conduit CG-A;1 to the new IT Equipment Enclosure.

ADDITIONAL REQUIREMENTS DISCUSSED AT PRE-BID:
Not used.

ADDITIONAL NOTES:
Not used.
END OF ADDENDUM NO. 1

Attachments:
1. Drawings Addendum
2. Specifications Addendum
3. Pre-Bid Sign-In Sheet
CHILLER PLANT IMPROVEMENT FOR STEM BUILDING

ISSUED FOR ADDENDUM 1
### ELECTRICAL INTERCONNECT SCHEDULE

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<th>No.</th>
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<th>Occurring Time</th>
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### ELECTRICAL PANEL SCHEDULE

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**SHEET NOTES:**

1. The electrical interconnect schedule includes all major components and their corresponding details. Each entry represents a specific interconnect to be reviewed and verified.  
2. The electrical panel schedule encompasses all panels associated with the system, detailing their locations and contactors.  
3. The electrical schedule is comprehensive, covering interconnects, panels, and other electrical components. It is designed to ensure all aspects of the electrical system are accounted for.  
4. The key to the schedule includes symbols and codes for easy reference.  

**KEY NOTES:**

- Communication issues are highlighted in the schedule, indicating potential areas for concern.
- All interconnects are labeled with specific identifiers for easy reference.
NOTES
1. Install communications conduit sized per IT design (max 1") from meter enclosure to 20°F (180°F) well-enclosed enclosures with hinged cover and cam lock. Additional tail pipe required if more than 150 degrees in total bend loss.
2. Install fiber service conduit to IT equipment enclosure.
3. Install drop wires in all conduits; all conduit ends to be bared.
4. Patch cord between enclosure and IT jack to be supplied under project, typically meter installer.
CHILLER PLANT IMPROVEMENT
FOR STEM BUILDINGS

ISSUED FOR ADDENDUM 1 – SPECIFICATIONS

May 2015

WM Group Services, LLC
Two Penn Plaza, Suite 552
New York, NY 10121
264113 - LIGHTNING PROTECTION
264950 - SUBSTATION CONTROL HOUSE
265113 - INTERIOR LIGHTING
265623 - EXTERIOR LIGHTING

DIVISION 27 - COMMUNICATIONS

END OF TOC
1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
   1. Product name or title of material.
   2. Product description (generic classification or binder type).
   3. Manufacturer's stock number and date of manufacture.
   4. Contents by volume, for pigment and vehicle constituents.
   5. Thinning instructions.
   6. Application instructions.
   7. Color name and number.

B. Store materials not in use in tightly covered containers in a well ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing and application.

1.5 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-based paints only when the temperature of surface to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to the following:
   1. Devoe and Raynolds Co. (Devoe).
   2. Fuller O'Brien (Fuller).
   3. The Glidden Company (Glidden).
   5. PPG Industries, Pittsburgh Paints (PPG).
   7. The Sherwin-Williams Company (S-W).
   8. or equivalent.
2. Where in-accessible due to other piping, etc.

F. Where applicable, all valves shall meet current Federal Specifications and/or Manufacturers Standardization Society.

2.3 HIGH PERFORMANCE BUTTERFLY VALVES (TRUNNION)

A. High performance butterfly valves (Trunnion):
   1. Provide flange or lug type for connection to ANSI class 150 flanges.
   2. Body shall be cast steel with neck extended to suit insulation thickness
   3. Disc shall be cast steel.
   4. Stem shall be 17 4 ph stainless steel
   5. Wear ring (seat) shall be:
      a. Teflon or urethane with Buna N or Viton backup O ring for ANSI class 150 service
      b. 316 stainless steel wear ring with EPR O ring
   6. Provide non asbestos packing material
   7. Operators:
      a. Valves to 8 inch: Handles with minimum of 10 locking positions and adjustable memory stop
      b. 8 inch and larger: Gear operators with adjustable balance return stops and position indicators
      c. Motor operated valves where noted
   8. Factory leakage test shall be bubble tight to ANSI or WOG pressure rating at corresponding service temperature
   9. Valves similar to following classes, ratings, sizes and Posi Seal International, Inc. figure numbers
      a. WOG class: 200 lb
         1) ANSI rating: 150
         2) Sizes: 2 inch to 24 inch
         3) Figure number: 1144

2.4 MOTORIZED VALVE OPERATORS

A. Mount operators on side or top at factory or at site under manufacturer’s supervision. Provide gear operated single or double reduction. For 90 degree application, adjustable mechanical stops shall prevent travel of more than 90°.

B. Grease or oil lubricated

C. 120 volt, single phase, 60 hertz.

D. 

E. Actuators shall be submitted with a chart of published valve torque requirement and published actuator torque outputs. Sizing safety factors must exceed 25%. Actuator shall be rated NEMA 4, 4X, IP65, UL approved. Actuators shall be 120 VAC with a maximum locked rotor current rating of 3.1 amperes. All motors shall have thermal overload protection and be rated continuous duty. Actuator gear trains shall be of the self-locking non-reversing type. Electrical mechanical solenoid brakes shall not be permitted as the stopping/locking device. All actuators shall have a handwheel manual override device with an automatic power
cut-off switch to prevent the motor from operating when the handwheel is engaged. Mechanical travel stops shall be provided to prevent over travel in the manual mode.

Actuators shall be furnished with 2 sets of open-closed SPDT Form C mechanical limit switches (one set for auxiliary position monitoring). Modulating actuators shall have a solid state, servo amplifier circuit board for precise control of valve position. The servo shall have voltage spike protection with independent adjustment of both open and close speed control and adjustments for zero, span and deadband and shall include LED indicators: Power – yellow; open drive – green; closed drive - red. The servo control shall be configurable for fail last, open or closed upon the loss of control signal and are to have a continuous feedback signal to monitor valve position. The control input signal will be configurable to 4-20 mA DC.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide valves line size.
B. Pressure rating of valves same as piping in which installed.
C. Install valves with stems upright or horizontal, not inverted.
D. Install valves with cast directional arrows in direction of flow.
E. Install valves to be accessible. Install valves to be removable without separating or lifting piping in which installed. On threaded bodies provide cap screws. Where abutting flanged strainers or similar devices, position valve with respect to device so as to permit removal of bolts.
F. Valves: Provide valves as noted. Provide shutoff valves on inlets and outlets of equipment, on branch connections to mains and as noted. Provide other types at locations as noted.
G. Motorized valve operators: Provide as noted.
H. Locate wheel handles to clear obstructions with hand.
I. Locate equipment shut-off valves to be accessible without climbing over equipment.
J. Piping adjacent to lugged valves to be flanged and removable while valve is in use.

3.2 VALVE APPLICATIONS

A. Use gate or butterfly valves for shut-off and to isolate equipment, parts of systems, or vertical risers.
B. Use globe or butterfly valves for throttling, bypass, or manual flow control services.
C. Use only butterfly valves in chilled and condenser water systems for throttling and isolation service.
D. Use lug or grooved end butterfly valves to isolate equipment.
SECTION 15172 - VARIABLE FREQUENCY DRIVES

Part 1. GENERAL

1.1 SCOPE OF WORK

A. Furnish equipment and services necessary for a complete and safe installation in accordance with the contract documents and all applicable codes and authorities having jurisdictions for the following:
   1. Variable frequency drives to control Chilled Water and Condenser Water Pump motors as shown on the drawings.

1.2 REFERENCES

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
C. UL, and cUL Approved
D. IEEE Standard 444 (ANSI-C343)
E. IEEE Standard 519
F. UL 508C (Power Conversion)
G. UL 1995 (Plenum rating)
H. FCC CFR 47 Part 15 Subpart B

1.3 SUBMITTALS

A. Submit product data, drawings and diagrams for the following items:
   1. Product data: Manufacturer’s catalog cuts, ratings and installation instructions.
   2. Drawings: Scale drawings of assembly.
   3. Diagrams: wiring diagrams including all external connections.
   4. Technical performance specifications
   5. Current harmonic spectrum for the actual VFD proposed (for verification of a harmonic analysis study performed by others).

1.4 OPERATION AND MAINTENANCE DATA

A. Include instructions for starting and operating VFD, and describe operating limits, which may result in hazardous or unsafe conditions.

1.5 QUALIFICATIONS

A. Manufacturer must have a minimum of 20 years of documented experience, specializing in variable frequency drives.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site.
B. Accept VFD on site in original packing. Inspect for damage.
C. Store in a clean, dry space. Maintain factory wrapping, or provide an additional heavy canvas or heavy plastic cover, to protect units from dirt, water, construction debris, and traffic.
D. Handle carefully, in accordance with manufacturer's written instructions, to avoid damage to components, enclosure, and finish.

Part 2. PRODUCTS

2.1 MANUFACTURERS

A. Variable Frequency Drives
1. ABB (Basis of Design) Model AC1550
2. Toshiba Series Q9
3. Cerus Ind. Series P
4. Or Equivalent

2.2 VARIABLE FREQUENCY DRIVES

A. Description:
1. Provide enclosed variable frequency drives suitable for operation at the current, voltage, and horsepower indicated on the schedule. Conform to requirements of NEMA ICS 3.1.

B. Ratings
1. VFD must operate, without fault or failure, when voltage varies plus 10% or minus 15% from rating, and frequency varies plus or minus 5% from rating.
2. VFD shall be 480 volts, 60 Hz, 3 Phase.
3. Displacement Power Factor: 0.98 over entire range of operating speed and load.
4. Operating Ambient Temperature: 14 degrees F to 104 degrees F.
5. Humidity: 0% to 95% non-condensing.
6. Altitude: to 3,300 feet, higher altitudes achieved by derating.
7. Minimum Efficiency: 96% at half speed; 98% at full speed.
8. Starting Torque: 100% starting torque shall be available from 0.5 Hz to 60 Hz.
9. Overload capability: 110% of rated FLA (Full Load Amps) for 60 seconds; 180% of rated FLA, instantaneously.
10. The VFD must meet the requirements for Radio Frequency Interference (RFI) above 7 MHz as specified by FCC regulations, part 15, subpart J, Class A devices.
11. Total Harmonic Distortion (THD) compliance:
   Given the information provided by the customer’s electric power single line diagram and distribution transformer data, the VFD manufacturer shall carry out an analysis of the system. The analysis reviews the potential for the proposed equipment, and any existing equipment, to meet IEEE 519 (tables 10.2 and 10.3) recommendations at the Point of Common Coupling (PCC). The result of the analysis shall determine if additional power quality improvement measures should be included in the proposal to meet the THD recommendations of IEEE 519. The PCC shall be at the primary side of the main distribution transformer.
12. VFDs must have a minimum short circuit rating of 65K amperes RMS (100K amperes RMS with a DC bus reactor) without additional input fusing.
B. Verify that electrical wiring installation complies with manufacturer's submittal and installation requirements in Division 26 Sections.

C. Complete installation and startup checks according to manufacturer's written instructions.

3.9 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.10 CLEANING

A. Clean VFDs internally, on completion of installation, according to manufacturer's written instructions. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

3.11 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain VFDs.

3.12 TRAINING

A. Factory representative shall provide on-site training of operating personnel after the system is fully operational.

B. Provide eight (8) sets of operation and maintenance manuals to owner after completion of startup.

3.13 WARRANTY

A. Two-year warranty from date of beneficial use. Warranty shall include parts, and labor allowance for repair hours.

END OF SECTION
2.04 WARRANTY

All equipment shall have the warranty of 2 years from the date of beneficial use.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Place vessels as shown in installation drawing and level. Use manifold as guide for spacing.
B. Install upper and lower manifolds as per manufacturer’s instructions.
C. Install piping between manifold and pump(s) if necessary.
D. Attach control panel to vessel mount.
E. Connect control wiring to valves.
F. Connect electrical power to control panel and control to pump(s) according to local electrical codes and wiring diagram supplied by manufacturer.
G. Install media according to manufacturer’s instructions.

3.02 STARTUP AND TESTING

A. Startup by factory authorized agent shall be provided.
B. Submit cooling water particle analysis reports showing count and volume of particles within the following micron size ranges: 0.5 to 1, 1 to 2, 2 to 5, 5 to 10, 10 to 20, and 20 and larger at time of startup.
C. Submit cooling water particle analysis reports showing count and volume of particles within the following micron size ranges: 0.5 to 1, 1 to 2, 2 to 5, 5 to 10, 10 to 20, and 20 and larger 30 days after startup.
D. Submit report analyzing results from 3.02 B and C confirming that system meets performance specifications in paragraph 1.02 C.
C. Mark packed materials for identification. Show on shipping invoice, crate, box, carton or component identification, the Department’s purchase order number and consignee’s name and shipping address.

D. Notify Department within 24 hours of shipment of equipment. The following information shall be supplied: shipping date, carrier PRO number, truck number, quantity, weights, items shipped, and estimated time of arrival.

1.9 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.10 WARRANTY

A. Upon completion, the manufacturer shall issue a written warranty, duly authorized, covering the following:
   1. The cooling tower structure and internal components shall be warranted against defects in material and workmanship and the systems shall meet operating conditions, capacity, and performance for the greater period of 24 months from beneficial use by the College. The mechanical equipment and motors shall be warranted for 2 years from beneficial use. If either the unit or accessories fail to meet operating requirements or if failure of a part occurs during this warranty period, rework or replace items to meet the contract requirements at no cost to the College.

B. The College reserves the option to request thermal or sound performance test per CTI Standards throughout the warranty period.

1.11 MATERIALS

A. Provide two sets of any special tools required or recommended by Manufacturer for field maintenance.

PART 2 PRODUCTS

2.1 COOLING TOWERS

A. Manufacturers:
   1. Marley Cooling Tower.
   2. Baltimore Aircoil.
   3. Evapco.
   4. Or equivalent as approved by the Professional.

B. Product Description: factory assembled, sectional, cross-flow design, with fan and motor assemblies, built with pan, casing, fill and drift eliminators.

2.2 STEEL COOLING TOWERS

A. General:
1. Completely factory assembled, piped and wired, requiring no field assembly, with the exception of field installed accessories.

2. Suitable for installation in the space conditions indicated on drawings, including clearance for installation, operation, maintenance, and air flow into and out of tower. Cooling tower manufacturer shall certify tower for space conditions given.

3. The load and location of required cooling tower supports shall be provided by this manufacturer. Manufacturer shall design cooling tower and provide materials necessary for attachment to dammage steel.

4. Tower design and materials of construction, including fill, shall have a design life expectancy of not less than 10 years for the geographical location and atmospheric conditions of the installation. Towers shall be bolted or with continuously welded basin construction. Spot welded construction is not permitted. Towers shall be designed for wind load as required by BOCA and in accordance with authorities having jurisdiction.

5. Except as noted, all components shall be stainless steel.

6. PVC fill shall be cross-corrugated 20 mil (before forming) thick sheets. Fill shall withstand a continuous 1200°F continuous water temp, and a 1300°F maximum water temperature. The fill shall be impervious to rot, decay, fungus and biological attack. Maximum flame spread and smoke developed ratings of 25 & 50 respectively.

7. PVC eliminators and louvers shall be 15 mil thick with maximum flame spread and smoke developed ratings of 25 & 50 respectively. Triple-pass drift eliminators shall be used.

8. Fans and drives: Except as noted, airflow shall be manually adjustable in the field through adjustable pitch fan blades. Fans shall be statically balanced in factory and properly supported to prevent damage in shipment and rigging. Drive shall be designed for minimum 150 percent of motor horsepower. Provide stainless steel for fans and drives. Acceptable fan and drives include:
   a. Propeller fans: Cast aluminum. Fan blades shall connect to hubs using stainless steel Grade 8 bolts or approved alternate as approved by Professional.
   b. Gear drives: Right angled type suitable for cooling tower duty, provide oil level indicator and reservoir with fill and drain connections which shall be extended to the fan deck level for access. A two-year warranty shall be provided for gear drives. First five years of oil changes to be provided by manufacturer (including all oil, disposal and labor). Gear drives will not require an external oil pump or require an electric internal pump. Vibration switch to be mounted on or near fan drive and shall disable motor in the event of a trip. All gearbox bearings shall be rated at an L10A service life of 100,000 hours or greater and the gear sets shall have AGMA Quality Class of 9 or greater. The gearbox shall include any modifications to enable operation down to 10% of full speed.

9. Distribution orifices and spray nozzles: Plastic, individually removable for cleaning or replacement, capable of passing a 1/4" sphere (minimum 5/16" opening). Provide stainless steel distribution basin or corrosion resistant plastic distribution system to distribute water evenly over the tower fill. Provide two compartment water basin (or other engineered means) to provide balanced distribution flow across entire out-board face at reduced (33%) flow rate. The water distribution system shall be equipped with a method to operate under variable flow conditions while maintaining a uniform air-side pressure drop through the fill to maximize cooling efficiency and minimize the risk of ice and scale formation in the fill. System must accommodate flow rates down to 33% of design flow.

11. Fan and drive guards: Provide OSHA approved guards and screens around fans, drives and motors as necessary to protect people outside tower from injury due to moving parts. Provide warnings on access doors to caution operations as to hazards of moving parts.

12. Ladders, platforms, hand rails and access doors: Provide for ready access to all components, including balancing valves, hot water distribution basins or nozzles, cold water basin and all components located within it, motor lubrication fittings, gear oil level indicators, oil fill connections, oil drain valves, power band, etc. Gear oil level must be readable from the outside of the cell and/or during operation. Follow local, town, and state codes. Ladders shall extend to within 12" of access level (roof or platform). Ladder to fan deck shall be aluminum, with 1-1/4" steel pipe handrail around fan deck. Ladders, platforms and handrail shall conform to all OSHA requirements, including cages if ladders exceed 20 ft height or if shown on drawings. Provide access doors on both sides of casing and interior platforms to allow access through the interior of one tower cell to the adjacent tower cells. A galvanized steel access door shall be located on both end walls for entry into the cold water basin and fan plenum area. Access doors shall be operable from inside as well as outside the tower. Provide SS internal access walkway and galvanized steel or fiberglass mechanical equipment platform with handrails.

13. Connection points and cooling tower structure shall withstand forces imposed by rigging equipment of 2g horizontal and 3g vertical magnitudes with no compromise to the structural integrity of any components. The calculations shall be performed with the tower in the condition it will be delivered. Eye bolts or other approved means shall be provided for four point rigging of tower as approved by Professional.

14. The complete mechanical equipment assembly for each cell shall be supported by two horizontal steel beams that resist misalignment between the motor and the gear reducer/belt drive system. The mechanical equipment assembly shall be warranted against any failure caused by defects in materials and workmanship for no less than two (2) years. This warranty shall cover the fan, speed reducer, drive shaft and couplings and the mechanical equipment support. The electric motor shall carry a manufacturer's warranty of at least two years.

B. Double flow, Cross flow, vertical discharge type:
1. Cold water basin: Welded 304 stainless steel for all components, including collection basin bottom and sides, flanged inlet connections as shown on drawings, bolts and nuts. Basin to be set up with bottom supply, return and equalizer connections as shown on the plans. Condenser water headers and distribution system shall be internal to the cooling tower structure with external flanged connections. All connections to system piping to be provided with 150# ANSI flanges. Basin freeboard to be minimum 18." Provide 2" mechanical float valve per cell for water make-up.

2. Provide single self-balancing bottom inlet piping connection per cell. Internal piping shall be supplied/supported by the manufacturer of schedule 40 PVC piping and shall be self-draining when pump is shut down.

3. Accessories:
   a. Provide fan cylinder or casing extension for overall tower height as shown on drawings,
   b. Vibration switch,
   c. Portable mechanical equipment removal davit with hand winch and cable for use on any of the four cells,
   d. Removable stainless steel covers for hot water basins
   e. Stainless steel air inlet screens.
A. Manufacturer shall be specializing in the manufacture of the products specified in this Section with minimum ten years documented experience and minimum five years experience with the model specified in this Section.

B. Unit shall be manufacturer’s standard product, designed and manufactured in accordance with appropriate industry standards, including ASHRAE-90.1-2010.

1.5 SUBMITTALS

A. Product data: Detailed equipment drawings including dimensional information, weight, support details, catalog cuts of components, electric requirements, wiring diagrams and control sequence.

B. Performance data: for full load and part load conditions as indicated hereinafter.

C. Assembly drawings indicating field piping and wiring requirements.

D. Furnish complete wiring diagrams of the centrifugal chiller and required starter interlocks for devices supplied by this vendor and those required and provided by others such as but not limited to components like: pumps, flow switches, refrigerant leak sensors, miscellaneous interlocks, etc. as applicable.

E. For the Variable Frequency Drive
   1. Technical performance specifications
   2. Current harmonic spectrum for the actual VFD proposed (for verification of a harmonic analysis study performed by others).

F. Operation and Maintenance Data
   1. Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.
   2. Provide eight (8) sets of operation and maintenance manuals to owner after completion of chiller startup.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Units shall be stored and handled in accordance with manufacturer’s instructions.

B. The chiller shall be adequately packaged to provide protection from exposure to the elements and damage encountered during normal shipping and sheltered storage.

C. For Chillers to be shipped in parts and assembled at the installation location:
   1. Chiller shall be fully assembled and tested before it is disassembled and prepared for shipment.
   2. All disassembly work is to be performed at the manufacturer’s factory prior to shipment.
   3. No insulation shall be applied at the factory. Under a separate contract, field insulate chiller per manufacturer’s insulation diagram and bill of materials.
   4. Ship chiller knocked-down into three major assemblies
      a. Driveline (motor and compressor)
      b. Evaporator Shell
c. Condenser Shell

5. Ship refrigerant separately. Mechanical contractor shall rig refrigerant into equipment room and place adjacent to the chiller. Manufacturer’s technician shall charge unit at startup. Mechanical contractor shall remove and return empty refrigerant vessels.


7. Separate the evaporator and condenser shells. Close all refrigerant lines between the shells with steel cover plates. Charge with dry nitrogen at 2-3 psig.

8. Prepare and protect each piece for shipment per specification

9. Installing contractor to perform all rigging work with rigging contractor’s labor. Chiller manufacturer to supervise rigging activities with a technician who is factory trained and employed by the chiller manufacturer. The technician (as a minimum) shall be present when the shells are set in place and leveled, and when the driveline, starter, and suction elbow are lowered into position on the shells.

10. The manufacturer’s technician shall supervise complete re-assembly by installing contractor’s labor, including tightening of bolts to their recommended torque ratings, reconnection of intra-chiller electrical wiring, control wiring and refrigerant lines, etc.

11. The manufacturer’s technician shall leak test the unit, checking thoroughly for leaks. Any leaks must be fixed before the technician charges machine with refrigerant and oil.

Part 2. PRODUCTS

2.1 MANUFACTURERS

A. Chillers
   1. Carrier Corp.
   2. McQuay
   3. York International Corp.
   4. Or equivalent

2.2 CHILLER UNIT

A. Design Operating/Performance Data:
   1. Refrigerant: R134a
   2. Chiller nominal capacity: 1500 tons, rated for the following conditions:

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<td>Leaving water temp, °F</td>
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<td>Leaving water temp, °F</td>
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<tr>
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B. The manufacturer shall employ and certify such quality assurance measures as are necessary to ensure that the work conforms to the Specifications herein.

C. The Manufacturer shall have manufactured units of similar size, nature, and intent that have operated successfully for a period of not less than three (3) years.

D. All workmen performing work as described herein shall be skilled workers of the trade involved.

E. Perform factory or field performance testing as specified in Part 2.

F. The supplier shall certify that all materials or components used in the heat exchangers shall not contain PCBs, asbestos, or lead paint.

1.05 WARRANTY

A. The equipment manufacturer’s warranty shall be provided to The College of New New Jersey and shall extend for a period of two (2) years from issuance of the Certificate of Final Completion.

B. Such warranty shall be submitted to the College in advance for the College’s approval as to form and substance of such warranty. Such approval shall be at the sole discretion of the College. Such warranty, at a minimum, shall cover any defects in material and workmanship and include labor to replace or repair the defective part.

1.06 EXTRA MATERIALS:

A. Provide two sets of replacement gaskets.

B. Provide two sets of wrenches for disassembly of plate type heat exchangers.

C. Provide operations and maintenance manuals.

PART 2. PRODUCTS

2.01 MANUFACTURERS

A. Heat Exchangers, Plate & Frame Type. (List of manufacturers or approved equal):
   1. Tranter
   2. APV
   3. Bell & Gossett, ITT.
   4. Alfa Laval
   5. Polaris
   6. Or Equivalent

2.02 DESIGN CRITERIA

A. Sizing:
The College of New Jersey Plate and Frame Heat Exchanger
Chiller Plant Improvement for STEM buildings 15730-2 Mar, 2015
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<th>Item</th>
<th>Hot Side (Chilled Water)</th>
<th>Cold Side (Condenser Water)</th>
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<td>Volume Flow Rate</td>
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<td>3000</td>
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<tr>
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<td>Deg. F</td>
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<td>10.0/9.9</td>
<td>PSIG</td>
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</table>

B. Provide 10% extra heat transfer surface than required for the above performance.

C. General:

1. The exchanger design, materials and fabrication shall conform to Section VIII Division 1 of the ASME Code.

3. The exchanger shall have one-piece inter-plate gaskets made of materials suitable for the given fluids and process conditions. Channel plate ports to be double gasketed to prevent mixing or cross-contamination of hot side and cold side fluids.

4. The exchanger shall be counter flow or cross flow design to optimize thermal heat transfer and cost.

5. The exchanger shall be rated with fouling allowance required for the process duty.

6. Nozzle velocities shall not exceed 20 fps for liquids.

7. Plates shall be designed to withstand full maximum differential pressure without any pressure on the adjacent plates.

8. Minimum thickness of plates shall be 0.70 mm.

9. All heat transfer surfaces must be accessible for mechanical cleaning.

10. Frame capacity must be able to accommodate at least 20% additional plates.

11. The heat exchanger will be capable of being blow down and allow for hose connection to reverse flush cleaning. Fittings for reverse flush shall be integral with the inlet and outlet between the flanges and the main plate.

12. Units shall be affixed with the ASME code stamp. Provide with manufacturer’s stainless steel nameplate stamped with model number, pressure and performance rating.

13. Provide insulated removable cover with quick install/release straps and fastening system. The straps and fastening system shall be stainless steel. The cover shall include a silicone coated jacket on both sides of the insulation.

2.03 Fabrication

A. Plates:

1. Stainless Steel, type 304

2. Identical surface patterns.
3. With water distributing flow directors.
4. Designed to eliminate cross contamination.
5. Number each plate.

B. Gaskets:
   1. One piece nitrile butyl rubber or EPDM.
   2. Gaskets shall be provided with mechanical retainers.

C. Frame:
   2. Painted with baked epoxy enamel.

D. Guide bars:
   1. Painted carbon steel.

E. Pipe Connections:
   1. 150 PSI ANSI rated weld neck flange type.
   2. Size and location as scheduled (see Section 2.02.A of this Specification)

2.04 TESTING

A. Assembled exchanger shall be hydrostatically tested at 1.5 times full design pressure. Pressure shall be held without additional pumping for a minimum of two (2) hours with less then a 5% loss in pressure. Each circuit shall be tested independently.

B. Submit factory test reports to the Authority (refer to Appendix A).

2.05 SHIPPING:

A. Ship fully assembled.

B. With protective shroud.

PART 3. EXECUTION

3.01 INSTALLATION

A. Installation of the Heat exchanger will be done per manufacturer’s recommendation.

3.02 COMMISSIONING

A. The plate and frame heat exchanger shall be commissioned by the installing contractor. The manufacturer will provide support for the commissioning and startup process including providing copies of factory tests and providing startup assistance during the commissioning and testing of the equipment.
SECTION 15735 - HYDRONIC PUMPS

PART 1 GENERAL

1.1 STIPULATIONS

A. The specifications sections “General Conditions of Contract,” “Special Conditions” and “Division 1 – General Requirements” form a part of this section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

A. Section Includes:  
   1. Vertical in-line pumps for Condenser Water

   B. Related Sections:  
      1. Section 15170 - Common Motor Requirements for HVAC Equipment: Product requirements for motors for placement by this section.
      2. Section 15110 - General-Duty Valves for HVAC Piping: Product requirements for valves used in hydronic piping systems.
      3. Section 15100 - Hydronic Piping: Execution requirements for connection to pumps specified by this section.
      4. Section 03330 – Cast in Place Concrete

1.3 REFERENCES

A. National Electrical Manufacturers Association:  
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. Underwriters Laboratories Inc.:  
   1. UL 778 - Motor Operated Water Pumps.

1.4 PERFORMANCE REQUIREMENTS

A. Provide pumps to operate at system fluid temperatures indicated on Drawings without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.5 SUBMITTALS

A. Product Data: Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements. Submit also, manufacturer model number, dimensions, service sizes, and finishes.

B. Manufacturer's Installation Instructions: Submit application, selection, and hookup configuration with pipe and accessory elevations. Submit hanging and support requirements and recommendations.
F. Shaft Sleeve: Aluminum bronze.

G. Seal: Carbon rotating against stationary ceramic seat, 225 degrees F maximum continuous operating temperature.

H. Electrical Characteristics and Components:
   1. Motors: In accordance with Section 15170. 1750 rpm unless specified otherwise.
   2. Wiring Terminations: Furnish terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

2.2 WARRANTY

A. All equipment shall have the warranty of 2 years from the date of beneficial use.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install vertically with motor up per manufacturer’s recommendation.

B. Provide pumps to operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

C. Pumps must always be supported.

D. Install long radius reducing elbows or reducers between pump and piping. Support piping adjacent to pump so no weight is carried on pump casings.

E. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump so no weight is carried on pump casings. Provide supports under elbows on pump suction and discharge line sizes 4 inches and larger.

F. Pump should be accessible for inspection and repair work, head room must be provided for the use of hoist or tackle as necessary.

G. Provide drains for bases and seals.

H. Check, align, and certify alignment of the pumps prior to start-up.

I. Install vertical in-line pumps on a concrete pad. Refer to Section 03300.

J. Lubricate pumps before start-up.

3.2 FIELD QUALITY CONTROL

A. Inspect for alignment of base mounted pumps.

END OF SECTION
1.5 RELATED SECTIONS

A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of this specification and shall be used in conjunction with this section as a part of the Contract documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

1.6 CODES AND STANDARDS

A. All work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of the local, state, and federal authorities. Such codes, when more restrictive, shall take precedence over these drawings and specifications. As a minimum, the installation shall comply with the current editions in effect 90 days prior to receipt of bids of the following codes:

1. National Electric Code (NEC)
2. Uniform Building Code (UBC)
   a. Section 608, Shutoff for Smoke Control
   b. Section 403.3, Smoke Detection Group B Office Buildings and Group R, Division 1 Occupancies
   c. Section 710.5, Wiring in Plenums
   d. Section 713.10, Smoke Dampers
   e. Section 1106, Refrigeration Machinery Rooms
   f. Section 1107, Refrigeration Machinery Room Ventilation
   g. Section 1108, Refrigeration Machinery Room Equipment and Controls
   h. Section 1120, Detection and Alarm Systems
3. Uniform Mechanical Code (UMC)
5. Unitary controllers, intelligent sensors, and intelligent actuators shall conform to the appropriate LonMark™ functional profile configurations based on intended use and shall be so labeled.

1.7 SUBMITTALS

A. Submit shop drawings and product data for all hardware, software, and installation required per the provisions of Division 1 and this Division’s General Provisions within 12 weeks of contract award.:

1. Product data:
   a. Manufacturer’s installation instructions.
   b. Manufacturer’s descriptive literature, operating instructions, operating range, total range and maintenance and repair data.
   c. Substitutions: Submit requests for substitution in accordance with provisions of Division 1.
   d. Performance Data/curves.
   e. Wiring Diagrams.
a. Dry Type Transformers

11. Section 262416 – Panelboards
12. Section 262419 – Motor Control Center
13. Section 262726 – Wiring Devices
   a. Receptacles
   b. Lighting Switches
   c. Faceplates and Covers
14. Section 264113 – Lightning Protection for Structures
   a. Air Terminals
   b. Conductors
   c. Attachments
15. Section 265113 – Interior Lighting
   a. Fixtures
   b. Lamps
   c. Ballasts
   d. Control
   e. Supports
   f. Seismic Restraints
16. Section 265623 – Exterior Lighting
   a. Fixtures
   b. Lamps
   c. Ballasts
   d. Control
   e. Supports
   f. Seismic Restraints
17. Section 261300 – Medium-Voltage Switchgear
   a. New Components
   b. Wiring diagrams for all new work
18. Section 263111 – Digital, Addressable Fire-Alarm System
   a. System smoke detectors

19. Section 271500 – Communications Horizontal Cabling
   a. Cable(s) for low voltage wiring

1.9 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes providing support systems to receive;
   1. Owner's equipment and making electrical connections
   2. Owner will arrange for and deliver Shop Drawings, and Product Data.
<table>
<thead>
<tr>
<th>Company Name</th>
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<tr>
<td>Gabe Shingle Inc</td>
<td>Gabe</td>
<td>732-751-2828</td>
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<td><a href="mailto:Gabe@GabeShingleInc.com">Gabe@GabeShingleInc.com</a></td>
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<td>Ray Angelini Inc</td>
<td>Charles</td>
<td>856-228-5466</td>
<td>556-228-4450</td>
<td><a href="mailto:charlesangeli@GabeShingleInc.com">charlesangeli@GabeShingleInc.com</a></td>
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<td>P.U. Weyer</td>
<td>Charles</td>
<td>609-921-4647</td>
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<td><a href="mailto:charleswey@GabeShingleInc.com">charleswey@GabeShingleInc.com</a></td>
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<td>Johnson Concrete Inc</td>
<td>Braheem Santos</td>
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<td>John Carringer Inc</td>
<td>Kevin Kontz</td>
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<td><a href="mailto:bill@ETSFVU.com">bill@ETSFVU.com</a></td>
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<td>Bruce McDonald</td>
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Warren Lightning Rod: Bill Meinel 856-854-7000
bmeinel@wlr.com