INVITATION FOR BIDS: CCK-2283-18
RESEARCH BUILDING #2: Construct Spline Utilities: Chiller 6 and CUP Building Revisions
Bid Package 8, Trade Category 23V, Chiller #6 Mechanical & Plumbing and Trade Category 26V,
Chiller #6 Electrical, Project #2425.0
ADDENDUM # 2
April 9, 2018

ATTENTION: This is not an order. Read all instructions, terms and conditions carefully.

IMPORTANT:
BID AND ADDENDUM MUST BE RECEIVED BY 4/17/18 @ 3:00 P.M. LEXINGTON, KY TIME.

Bidder must acknowledge receipt of this and any addendum as stated in the Invitation for Bids.

Bidders shall conform to the following clarifications, corrections and changes, as same shall become binding on the Contract to be issued in response to this Invitation for Bids. Bidders must acknowledge receipt of this Addendum in the space provided on the Form of Proposal. Failure to do so may subject Bidder to disqualification.

1. Extend the Bid Due Date from 4/13/2018 until 4/17/2018
2. Please refer to and incorporate into the Offer the attached Addendum #2 from AEI Affiliated Engineers, Inc. dated 4/6/2018. Pages 1 thru 74.
3. Replace the Special Conditions with the attached revised Special Conditions.
4. Replace the Form of Proposal for Subcontract 23V, Mechanical & Plumbing with the attached revised Form of Proposal.
5. Replace the Form of Proposal for Subcontract 26V, Chiller 6 Electrical with the attached revised Form of Proposal.
6. Refer to and incorporate within the Offer the attached Written Questions and Answers, Research Building #2, Bid Package #8 Construct Spline Utilities: Chiller 6 and CUP Building Project #2425.0, CCK-2283-18.
7. Finally, replace the Site Logistic Plan with the attached revised and updated BP #8 Logistic Plan.

OFFICIAL APPROVAL
UNIVERSITY OF KENTUCKY

________________________________________
Mike Mudd / (859) 257-5409

SIGNATURE

________________________________________
Typed or Printed Name
Addendum

University of Kentucky BP-8 Campus Infrastructure & C.U.P

Lexington, KY

CA Project No. 514-5601-00

All Bidders

To

Friday, April 13, 2018 at 3pm.

This addendum is issued to modify or interpret previously issued documents by additions, deletions, clarifications, or corrections. It forms a part of the previously issued documents.

This addendum may include revised pages and drawings, which shall be inserted before the corresponding page or drawings in the previously issued documents. Revised pages and drawings are identified by the corresponding addendum number and date.

PROJECT MANUAL

SECTION

Revise TABLE of Contents- TOC-1 to reflect additions to project manual.

Spec 024119 ADD new section to project manual.

Spec 099113 ADD new section to project manual.

Spec 099123 ADD new section to project manual.

Spec 22 1314

Page 6, DELETE Section 3.3 Concrete Sump Coating.

Spec 23 2116

Page 17, ADD 3.15.C, interior pipe painting.

Spec 23 2118

Page 7, REVISE 2.7.C.2, check valve pipe sizes.

Spec 23 0901A

Page 3, REVISE system to communicate with the Delta Room.

DRAWINGS

SHEET H201.8, Removed note #6

SHEET H400.8, Added pipe hanger detail #11
Addendum
Addendum # 2            Date: 4.6.18
Project Name University of Kentucky BP-8 Campus Infrastructure &        Page 2 of 2
C.U.P

Attachments:

024119- Selective Demolition
099123- Interior painting
099113 Exterior painting
22 1314-Sanitary Waste and Storm Drainage
23 2116-Pipe and Pipe fittings
23 2118-Valves
23 0901A- Control System
H201.8- HVAC Plan CUP Building First Floor
H400.8- HVAC Details

END OF ADDENDUM
## TABLE OF CONTENTS

### DIVISION 01 – GENERAL CONDITIONS

### DIVISION 02 – EXISTING CONDITIONS
02 4119 Selective Demolition

### DIVISION 03 – CONCRETE
03 3000 Cast In Place Concrete

### DIVISION 05 – METALS
05 1200 Structural Steel

### DIVISION 06-08 - not used

### DIVISION – 09 FINISHES
09 9113 Exterior Painting
09 9123 Interior Painting

### DIVISION 10-14 - not used

### DIVISION 20 - MECHANICAL
20 0000 General Mechanical Requirements
20 0513 Motors
20 0520 Excavation and Backfill
20 0529 Mechanical Supporting Devices
20 0553 Mechanical Systems Identification
20 0573 Mechanical Systems Firestopping
20 0700 Mechanical Systems Insulation

### DIVISION 21 - not used

### DIVISION 22 – PLUMBING
22 0000 General Plumbing Requirements
22 1118 Water Distribution System
22 1314 Sanitary Waste and Storm Drainage

### DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING
23 0000 General HVAC Requirements
23 0550 Vibration Isolation
23 0594 Water Systems Test Adjust Balance
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>23 0598</td>
<td>Acceptance Testing of Rotating Equipment</td>
</tr>
<tr>
<td>23 0901A</td>
<td>Control Systems</td>
</tr>
<tr>
<td>23 0993</td>
<td>Control Sequences</td>
</tr>
<tr>
<td>23 2116</td>
<td>Pipe and Pipe Fittings</td>
</tr>
<tr>
<td>23 2118</td>
<td>Valves</td>
</tr>
<tr>
<td>23 2120</td>
<td>Piping Specialties</td>
</tr>
<tr>
<td>23 2123</td>
<td>Pumps</td>
</tr>
<tr>
<td>23 2514</td>
<td>Chemical Treatment Systems and Final System Fill</td>
</tr>
<tr>
<td>23 3114</td>
<td>Ductwork</td>
</tr>
<tr>
<td>23 6000</td>
<td>Primary Cooling Equipment * includes Appendix (Chiller 5 Submittal)</td>
</tr>
</tbody>
</table>

**DIVISION 26 – ELECTRICAL**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 0000</td>
<td>General Electrical Requirements</td>
</tr>
<tr>
<td>26 0513.16</td>
<td>Medium-Voltage Single-and-Multi-Conductor Cables</td>
</tr>
<tr>
<td>26 0519</td>
<td>Low-Voltage Electrical Power Conductors and Cables</td>
</tr>
<tr>
<td>26 0526</td>
<td>Grounding and Bonding for Electrical Systems</td>
</tr>
<tr>
<td>26 0529</td>
<td>Hangers and Supports for Electrical Systems</td>
</tr>
<tr>
<td>26 0533</td>
<td>Raceway and Boxes for Electrical Systems</td>
</tr>
<tr>
<td>26 0553</td>
<td>Electrical Systems Identification</td>
</tr>
<tr>
<td>26 0593</td>
<td>Electrical Systems Firestopping</td>
</tr>
<tr>
<td>26 0812</td>
<td>Power Distribution Acceptance Tests</td>
</tr>
<tr>
<td>26 0813</td>
<td>Power Distribution Acceptance Test Tables</td>
</tr>
<tr>
<td>26 2726</td>
<td>Wiring Devices</td>
</tr>
<tr>
<td>26 2813</td>
<td>Fuses</td>
</tr>
<tr>
<td>26 2816</td>
<td>Enclosed Switches and Circuit Breakers</td>
</tr>
<tr>
<td>26 2913</td>
<td>Enclosed Controllers</td>
</tr>
<tr>
<td>26 5100</td>
<td>Lighting Systems</td>
</tr>
</tbody>
</table>

**DIVISION 27-28 - not used**

**DIVISION 31 – EARTHWORK**

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 5000</td>
<td>Excavation, Retention, Shoring and Bracing</td>
</tr>
</tbody>
</table>

**END OF TABLE OF CONTENTS**
SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
   A. Section includes surface preparation and the application of paint systems on exterior substrates.
   B. Related Requirements:
      1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates.
      2. Section 055000 "Metal Fabrications" for shop priming metal fabrications.

1.3 DEFINITIONS
   A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
   B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
   C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
   D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
   E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
   F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of product. Include preparation requirements and application instructions.
      1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
      2. Indicate VOC content.
   B. Samples for Initial Selection: For each type of topcoat product.
C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same
designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

   A. Furnish extra materials, from the same product run, that match products installed and that are
      packaged with protective covering for storage and identified with labels describing contents.
      1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

   A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to
      verify preliminary selections made under Sample submittals and to demonstrate aesthetic
      effects and set quality standards for materials and execution.
      1. Architect will select one surface to represent surfaces and conditions for application of
         each paint system.
         a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
         b. Other Items: Architect will designate items or areas required.
      2. Final approval of color selections will be based on mockups.
         a. If preliminary color selections are not approved, apply additional mockups of
            additional colors selected by Architect at no added cost to Owner.
      3. Approval of mockups does not constitute approval of deviations from the Contract
         Documents contained in mockups unless Architect specifically approves such deviations
         in writing.
      4. Subject to compliance with requirements, approved mockups may become part of the
         completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

   A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient
      temperatures continuously maintained at not less than 45 deg F (7 deg C).
      1. Maintain containers in clean condition, free of foreign materials and residue.
      2. Remove rags and waste from storage areas daily.
1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.

2.2 PAINT, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

D. Colors: As selected by Architect from manufacturer’s full range.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from
previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

C. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
   1. SSPC-SP 2.
   2. SSPC-SP 3.
   3. SSPC-SP 7/NACE No. 4.
   4. SSPC-SP 11.

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.
3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:
   1. Alkyd System MPI EXT 5.1D:
      a. Prime Coat: Primer, alkyd, anticorrosive, for metal, MPI #79.
      c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

B. Galvanized-Metal Substrates:
   1. Alkyd System MPI EXT 5.3B:
      c. Topcoat: Alkyd, exterior, semi-gloss (MPI Gloss Level 5), MPI #94.

END OF SECTION 099113
SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes surface preparation and the application of paint systems on exterior substrates.

B. Related Requirements:
   1. Section 033000 Cast in Place Concrete
   2. Section 20 0000 General Mechanical Requirements
   3. Section 23 2116 Pipe and Pipe Fittings

1.3 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.
C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
      a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.
1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 METAL PRIMERS

A. Rust-Inhibitive Primer (Water Based): MPI #107.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Benjamin Moore; Acrylic Metal Primer, M04.
      b. Cloverdale Paint: High Performance, EcoLogic Rustex Primer, 703 Series.
      c. Duron CGI; Duron Paints, Dura Clad Universal Acrylic Metal Primer, 33105.
      d. ICI Paints (Canada); Devoe, Devflex, 4020.
      e. Kelly-Moore; DTM Acrylic Metal Primer, 5725.
      f. PPG; Pitt-Tech, Rust Inhibitive Primer (W.B.), 90-712.
      g. Sherwin-Williams; Industrial & Marine, Aquaclad W. B. Alkyd Primer, B55A710.

2.2 LATEX PAINTS

A. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ICI Paints (Canada); Dulux Lifemaster, Interior Acrylic Eggshell, 59311.
      b. Kelly-Moore; Enviro-Cote, Int. Acrylic Satin, 1510.

B. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).
   1. Products: Subject to compliance with requirements, provide one of the following:
      c. Duron CGI; Genesis Odor Free, High-Performance Int. Latex S. G., 3-914.
      d. ICI Paints (Canada); Dulux Lifemaster, Interior Acrylic Semi-Gloss, 59211.
      e. Kelly-Moore; Enviro-Cote, Int. Acrylic Semi-Gloss, 1520.
      f. PPG; Pure Performance, Interior Semi-Gloss Latex, 9-500.
      g. Sherwin-Williams; Harmony, Interior Latex Semi-Gloss, B10W951.

APPLICATION

3.1 INTERIOR PAINTING SCHEDULE

A. Cotton or Canvas Insulation-Covering Substrates: Including pipe and duct coverings.
      a. Prime Coat: Interior latex primer/sealer, MPI #50.
c. Topcoat: Institutional low-odor/VOC interior latex, low sheen, MPI #144, MPI gloss level 2.

B. Steel Substrates:
      h. Prime Coat: Rust-inhibitive primer (water based), MPI #107.
      i. Intermediate Coat: Institutional low-odor/VOC interior latex, MPI #147, matching topcoat.
      j. Topcoat: Institutional low-odor/VOC interior latex, semi-gloss, MPI #147, MPI gloss level 5.

END OF SECTION
SECTION 22 1314 SANITARY WASTE AND STORM DRAINAGE SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION
A. This Section includes materials and methods for sanitary waste and vent, clearwater waste and vent, storm drainage, and overflow storm drainage piping systems within and including piping to 5 ft outside building wall.

1.2 RELATED WORK
A. Section 20 0513 - Motors
B. Section 20 0520 - Excavation and Backfill
C. Section 20 0529 - Mechanical Supporting Devices

1.3 REFERENCE
A. Work under this Section is subject to requirements of Contract Documents including General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

1.4 QUALITY ASSURANCE
A. Order piping with each length marked with manufacturer's name or trademark and type of pipe; with each shipping unit marked with purchase order number, metal or alloy designation, temper, size, and supplier's name.
B. Installed material not meeting specification requirements must be replaced with material that meets these specifications without additional cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Promptly inspect shipments to insure material is undamaged and complies with Specifications.
B. Cover pipe to prevent corrosion or deterioration while allowing sufficient ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends from damage. End caps shall remain in place. Protect fittings by storage inside or by durable, waterproof, above ground packaging.
C. Offsite storage agreements will not relieve Contractor from using proper storage techniques.
D. Storage and protection methods must allow inspection to verify products.

1.6 SUBMITTALS
A. Manufacturer's technical data for the following:
   1. Pipe and fittings
   2. Joints
   3. Cleanouts
   4. Sewage ejectors
   5. Fiberglass sump basins
6. Sump cover
7. Trench Drains

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials herein specified shall be new, unless otherwise noted.

2.2 PIPE, FITTINGS, AND JOINTS

A. Interior Above Ground:
   1. Cast Iron (3” and larger):
      a. Pipe: Hubless cast iron pipe, ASTM A-888, CISPI 301, NSF certified and marked with collective trademark of Cast Iron Soil Pipe Institute or receive prior approval by Engineer
      b. Fittings: Hubless cast iron fittings, ASTM A-888, CISPI 301, NSF certified and marked with collective trademark of Cast Iron Soil Pipe Institute or receive prior approval by Engineer
      c. Joints: Heavyweight couplings with 0.060” thick stainless steel clamps, FM 1680 Class 1, ASTM Standard C-1540 Mission Heavyweight, Husky Series 4000, Ideal Tridon “HD”, or Clamp-All Hi-Torq 125
   2. Copper (3” and smaller):
      a. Pipe: Type L copper tube, ASTM B88
      b. Fittings:
         1). Cast copper drainage fittings (DWV), ANSI B16.23
         2). Wrought copper drainage fittings (DWV), ANSI B16.29
      c. Joints: Lead free (<0.2%) solder, ASTM B32; flux, ASTM B813

2.3 VALVES

A. Pump Discharge Check Valves:
   1. Acceptable Manufacturers: Hammond, Milwaukee, Nibco and Stockham with indicated features and equal to model listed
   2. Size 2” to 4”, Horizontal Installation:
      a. Cast iron body, swing check, bronze disc and ring, brass pin, Class 125, threaded ends, Nibco T-918-B
   3. Size 6” and Larger, Horizontal Installation:
      a. Cast iron body, swing check, cast iron disc with bronze disc face rings or bronze disc, brass pin, Class 125, flanged ends, Nibco F-918-B
   4. Size 2-1/2” and Larger, Vertical Installation:
      a. Cast iron body, swing check, bronze disc to 4” and cast iron disc with bronze disc face rings or bronze disc for 5” and up, lever and spring operator, brass pin, Class 125, flanged ends, Nibco F-918-BLS
   5. Size 4” and smaller:
      a. Acceptable manufacturers: Chemtrol, Ipex, Spears, or approved equal
      b. PVC body, swing check, EPDM seals, flanged ends. Spears 4423-(size)

B. Pump Discharge Isolation Valves:
   1. Ball Valves:
2.4 CLEANOUTS

A. Josam, Mifab, Smith, Wade, Watts or Zurn, equal to number listed in Drains and Cleanout Schedule.

B. Provide recessed, solid brass, cleanout plugs where fittings are used as cleanouts. Provide taper-thread plug with Teflon tape thread wrap.

2.5 TRENCH DRAINS

A. Acceptable Manufacturers: Josam, Mifab, J.R.Smith, Wade, Zurn, or approved equal

B. Presloped Channel: Polymer concrete trench drain system with ductile iron edge rail, 14 inch wide channel brute extra heavy duty polymer concrete channel with ductile iron rails. Secured ductile iron slotted. Provide with no-hub connection. Based of design J.R SMITH 9879

C. Refer to schedule on drawings for drain model.

2.6 SEWAGE EJECTOR: (SE-1)

A. Acceptable pump manufacturers: Weil, Sulzer, Aurora/Hydromatic, Bell and Gossett ITT, Gould, Myers, and Zoeller

B. Acceptable control manufacturers: See Water, SJE-Rhombus, Hydromatic and Zoeller, Weil pump

C. Pumps shall be heavy duty 4” vertical discharge wastewater sewage ejector type constructed with bronze lower sleeve bearings cast iron impeller and S.S. shafts. Pumps shall be provided as a packaged system. Pumps, controls and accessories shall be supplied by one source to maintain consistency and uniformity of the system.

D. Motors shall be NEMA design B, filled with non-toxic dielectric oil. Motors shall meet requirements of Section 20 0513 - Motors.

E. Pump shall be of capacity and motors shall be of electrical service as indicated in equipment schedules on drawings.

F. Pump controls shall include:
   1. Double (one On, one Off) UL Listed float switches
   2. NEMA 1 duplex enclosure indoor alarm panel with warning light, horn, silent switch, test switch and high level float switch, UL Listed
   3. Control panel with HOA switch, pump run light, resettable overload heaters, NEMA 1, enclosure
4. Pump alternator and alarm panel with HOA switch, run light and resettable overload heaters for each pump; warning light; horn; silent switch; test switch; labeled terminal switch and devices; auxiliary dry contacts for remote alarm at the BAS; NEMA 1 enclosure.
5. Class 1, Group D, Division 1 explosion proof rated controls and switches
6. Elapsed run time meters
7. Refer to Section 26 2913 - Enclosed Controllers for starter requirements.

G. Pump accessories shall include:
   1. NEMA 1 junction box
   2. Dual mechanical seals, seal leak detector probe and warning light in control panel
   3. Explosion proof, Class 1, Group D, Division 1 motor
   4. Unions

2.7 SEWAGE EJECTOR (SE-2)
A. Refer to schedule on drawing from manufactures and model numbers.

2.8 FIBERGLASS SUMP BASINS
A. Basin shall be constructed of 70-75% fiberglass and 25-30% polyester resin, ASTM D3753, with no fillers with minimum design safety of four. Basin shall have side hub inlet and vent flange.

B. Basin shall have heavy duty steel pump basin gasketed cover with inspection access plate. Access plate shall have discharge pipe flange for each pump and vent pipe, and hole for control cabling.

C. Basin shall have anti-floatation ring and be encased in minimum of (6") concrete.

D. Minimum wall thickness for basins as follows:

<table>
<thead>
<tr>
<th>Sump Diameter (&quot;&quot;)</th>
<th>24&quot;</th>
<th>30&quot;</th>
<th>36&quot;</th>
<th>42&quot;</th>
<th>48&quot;</th>
<th>60&quot;</th>
<th>72&quot;</th>
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<tr>
<td>Max 10 ft Depth</td>
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<td>5/16&quot;</td>
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<td>3/8&quot;</td>
<td>7/16&quot;</td>
</tr>
<tr>
<td>Max 20 ft Depth</td>
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<td>5/16&quot;</td>
<td>3/8&quot;</td>
<td>3/8&quot;</td>
<td>7/16&quot;</td>
<td>1/2&quot;</td>
<td>1/2&quot;</td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install pipe and fittings in accordance with reference standards, manufacturer's recommendations and recognized industry practices.

B. Connect piping to fixtures, each piece of equipment, and drains. Install required piping as shown on drawings.
C. Grade horizontal lines with minimum of 1/8" per ft, except piping 2" diameter and smaller which shall be run at 1/4" per ft slope.

D. Grade horizontal lines with minimum of 1/4" per ft, except piping 4" diameter and larger which may be run at 1/8" per ft slope with approval of local authority.

E. Install piping parallel with building lines and at heights, which do not obstruct any portion of window, doorway, stairway, or passageway, except, as may be shown on plans. Install overhead piping as high as possible.

F. Grade vent pipe for complete drainage by gravity to soil or waste pipes. Vent terminations shall be set true and level. Locate vent piping at least 10 ft away from window, door or intake openings. Coordinate closely with roofing contractor to prevent damage to roofing membrane. Flashing shall be in accordance with requirements of roofing manufacturer.

G. Where interferences develop, offset or reroute piping as required to clear interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

H. Provide protective sleeve covering of elastomeric pipe insulation, where piping and/or fittings are embedded in masonry or concrete.

I. Maintain piping in clean condition internally during construction.

J. Mitered ells, notched tees, and orange peel reducers are not allowed. Bushings are not allowed on threaded piping.

K. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including required service space for this equipment, unless piping is serving this equipment.

L. Set cleanouts true and level and protect properly throughout construction.

M. Set floor drains true and level and protect properly throughout construction. Weep holes shall be filled with removable material and kept free from concrete and other debris during construction. Weep holes shall be cleaned out for final working order. Provide safing for floor drains installed in elevated slabs.

N. Trap each fixture and piece of equipment requiring sanitary drainage connections. Trap seals shall be standard depth, except when deep seals are required by code. Traps shall be set true and level and located within limits of code requirements. Traps shall not be used as separator, interceptor or other type of device to retain solids. Traps shall be provided with thread type approved cleanout plugs when specified. Protect traps during construction and seal off to prevent stones, debris and other foreign matter from entering before use. Locate running traps for full accessibility with double cleanout.

O. Provide plugs or caps for pipe openings during construction to prevent debris from entering pipe. Temporary plug shall be plastic cap or equivalent.

3.2 COPPER TUBING

A. Copper tubing shall be installed per Copper Development Association guidelines in addition to methods specified herein.

B. Soldered Copper Joints:
1. Use non-acidic and lead free flux on cleaned pipe and fittings for soldered joints.
2. Cut tube square, remove burrs from exterior of tube and ream interior of tube before assembly.
3. Fill joints with solder by capillary action. Solder shall cover joint periphery. Wipe joint clean.
4. Apply heat carefully to prevent damage to pipe, fittings and valves.
5. Follow manufacturer's recommendations when heating valves and equipment for soldered connections.

3.3 CONCRETE SUMP COATING

A. Abrasively clean surfaces to insure proper bonding.
B. Protect surfaces that are not to be coated (pipe opening, drains, etc.).
C. Apply primer coat or first coat as soon after surface preparation as physically possible. This first application must be done to steel surfaces before flash rusting can occur. If flash rusting occurs, do not continue with coating until flash rust has been removed.
D. Do not apply finishes to surfaces that are not dry.
E. Apply each coat to uniform finish.
F. Allow applied coat to dry before next coat is applied.
G. Re-coat within 24 h of previous coating. If more than 24 h passes between coats Manufacturer and/or Owner may direct Contractor to roughen last coat to insure proper bonding. If this happens cost of this roughening and cost of additional coating, plus labor associated with this work will be considered to be sole responsibility of Contractor.
H. Ensure wetted surfaces of hatch covers, sealing surface and openings are properly coated.

3.4.3 TESTING

A. Refer to Testing paragraph of Section 20 0000 - General Mechanical Requirements.
B. Water test may be applied to system either in its entirety or in sections. Piping shall be tightly plugged and submitted to 10 ft head of water located at highest point. Provide separate standpipe above highest point being tested or extend system to obtain required 10 ft head of water. Head shall be maintained for at least 30 minutes before inspection starts.
C. Defective work or material shall be replaced or repaired as necessary and inspection and test repeated. Repairs shall be made with new materials. No caulking of threaded joints or holes will be allowed.
D. Do not backfill pipe until successfully tested.
E. Testing with air will not be allowed.

END OF SECTION
SECTION 23 2116 PIPE AND PIPE FITTINGS

PART 1 - GENERAL

1.1 RELATED WORK

A. Section 20 0529 - Mechanical Supporting Devices
B. Section 23 0594 - Water Systems Test Adjust Balance
C. Section 23 0901A - Control Systems
D. Section 23 2118 - Valves
E. Section 23 2120 - Piping Specialties

1.2 REFERENCE

A. Work under this Section is subject to requirements of Contract Documents including General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

1.3 DESCRIPTION

A. This Section includes pipe and pipe fitting specifications and installation requirements for heating and cooling systems.
B. Specification of an item in this or any other sections shall not relieve Contractor from providing all items, articles, materials, operations, methods, labor, equipment and incidentals necessary for a complete and functional system.
C. Use only new material, free of defects, rust and scale, and guarantee for services intended.
D. Use material meeting the latest revision of ASTM specifications as listed in this specification.
E. Follow local codes if they require other types of pipe or joints.
F. Use only long radius elbows having centerline radius of 1.5 pipe diameters unless otherwise indicated.
G. Manufacturer, pressure class, size and heat code of each fitting and flange shall be permanently identified on its body in accordance with MSS SP-25.
H. Where size for a pipe segment is not indicated, the pipe segment size shall be equal to the largest pipe segment to which it is connected. Transition to smaller size shall occur on the side of fitting where smaller size is indicated.
I. Unless otherwise indicated, fittings and accessories connected to pipe shall be of the same material as the pipe.
J. Unless otherwise indicated, construct piping for highest pressures and temperatures in respective system in accordance with the latest revision of the applicable Sections of ASME Code for pressure piping, ASME B31 including the following:
   1. B31.9 .......................Building Services Piping
2. B31.1 .................. Power Piping
3. B31.3 .................. Process Piping

K. Boiler external piping shall comply with the latest revision of Section 1 of ASME Boiler and Pressure Vessel Code. This Contractor shall be responsible for materials, installation, testing and certification in accordance with the Code.

1.4 SUBMITTALS

A. Shop Drawings for each piping system for all pipe sizes including, but not limited to, the following:
   1. Name of system
   2. Pipe; ASTM number, grade if known, type, wall thickness, material
   3. Fittings; ASME number, grade if known, class, type, wall thickness, material
   4. Joint type
   5. Flanges; ASTM number, grade, class, type, material
   6. Bolts and nuts; material
   7. Thread joint sealants; material
   8. Flange gaskets; material, rating
   9. Unions; ASTM number, type, material, rating
   10. Type of welding
   11. Welding Quality Control Program
   12. Test pressure and media
   13. Pipe flushing/cleaning plan
   14. Pipe cleaning method
   15. All other appropriate data

B. Submit pipe certification as specified under Pipe Certification in this Section.

C. Submit required documents as specified under Pipe Welding in this Section.

D. Provide Flushing and Cleaning Plan:
   1. Submit pipe flushing/cleaning plan for water, fluid, steam and condensate systems for approval. Plan shall detail methods for compliance with requirements of this section, including:
      a. Flushing and cleaning procedure narratives.
      b. Size, power source, and connection points of contractor provided pumps that will be used for flushing and cleaning.
      c. If Contractor proposes to utilized project system pumps, method of protecting pumps from damage and developing required velocity of section of piping to be flushed.
      d. Method of sectionalizing piping to obtain required velocity.
      e. Minimum velocities at each section of pipe, clearly indicating any sections where 6 fps cannot be achieved.
      f. Location and means of temporary bypasses for coils, control valves and other equipment.
      g. Flushing schedule and drawings or diagrams that will be used for inspection and sign off prior to and after procedure, at Owner’s option.
   2. Submit documents showing verification of flushing/cleaning following specified requirements and results.
1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Furnish pipe with plastic end-caps/plugs on each end of pipe. Maintain end-caps/plugs through shipping, storage and handling to prevent pipe-end damage and eliminate dirt and construction debris from accumulating inside of pipe.

B. Where possible, store materials inside and protect from weather. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

C. Before shipping, all carbon steel piping shall be free of rust and scale, and furnished with plastic end caps/plugs on each end of pipe.

1.6 PIPE WELDING

A. Procedure and Welding Qualification Records:
   1. Submit Welding Procedure Specifications (WPSs) and their supporting Procedure Qualification Records (PQRs) to be used on the work to Engineer for review and approval prior to performing any welding. These documents shall meet requirements of ASME B31.1 and B31.9, as applicable.
   2. Unless otherwise indicated, welding shall be done using only the following processes:
      a. Shielded Metal Arc Welding (SMAW), also known as "stick" welding
      b. Gas Tungsten Arc Welding (GTAW), also known as TIG and Heliarc welding
      c. Gas Metal Arc Welding (GMAW), also known as MIG welding
      d. Flux-Cored Arc Welding (FCAW), a variation of GMAW
      e. Submerged Arc Welding (SAW)
      3. Root pass must be applied by only GTAW process with argon gas purge for stainless steel pipe.
      4. Unless otherwise stated, fabrication, installation, inspection, examination and testing shall be in accordance with ASME B31.1 or B31.9, as applicable.
      5. Backing rings (chill rings) or consumable inserts are not allowed, unless specifically requested by Owner or Engineer.

B. Quality Control Program:
   1. Submit written quality control program for review and approval prior to implementing any welding on this project. Quality control program shall include the following as minimum:
      a. Explanation of how Contractor will assure proper fitup for each weld.
      b. Explanation of how Contractor will document welds performed by individual welding operators for systems under ASME B31.1.
      c. Explanation of how Contractor will assure that proper welding procedure is being followed.
      d. Credentials of personnel responsible for required weld examinations.

C. Weld Inspection and Examination:
   1. Provide examination services for all welding for this Project. Examination shall be in accordance with requirements of ASME B31.1, Table 136.4 or B31.9, as applicable.
   2. Periodically, as welding progresses, submit report, signed by weld examiner, indicating status of project welding quality.
   3. Arrange with Owner's Inspector for observation of fitup and welding methods prior to implementing any welds, including shop welds, on this Project.
4. In addition, Owner's Inspector will perform any additional observations deemed necessary before, during, or after fabrication to assure, to Owner's satisfaction, that proper welding is provided. Owner reserves the right to perform independent examination of welds. If Owner has any concern as a result of such examination Owner reserves the right to stop in progress welding work, without any cost to Owner, until resolution satisfactory to Owner is reached.

5. In addition, any steam or condensate weld that is unable to be tested by means of hydro-testing, shall be inspected and tested by non-destructive examination.
   a. All tests shall be performed by an AWS-CWI (American Welding Society Certified Welding Inspector). The firm providing these services shall be agreed upon by the Owner and the Engineer.
   b. Butt welds shall be tested by means of radiography. The criterion for pass/fail of this test will be as defined in the latest edition of the ASME B31.1 Power Piping code.
   c. Socket weld connections shall be tested by means of dye penetrate or magnetic particle analysis. The criterion for pass/fail of this test will be as defined in the latest edition of the ASME B31.1 Power Piping code.
      1. The Owner reserves the right to test using non-destructive means (radiographic inspection) any weld made by the contractor.
      2. Any failure of a weld in a segment constitutes inspection of all welds in that segment at the contractor's expense.
      3. The firm providing the testing services shall determine prior to pipe joint fit up if the area of radiography exposure is:
         a. Completely inside the construction fence.
         b. Beyond the construction fence and not impacting adjacent buildings.
         c. Beyond the construction fence and impacting adjacent buildings.
         d. If the area of radiography exposure is determined to impact areas outside of the construction fence, contact the Owner for coordination of signage, barricades and monitoring.
            1. All initial testing will be funded by the owner through the project testing funds.
            2. All repairs, and re-examination of repaired welds will be at the contractor's expense.

D. Welder Qualifications:
   1. Each welder and welding operator must qualify by passing required procedure test before performing any project welds. Submit copy of Manufacturer's Record of Welder or Welding Operator Qualification Tests (WPQS) as required by Section IX of ASME Boiler and Pressure Vessel Code for all welding procedures to be performed by welding operator.
   2. Welder qualifications must be current. If qualification test is more than 6 months old, provide record of welding continuity for each welder.
   3. Record of welding continuity is intended to show that welder has performed welding at least every 6 months since the date that welder qualification test was passed for the submitted welding procedure specification.
   4. Record of welding continuity shall include, at minimum, the following:
      a. Welder's employer name and address
      b. Date Welder Qualification Test was passed
      c. Dates indicating welding continuity
   5. Welders shall be qualified as required by ASME B31.1 or B31.9, as applicable. In addition, there shall be an independent witness of welder tests. That witness
shall be representative of independent testing laboratory, Authorized (Code) Inspector, Owner's or Engineer's Inspector or consultant approved by National Certified Pipe Welding Bureau.

6. Welder qualifications must cover all pipe sizes and wall thickness used on this project. Test segments or coupons shall be appropriately selected for qualification. Test position shall be arranged in "6G position."

E. Weld Record:

1. For welding within the scope of ASME B31.1 Power Piping, submit to Engineer for approval an administrative procedure for recording, locating, monitoring and maintaining quality of welds to be performed on the project. This quality control document record shall include but not be limited to:
   a. Drawings and schedules identifying location of each weld by individual number, identification of welder who performed each weld by individual welder's name, stamp number, date, and WPS used.

1.7 PIPE CERTIFICATION

A. Certification is required for all pipe within scope of ASME B31.1. Submit certification papers, as outlined below, within 30 days of delivery of pipe to project site.

B. Type E or S Pipe:

1. Furnish manufacturer's mill certificates (material test report) including dimensions, heat numbers, chemical analysis and tensile test results for pipe shipped to project site.

PART 2 - PRODUCTS

2.1 CHILLED WATER

A. 2-1/2" and Smaller:

1. Pipe: ASTM B88 seamless, Type L, hard temper copper tube.
3. Joint: ASTM B32, lead free solder, Bridgit, Silvabrite, Silverflow or Canfield
4. Unions: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper solder joint, Class 250. No unions to be used for lines sizes 3/4" and smaller. Unions shall be used for line sizes over 1".
5. Use solder joints for valves and piping specialties in copper piping.

B. 3" through 4":

1. Pipe: ASTM B88 seamless, Type L, hard temper copper tube.
3. Joint: ASTM B32, lead free solder, Bridgit, Silvabrite, Silverflow or Canfield.
4. Flanges: 150 lb. bronze solder flanges. Flanges shall still be rated for 250 psig Working pressure (cold water) and 250 psig bubble-tight shutoff, with 150 class weld companion flanges
5. Unions: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper solder joint, Class 300. No unions to be used for lines sizes 3/4" and smaller. Unions shall be used for line sizes over 1"

C. 6" and Larger: 
3. Flanges: Class 300. Refer to Unions and Flanges in this Section. Weld flanges for chilled water piping can be 150# (class) on Chilled water piping 20" and smaller. Flanges shall still be rated for 250 psig Working pressure (cold water) and 250 psig bubble-tight shutoff, with 150 class weld companion flanges.

2.2 CONDENSER WATER

A. 2" and Smaller:
1. Pipe: ASTM A53, Grade B, Type E or ASTM A106, Grade B, standard weight, carbon steel
2. Fittings: ASME B16.4, Class 125, cast iron, threaded or ASME B16.3, Class 150, malleable iron, threaded
3. Unions: ASME B16.29, malleable iron, Class 250. Refer to Unions and Flanges in this Section

B. 2-1/2" and Larger:
1. Pipe: ASTM A53, Grade B, Type E or S, Schedule Standard, black steel
2. Fittings: 150 lb. welded.
3. Flanges: 150 lb. or 300 lb. flanges as required. Refer to Unions and Flanges in this Section

2.3 LOW PRESSURE STEAM AND CONDENSATE SYSTEM (15 PSIG THRU 150)

A. 2" and Smaller:
1. Pipe: Schedule 40 for steam and Schedule 80 for condensate, seamless steel, black; ASTM A106, Grade B, or A53 Grade B, ERW.
2. Joints: Threaded with seam weld, except use threaded for instruments
3. Fittings: 300 lb malleable iron threaded with seam weld, except use threaded for instruments, 3000 psi; ASTM A105.
4. Unions: Malleable iron, threaded, steel to steel seat, ground joint, 3000 psi; ASTM A105, ANSI B16.11.

B. 2-1/2" and Larger:
1. Pipe: Schedule 40 for steam and Schedule 80 for condensate, seamless steel, black; ASTM A106, Grade B, or A53 Grade B, ERW.
3. Fittings: Steel, Schedule 80, butt-welded, beveled end, long radius elbow; ASTM A234, ANSI B16.9.
4. Flanges: Refer to Flanges in this Section

2.4 BOILER BLOW DOWN AND EQUIPMENT DRAIN

A. 2" and Smaller:
1. Pipe: ASTM A106, Grade B, extra strong, carbon steel
2. Fittings: ASTM A105 Grade II/ASME B16.11, 3000 lb forged steel, threaded
3. Unions: Forged steel, 3000 lb, threaded. Refer to Unions and Flanges in this Section

B. 2-1/2" and Larger:
1. Pipe: ASTM A53, Grade B, Type E or S, extra strong, carbon steel
2. Fittings: ASTM A234 Grade WPB/ASME B16.9, extra strong, seamless, carbon steel weld
3. Flanges: Class 300. Refer to Unions and Flanges in this Section
2.5 INSTRUMENT TUBING

A. Copper:
   1. Pipe: Copper tube, Type L, hard drawn, ASTM B88
   2. Fittings: Brass, compression fittings

2.6 VENTS AND RELIEF VALVES

A. Unless otherwise indicated, use pipe and pipe fittings as indicated for the system to which relief valve or vent is connected.

B. Use ASTM B88 Type K hard drawn copper tube, cleaned and capped in accordance with ASTM B280, and marked “ACR” with ANSI B16.22 wrought copper or forged brass solder-type fittings for refrigerant vent piping.

2.7 PRESSURE GAUGES AND TAPPINGS

A. Use pipe and pipe fittings as indicated for the system to which pressure gauge or tapping is connected. Use "Threadolets", "Sockolets" or tee fittings for tappings. Refer to Part 3 under General for use of "Threadolets" and "Sockolets".

B. Gauge pipe shall be 1/4" unless otherwise indicated.

C. Gauge pipe shall be 1/2" for high pressure steam (101 psig and over) systems.

2.8 COOLING COIL CONDENSATE DRAIN

A. All sizes:
   1. Pipe: DWV copper.
   2. Fittings: Wrought copper fittings.
   3. Joint: ASTM B32, lead free solder, Bridgit, Silvabrite, Silverflow or Canfield.

2.9 DIELECTRIC UNIONS, FLANGES AND FITTINGS (STEEL PIPE TO COPPER PIPE)

A. 2" and Smaller:
   1. Use bronze ball valves specified in Section 23 2118 for dielectric purpose.
   2. Dielectric fittings similar to Victaulic Style 647 or Clearflow Dielectric Waterway fittings may be used in lieu of dielectric unions for pipe sizes 2" and smaller.
      a. Clearflow fittings shall be ASTM A53 electro zinc-plated steel pipe with high temperature polyolefin polymer liner, suitable for continuous use at temperatures up to 230°F and pressures up to 300 psig.
      3. ASTM A197/ASME B16, equal to Stockham Figure 693-1/2, Watts Series 3000 or Wilkins (Zurn) Model DU series dielectric unions with EPDM dielectric gasket, 250 psi at 180°F.

B. 2-1/2" through 4":
   1. Watts dielectric flange fittings Series LF 3100/LF 3110 with dielectric gasket, 175 psi at 180°F.
   2. Dielectric fittings similar to Victaulic Style 647 or Clearflow Dielectric Waterway fittings may be used in lieu of dielectric unions for pipe sizes 2-1/2" and larger.
      a. Clearflow fittings shall be ASTM A53 electro zinc-plated steel pipe with high temperature polyolefin polymer liner, suitable for continuous use at temperatures up to 230°F and pressures up to 300 psig.
2.10 DIELECTRIC UNIONS, FLANGES AND FITTINGS (STEEL TO STEEL PIPE)

A. 1" and Smaller: Similar to Epco model HA-B with dielectric gasket, 250 psi at 210°F

B. 1-1/2" and Larger: Similar to Epco model W with bolt insulators, dielectric gasket, bolts and nuts, 175 psi at 210°F). Pikotek model VSC dielectric gasket with viton sealing element, G-10 sleeve and double washers, suitable to 350°F, may be used with specified flanges.

2.11 UNIONS AND FLANGES

A. Unions:

1. 2" and Smaller: Malleable iron, ASME B16.39 with ground joint, bronze or brass to iron. Provide black malleable iron for carbon steel piping and galvanized malleable iron for galvanized steel piping. Unless otherwise specified, pressure class and joint type of union shall be equal to that specified for fittings of respective piping service. Minimum pressure class of unions shall be Class 250.

2. 2" and Smaller: Forged steel, ASTM A105 Grade 2, ASME B16.11, 300 lb WOG with steel to steel seats. Joint type shall match that specified for fittings of respective piping service.

B. Flanges:

1. 2-1/2" and Larger: ASTM A105, ASME B16.5, hot forged steel, welding neck pattern. Slip-on pattern are not allowed. Bore dimension of welding neck flange shall match inside diameter of connected pipe.

2. Use raised face flanges for mating with other raised face flanges with self-centering flat ring gaskets. Use flat face flanges for mating with other flat face flanges with full face gaskets.

3. Flange pressure class indicated in respective piping service is minimum required. Mating flange pressure class shall match pressure class of connected device, such as valves and piping specialties.

C. Flange Gaskets:

1. General - Gasket material shall be asbestos free and suitable for pressures, temperatures and fluid of respective piping system. Non-metallic gaskets shall be in accordance with ASME B16.21 and ASTM F104.

2. Service Temperature (through 249°F) – Garlock, Klingersil or J.M. Clipper, similar to Garlock 5500. Gaskets similar to Garlock Style 3000 may be used for hydronic piping. Unless otherwise indicated or recommended by manufacturer, gaskets shall be compressed inorganic fiber with nitrile binder 1/16" thick for flanges 12" and smaller and 1/8" thick for flanges 14" and larger.

3. Service Temperature (250°F thru 800°F) - Flexitallic, Garlock, Lamos equal to Flexitallic Style CG, flexible graphite filler, 304 SS winding, carbon steel centering ring, 0.175" thickness.

4. Service Temperature (801°F thru 1500°F) - Flexitallic, Garlock, Lamos equal to Flexitallic Style CG, flexible graphite filler, 316 SS winding, carbon steel centering ring, 0.175" thickness.

5. Service Temperature (1501°F thru 1700°F) - Flexitallic, Garlock, Lamos equal to Flexitallic Style CG, flexible graphite filler, Inconel 600 winding, 316 SS centering ring, 0.175" thickness.

D. Bolting:

1. Bolts, bolt studs, nuts and washers shall have zinc plated finish.
2. Thread shall be in accordance with ASME B1.1, Class 2A tolerance for external threads and Class 2B tolerance for internal threads. Threads shall be coarse-thread series except that alloy steel bolting 1/8” and larger in diameter shall be 8 pitch thread series.

3. Threaded rods are not allowed as fastening elements.

4. For Class 150 and Class 300 flanges not exceeding 400°F temperature, use carbon steel bolts or stud bolts conforming to ASTM A307, Grade B with nuts conforming to ASTM A194.
   a. Bolts conforming to ASTM A307, Grade A may be used for piping governed by ASME B31.9.
   b. For Class 400 and 600 flanges at 750°F or lower temperature, use alloy steel bolts or stud bolts conforming to ASTM A193, Grade B7 or B16, with nuts conforming to ASTM A194, Grade 2H.
   c. For Class 300 flanges above 400ºF design temperature (HPS, CPD, HPC), use alloy steel bolts or stud bolts conforming to ASTM A193, Grade B7 or B16, with nuts conforming to ASTM A194, Grade 2H.

2.12 THREADED JOINT SEALANTS
   A. Paste type for brush application or cord type. Products shall be non-toxic, chemically inert, non-hardening, rated for -50°F to 400°F and up to 10,000 psi (liquids) and 3000 psi (gases), certified by UL, CSA, and NSF.
   B. Use sealant similar to Loctite Model 54531 for piping handling oil or petroleum products.

2.13 WELD BRANCH OUTLET FITTINGS (WELDOLETS, THREADOLETS AND SOCKOLETS)
   A. Weld branch outlet fittings shall conform to MSS-SP-97, ASME B16.9 for weldolets, ASME B1.20.1 for threadolets and ASME B16.11 for sockolets.
   B. Materials shall match material of header piping and wall thickness of outlet or branch end shall match wall thickness of branch pipe.

PART 3 - EXECUTION

3.1 GENERAL
   A. Remove foreign materials before erection. Ream ends of piping to remove burrs.
   B. Install piping parallel to building walls and ceilings and at such heights so as not to obstruct any portion of window, doorway, stairway, or passageway. Install piping to allow adequate service space for equipment. Refer to drawings and/or manufacturer's recommendations. Install vertical piping plumb. Where interferences develop in field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings or other architectural details before installing piping.
   C. Piping shall be full weight and of sizes shown on the drawings. Ends of piping shall be reamed, and where applicable, all threads shall be sharp and true.
   D. Provide anchors, expansion joints, swing joints and expansion loops so that piping may expand and contract without damage to itself, equipment or building.
E. Mitered elbows, welded branch connections, notched tees and "orange peel" reducers are not allowed. Unless specifically indicated, reducing flanges and reducing bushings are not allowed. Reducing bushings may be used for air vents and instrumentation connections.

F. Unless otherwise indicated, use fittings as specified in Part 2 of this Section for elbows, tees, reducers, etc.

G. "Weldolets" with outlet size 2-1/2" and larger and "Threadolets" or "Sockolets" with outlet size 2" and smaller may be used for branch connections up to one pipe size smaller than main. Use "Threadolets" where threaded fittings are specified and use "Sockolets" where socket weld fittings are specified. Install in accordance with PFI (Pipe Fabrication Institute) Standard ES49.

H. Install drains throughout systems to permit complete drainage of entire system.

I. Do not install piping over electrical panelboards, switchgear, switchboards or motor control centers.

J. Install valves, control valves and piping specialties, including items furnished by others, as specified and/or detailed.

K. Make connections to all equipment installed by others where that equipment requires piping services indicated in this Section.

L. For piping within the scope of ASME B31.1 Power Piping, transfer piping material specification and "Heat Number" to each segment of pipe prior to cutting.

3.2 THREADED PIPE JOINTS

A. Threads of pipe and fittings shall conform to ASME B1.20.1.

B. Ream pipe ends after cutting and clean before erection. Apply thread sealants to cleaned male threads. Assemble joint to appropriate depth and remove any excess pipe joint compound from tightened joint.

3.3 FLANGED JOINTS

A. Clean flange surfaces and align them parallel. Bolt holes of gaskets shall be cut slightly larger than bolt diameter. Gasket ID shall be slightly larger than flange ID.

B. Position gasket concentrically so compression is equally distributed over entire gasket surface.

C. Lubricate bolts and run nuts down by hand.

D. By using torque wrench, tighten nuts in the proper sequence so gasket is compressed evenly, and to the appropriate torque specified by bolt manufacturer.

E. Re-torque bolts 12 to 24 h after start up.

3.4 WELDED PIPE JOINTS

A. Inspect pipe and pipe fittings for roundness before they are fit-up or set in place.

B. Properly clean and prepare pipe base material before fit-up. Verify joint land and bevel.

C. Preheat pipe base material as required by welding procedure specification. Temperature of pipe material must be minimum of 32°F before welding.
D. Properly align and adjust joint as required by welding procedure and thickness of material. Verify tolerances after tacking sequence.

E. Use weld material diameter as procedurally required for type and thickness of work being done.

F. Use sufficient argon pre-purge and argon post-purge for GTAW processes. Post purge should be until weld is no longer glowing plus 5 seconds. Maintain purge for at least 2 layers of weld material.

G. Properly store welding materials.

H. Clean tacks before welding out. Remove slag after each pass by grinding to avoid slag inclusion.

I. Weld reinforcement shall not exceed limits established in Chapter V of ASME B31.1.

J. Brush each weld free of rust and paint with rust resistant product that matches piping surface color.

K. For piping within scope of ASME B31.1, each weld shall be permanently marked by welder performing weld. Each welder shall sign and date field welding log record for all welds performed by welder as indicated in Part 1.

L. Conduct radiographic test for sections or joints that cannot be tested by hydrostatic test methods (such as joints cut into existing piping systems) by qualified radiographic testing firm.

3.5 COPPER PIPE JOINTS

A. Cutting of tubing shall not make tubing out of round. Ream cut tube ends to full inside diameter.

B. Remove slivers and burrs remaining from tube cut by reaming and filing both pipe surfaces. Clean fitting and tube with emery or sand cloth. Remove residue from cleaning operation, apply flux and assemble joint. Use solder or brazing to secure joint as specified for specific piping service.

3.6 STEAM AND STEAM CONDENSATE

A. Pitch steam mains down at 1" per 40 ft in direction of flow. Pitch runouts to terminal equipment and control valves at 1/2" per 1 ft for proper condensate drainage. Install drip traps at each rise and at horizontal termination of each steam main.

B. Pitch steam condensate lines down at 1" per 20 ft in direction of flow.

C. Unless otherwise indicated, use eccentric fittings for changes in horizontal pipe sizes with fittings installed for proper condensate drainage (bottom of pipe straight). Concentric fittings may be used for changes in vertical pipe sizes.

D. For steam branch connections and runouts, use top or top 45° connection to main.

E. For condensate branch connections to condensate mains, use top or top 45° connection to main.

F. For condensate connections from steam mains, use bottom connection to main.

G. Install minimum of 3 elbows in each pipe runout to terminal equipment to provide flexibility for expansion and contraction of piping system.

H. Any location on a steam line that holds water shall have a properly installed dirt leg and steam trap.
3.7 WATER SYSTEMS

A. Unless otherwise indicated, install horizontal piping level. Install manual air vents at all high points where air may collect. If vent is not in accessible location, extend air vent piping to nearest code acceptable drain location with vent valve located at nearest accessible location to pipe.

B. Main branches and runouts to terminal equipment may be made at top, top 45°, side or bottom 45° of main provided that there are drain valves suitably located for complete system drainage and manual air vents are located as described above.

C. Unless otherwise indicated, use top or top 45° connection to main for upfeed risers, and use side or bottom 45° connection to main for downfeed risers. Bottom connection is not allowed.

D. Use minimum of 3 elbows in each pipeline to terminal equipment to provide flexibility for expansion and contraction of piping systems. Offset pipe connections at equipment to allow for service, such as removal of terminal device.

E. Unless otherwise indicated, use concentric fittings for changes in pipe sizes and for valves smaller than pipe sizes.

F. Notch and dimple branch tubes. Braze joints. Apply heat properly so that pipe and tee do not distort. Remove distorted connections.

G. Where mechanically formed tee fittings are allowed, form mechanically extracted collars in continuous operation, consisting of drilling pilot hole and drawing out tube surface to form collar having height of not less than 3 times thickness of tube wall. Collaring device to be adjustable.

3.8 VENTS AND RELIEF VALVES

A. Install vent and relief valve discharge lines as indicated on drawings, as detailed, and as specified for each specific valve or piping specialty item.

3.9 INSTRUMENT AIR PIPING

A. Install exposed piping and conduit parallel to or at right angles to building structure and support adequately at uniform intervals. Use only tool made bends.

B. Make tests on sectional piping during progress of installation to ensure no leakage.

C. Test entire piping system by placing it under 100 psi pressure for 24 hours. Trend log pressure during test and submit test results with operating and maintenance submittal. Pressure drop during this period shall not exceed 3 psi.

D. Piping type shall be as follows:
   1. Exposed or Exterior:
      a. Use hard copper tubing.
      b. Use lengths of soft copper tubing formed in minimum 6-inch diameter 360 degree loops for vibration and expansion at connections to instruments, devices, and actuators.
   2. Where specifically indicated on the design documents:
      a. Use Stainless Steel Tubing
3.10 DIELECTRIC UNIONS AND FITTINGS

A. Install dielectric unions, flanges or fittings in main and branch piping of water systems at each point where copper to steel pipe connection occurs. Dielectric unions or fittings shall not be used at terminal device connections.

B. Concealed dielectric unions and fittings are not allowed.

C. Install steel to steel pipe dielectric unions or flanges in chilled water, steam and steam condensate piping at each point where interior steel piping is connected to exterior underground steel piping.

3.11 UNIONS AND FLANGES

A. Install union or flange at each automatic control valve and at each piping specialty or piece of equipment that requires tube pull or removal for maintenance, repair or replacement. If required, provide additional unions or flanges in order to facilitate removal of piping sections that interfere with tube pulls or equipment removal. Where valve is located at piece of equipment, provide flange or union connection on equipment side of valve.

B. Concealed unions or flanges are not allowed.

3.12 PIPING SYSTEM PRESSURE TESTS

A. Owner and/or Owner’s representative may elect to witness pressure test. Notify Owner and/or Owner’s representative at least 3 days in advance.

B. Conduct pressure test prior to flushing and cleaning of piping systems.

C. Conduct hydrostatic (HYDRO) test in accordance with ASME B31.1 137.4. Test pressure shall be in accordance with ASME B31.1, but shall not be lower than the minimum test pressure listed below.

D. If leaks are found, repair with new materials and repeat test until leaks are eliminated. Caulking will not be acceptable.

E. Pressure tests may be made of isolated portions of piping systems to facilitate general progress of installation. Any revisions made in piping systems require retesting of affected portions of piping systems.

F. No systems shall be insulated until it has been successfully tested. If required for additional pressure load under test, provide temporary restraints at expansion joints or isolate them during test. Unless otherwise noted, minimum test time shall be 4 h plus such additional time as may be necessary to conduct examination for leakage.

G. No pressure drop shall occur during test period. Any pressure drop during test period indicates leakage.

H. Provide pumps, gauges, instruments, test equipment, temporary piping and personnel required for tests and provide removal of test equipment and draining of pipes after tests have been made.

I. For hydrostatic tests, remove air from piping being tested by means of air vents. Measure and record test pressure at high point in system. Where test pressure at high point in system causes excessive pressure at low point in system due to static head, portions of piping system may be isolated and tested separately to avoid undue pressure. However, every portion of piping system must be tested at the specified minimum test pressure.
J. Conduct pressure tests with parameters indicated below:

<table>
<thead>
<tr>
<th>System</th>
<th>Minimum Test Pressure</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steam and condensate</td>
<td>450 psig</td>
<td>HYDRO</td>
</tr>
<tr>
<td>Heating hot water</td>
<td>100 psig</td>
<td>HYDRO</td>
</tr>
<tr>
<td>Chilled water</td>
<td>250 psig</td>
<td>HYDRO</td>
</tr>
<tr>
<td>Condenser water</td>
<td>175 psig</td>
<td>HYDRO</td>
</tr>
<tr>
<td>Low pressure steam, condensate and</td>
<td>225 psig</td>
<td>HYDRO</td>
</tr>
<tr>
<td>blowdown piping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic cold water and softened water</td>
<td>100 psig</td>
<td>HYDRO</td>
</tr>
</tbody>
</table>

K. Contractor shall provide all pumps, gauges, instruments; test equipment, flow meters, temporary piping and personnel required for tests and provide removal of test equipment and draining of pipes after tests have been made.

L. If piping system is drained after testing and left empty or untreated for more than 3 days, add Nalco 2572 at recommended dosages for dry system lay-up.

3.13 FLUSHING AND CLEANING PIPING SYSTEMS

A. Notify Owner and/or Owner’s representative at least 7 days in advance.

B. Flush new water, fluid, steam and condensate systems thoroughly for 15 minutes or longer, as required to ensure removal of dirt and foreign matter from piping system. Bypass pumps and equipment and remove strainers from strainer bodies. Provide circulation by Contractor-supplied portable pumping apparatus.

C. Provide temporary piping or hose to bypass coils, control valves, heat exchangers, other factory-cleaned equipment, and any component that may be damaged.

D. Sectionalize system to obtain minimum velocity of 6 fps. Provide temporary piping to connect dead-end supply and return headers as necessary. Flush bottoms of risers.

E. For pipes 18” and larger, maintain velocity as close as 6 fps possible, but not below 5 fps.

F. After initial flushing of system, use portable pumping apparatus to circulate cold water detergent for water systems. Refer to Section 23 2514 - Chemical Treatment Systems for pipe cleaning.

G. After initial flushing of system, use portable pumping apparatus for continuous 24 h minimum circulation of cold water detergent similar to Nalco 2567 cleaner. Flush detergent clear with continuous draining and raw water fill for additional 12 h or until all cleaner is removed from system. Replace strainers and reconnect permanent pumping apparatus and all apparatus bypassed.

H. Refer to Section 23 2514 - Chemical Treatment Systems for water analysis.

I. Use oil when flushing hydraulic piping.
J. Flush gas piping with clean, dry compressed air for one (1) h minimum. Open and clean drip legs. Repeat flushing until no debris is found in drip legs.

K. Steam Systems:

1. All steam piping in the distribution system shall be cleaned prior to its connection to the University’s district heating system.
   a. The steam and condensate piping shall be cleaned by means of steam blow only.
   2. The contractor shall coordinate with UK Physical Plant to conduct steam blow.
   3. All in-line instruments and devices shall be removed prior to the flushing and steam blowing, and replaced with spool pieces if necessary. After the completion of the cleaning, the Contractor shall reinstall all instruments.
   4. All permanent piping shall have passed its hydrostatic test and be flushed with water to remove loose debris prior to any steam blow.
   5. All steam and condensate lines shall be blown three separate times with cool down periods between each blow to cause thermal cycling of the piping. This is to facilitate the release of welding slag and other bonded debris.
   6. During the final blow for each pipe, the process shall generate not less than 250 feet per second of steam flow velocity in all sections of the permanent piping, and maintain this velocity for period not less than one hour. The blow shall continue until the piping is deemed clean enough to connect to the University’s district heating system by the designated UK Physical Plant representative.
   7. The steam blow shall be witnessed by mechanical design engineer of record, or their designated representatives.
   8. The steam blow shall not be conducted when the ambient air temperature is less than 50 degrees F. Any such event shall be scheduled with UK Physical Plant personnel. The scheduling of such events will be dependent on campus load, and steam availability, and outages required. UK Physical Plant has final authority on the scheduling of all such events.
   9. The steam blow shall minimize stress to the system components cause by excessive temperature and/or pressure changes.
   10. The arrangement of the temporary piping shall be designed in accordance with ASME B31.1. The piping arrangement and steam blow shall not cause the stress levels in any permanent or temporary piping component to exceed the allowable levels listed in ASME B31.1.
   11. Any low points created as a result of the temporary piping arrangement shall have manual drains installed for proper drainage during the blow. If the drains are installed in permanent piping they shall be installed in accordance with the piping standards for this project. If they are temporary to be removed after the steam blow, they may be of suitable temporary construction, such as threaded brass or bronze valves.
   12. The exhaust end of the line(s) being blow shall be muffled and/or quenched as required to maintain 85 dBA or less at a distance of 50 feet from the steam discharge point. In all cases the blow(s) shall adhere to the Town of Lexington and University noise ordinance.
   13. Steam discharge shall not produce shock waves or air born particulate which could settle on parked cars, people, buildings, etc. This includes small material which may soil clothing, buildings, cars, etc.
   14. Modifications to any permanent fixtures or systems to accommodate the steam blow shall be repaired and or replaced at the completion of the event to the satisfaction of the University and the designer of record.
15. The contractor shall provide barricades, warning tapes, and signage as necessary to secure the immediate area during the steam blow.

16. The Contractor shall provide all necessary temporary piping, valves, mufflers, etc. needed to accomplish the steam blow(s) safely and within the guidelines of this specification.

3.14 FLUSHING AND CLEANING CHILLED WATER PIPING SYSTEM

A. Contractor shall visually inspect internal portion of each length of pipe during installation. Remove all dirt and foreign matter prior to installing additional lengths. After each major section of piping has been installed, it shall be cleaned and flushed utilizing a high pressure water “hydro-jet” process. The hydro-jet process involves passing a high pressure, high volume spray type cleaning head through the piping. The head is inserted in each section of piping and activated with full water pressure and flow. Through hydraulic force from directional spray nozzles the head propels itself forward up the pipe section. Once the head reaches the end of the pipe section it is retracted while maintaining maximum water pressure and flow. The length of the piping section shall be determined ahead of time so that the proper amount of travel can be tracked with calibrated markings on the spray head feed water hose or a meter on the hose reel. While traveling through the piping the pressurized water spray knocks debris loose and carries it back to the open end of the piping where it is collected and removed from the system. For each section of piping the process shall be performed a minimum of two times and shall be repeated until the water exiting the end of the pipe is clear and free of debris as determined by the Owner/Engineer.

B. The hydro-jet equipment utilized shall be capable of providing a minimum of 50 gpm at 2000 psi.

C. All cleaning and flushing shall be performed such that all debris will be pulled or flushed downhill.

D. All cleaning and flushing shall be initiated from all low points in the system and shall terminate at the nearest adjacent high point in the system.

E. Coordinate the limitations and requirements of hydro-jet process with the flushing subcontractor such that the piping is installed in a sequence and manner that allows every section of the new pipeline to be cleaned and flushed. Limitations may include maximum length of the pipe section, maximum number and/or degree of bends in the pipe section, maximum slope of the pipe section, equipment and excavation access requirements, and the minimum size of the openings required in the piping to allow for insertion and retraction of the cleaning head.

F. Contractor shall provide access at all low points through valves, tees, flanges, etc. to facilitate the cleaning and flushing process. If temporary fittings or piping is required, it shall be provided by the Contractor and removed by the Contractor after successful cleaning.

G. After flushing and cleaning is completed, Contractor shall provide necessary pipe and fittings required to complete the piping system. Each cleaned section of piping shall be capped and protected to keep mud, debris, water, etc. from entering the piping. If a piping section is left open or unprotected, or is found to be contaminated, it shall be re-cleaned prior to being filled and activated at no cost to the Owner.

H. Contractor shall provide all water for flushing and testing. Coordinated rental of fire hydrant meters with local Fire Department(s), or the University as required.

I. Contractor shall provide all temporary piping from water source to piping system and shall provide means for conducting cleaning water from underground piping system to the appropriate sewer; i.e. pumps, piping, hoses, tanks, etc. Contractor to remove all temporary piping, pumps, hoses, etc. from site immediately after flushing has been completed.
J. Any section of piping which is unable to be flushed and cleaned by “hydro-jet” procedures shall be cleaned by hand to remove oils, dirt and debris. Hand cleaning procedures do not remove weld slag, and as such, any piping that cannot be flushed and cleaned by “hydro-jet” procedures shall have root pass of welds performed by GTWA process to eliminate the production of slag.

3.15 PIPE PAINTING

A. Exposed exterior carbon steel, black iron or other ferrous pipe and fittings shall be prepared and painted by qualified painters using corrosion inhibitive paints. Pipe shall be prepared in accordance with paint manufacturer’s instructions and primed (2 coats) and finish painted (2 coats). Paint type shall be approved by Architect/Engineer.

B. Protect piping from weather and paint promptly to prevent corrosion.

B.C. All new interior piping shall be painted to match existing piping in the plant.

END OF SECTION
SECTION 23 2118 VALVES

PART 1 - GENERAL

1.1 RELATED WORK
   A. Section 20 0700 - Mechanical Systems Insulation
   B. Section 23 0901A - Control Systems
   C. Section 23 2120 - Piping Specialties

1.2 REFERENCE
   A. Work under this Section is subject to requirements of Contract Documents including General
      Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.

1.3 SUBMITTALS
   A. Shop Drawings for each system for all sizes including, but not limited to, the following:
      1. Name of system
      2. Manufacturer's name
      3. Type
      4. Model number
      5. Materials of construction
      6. Temperature/pressure ratings
      7. Manufacturer's data sheets clearly cross-referenced
      8. All other appropriate data

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Gate valves, globe valves, check valves, and drain valves: Crane, Nibco, Stockham, Powell,
      Milwaukee, Hammond, or Grinnell equal to manufacturer's Figure number listed. Provide valves of
      same make for these services.
   B. Other valves: acceptable manufacturers and Figure Number listed under each item.

2.2 WATER SYSTEM VALVES
   A. General:
      1. Valves 2” and smaller in steel piping shall have threaded ends.
      2. Valves 2” and smaller in copper piping shall have solder ends.
      3. Provide valve stem extensions with sufficient length to allow for insulation where insulation is
         specified.
      4. All chilled water valves to be rated for 250 psig WOG working pressure.
   B. Ball Valves:
1. 2" and Smaller: ASTM B584 bronze body, chrome plated brass/bronze or stainless steel ball, full port for 3/4" and smaller and conventional port for 1" and larger, Teflon seat rings, blowout-proof stem, 2-piece construction, 600 psi WOG, 150 psi SWP, Nibco Fig. T(S)-580-70, Apollo No. 70, Watts, Milwaukee BA-150, Hammond, Kitz or Anvil

C. Spring Loaded Check Valves:
1. 2" and Smaller: bronze or iron body, Class 125 (250 psi WOG), Nibco Figure T(S)-480-Y, Mueller Figure 303-BP or Metraflex No. BSN.
2. 2-1/2" and Larger: cast iron or ductile iron body, flanged or wafer type, 302/304 or 316 stainless steel spring, aluminum bronze, carbon steel or ductile iron totally encapsulated in EPDM disc, Buna-N or electroless nickel plated seat, Class 250/300 (400 psi WOG), Nibco Figure F-960 or W-960, Milwaukee 1800 or 1400, Metraflex No. 700, Mueller Sure Check Model No. 74, or Crane Duo-check II

3. For valves 8" and larger, provide lifting lugs or threaded holes for lifting eye bolts.

D. Shut-Off Valves:
1. 2" and Smaller: ball valves as specified in this Section
2. 2-1/2" and Larger: butterfly valves as specified in this Section

E. Balancing Valves:
1. 2" and Smaller: calibrated balancing valves:
   a. Variable orifice with multiple turn valve type as manufactured by Armstrong Series CBV or ABV, Tour & Andersson (Victaulic) Series 786 or 787, NIBCO 1709 or 1710, or fixed orifice with ball valve type as manufactured by Flow Design Inc. (FDI), Presco, Gerand, Nexus, HCl or Taco. Bronze or brass body, 250 psi maximum working pressure, 250°F maximum operating temperature. Furnish valve with adjustable memory stop and quick disconnect taps with built-in check valve for pressure differential measurement, integral valve setting index and memory locking device.
   b. Valves shall measure down to 0.3 gpm with accuracy of ±5%.
   c. Valves shall be leak-tight at full rated working pressure.
   d. Unless otherwise indicated, size balancing valves so that at design flow rate, pressure drop across balancing valve with valve approximately 50% open will be at minimum 25% of reading range of meter used for balancing.

2. 2-1/2" and Larger: Armstrong Series CBV or Tour and Anderson (Victaulic) Series 788/789, ductile iron body, ASME/ANSI B16.42 Class 250/300 flange, 250 psi maximum working pressure, 250°F maximum operating temperature. Fixed orifice with ball valve or butterfly valve as manufactured by FDI, Presco or Gerand, Class 150 flange, 225 psi maximum working pressure, 250°F maximum operating temperature will be acceptable up to 4" size. Butterfly valves, as specified in this Section, together with averaging Pitot tube flow sensors, as specified in Section 23 2120 - Piping Specialties, under Flow Sensors and Meters between check valve and butterfly valve may be used when sizes for Armstrong or T/A valves are not available. Furnish butterfly valves with adjustable memory stops to limit return of valves to preset open position after shut-off.

3. Furnish portable meter kit within durable case similar to Gerand Model "R". Furnish meter with minimum 4-1/2" diameter aluminum or brass body/brass internals with reading range of either 0" to 50" or 0" to 100" water column differential as appropriate, 200°F maximum temperature, 300 psi working pressure. Meter accuracy shall be ± 2% full scale. Provide in kit: equalizing valves, 10 ft purge hose and size devices specified. Meter shall become property of Owner.

4. Contractor shall furnish meter for calibration and shall retain meter after final calibration.

F. Butterfly Valves:
1. 2-1/2" and Larger:
   a. Manufacturers: DeZurik, Keystone, Nibco, Milwaukee, or Bray
   b. Ductile iron body, stainless steel shaft, aluminum-bronze disc, or Nylon 11 coated ductile iron disc, upper thrust bearing, EPDM resilient seat, rated at 200 psi bidirectional shut-off pressure, suitable for continuous operation at temperature up to 225°F, compatible to ANSI B16.1 Class 250/300 flange standards, conforming to MSS-SP-67.
      1). Weld flanges for chilled water butterfly valves can be 150# (class) on Chilled water piping 20" and smaller. Flanges shall still be rated for 250 psig Working pressure (cold water) and 250 psig bubble-tight shutoff, with 150 class weld companion flanges.
   c. Dead end pressure rating shall be 150 psi with no downstream flange/piping attached.
   d. For valves 6" and smaller, provide 10-position lever actuators with locking devices. For valves 8" and larger, provide rotary hand wheel operators with adjustable position stop and position indicators. Size hand wheel operators with no higher than 40 lb rim pull at full valve pressure rating.
   e. External disc-to-stem connections using screws or pins are not allowed.
   f. Valve necks shall be of sufficient length to allow for insulation where insulation is specified. Wheel shaft shall be sufficient length so wheel does not touch insulation.
   g. Provide full lug type valves permitting removal of down stream piping while using valve for system shut-off.
   h. Furnish valves used for balancing with adjustable memory stops.

G. Butterfly Valves (High Performance):
   1. Manufacturers: DeZurik Type BHP, Xomox, Jamesbury, Bray Series 40, or Posi-Seal
   2. Carbon steel or stainless steel body, ANSI Class 250/300 design rated for 275 psi at 100°F, bidirectional bubble-tight shut off at 275 psi, threaded lug type, upper and lower body bearings with thrust bearings, one piece single or double offset shaft of 316 stainless steel and centerless ground and polished to minimize bearing and packing wear, PTFE seats, PTFE adjustable V-ring packing, capable of service in temperature ranges of -100 to 300°F, 316 stainless steel discs and totally enclosed, factory lubed, handwheel rotary actuator with external disc position indication.
   3. Dead end pressure rating shall be 275 psi without downstream flanging.

H. Water Pressure Regulating Valves:
   1. Manufacturers: Thrush, Watts, Cash-Acme, Taco, or B & G
   2. Brass or bronze body, spring and diaphragm operated, pressure adjustable with check valve and inlet strainer and designed for maximum working pressure of 125 psig and maximum operating temperature of 160°F.

I. Lockshield Valves:
   1. Ball valves as specified above with locking handles for padlocking in open or closed position.

J. Drain Valves:
   1. Ball valve as specified above with threaded hose adapter and cap. Provide 3/4" minimum drain valve for piping larger than 1/2", except strainer blowdown valves shall be blowdown connection size. Provide 1/2" drain valve for 1/2" piping. If 3-piece ball valves are specified, use 2-piece ball valves with same construction.

K. Pressure Compensating Flow Control Valves:
1. All metal construction, factory set to automatically maintain flow rate within plus/minus 5% accuracy over operating pressure differential range of at least 14 times minimum required for control, self-contained spring loaded perforated cartridge control mechanism, passivated stainless steel internal working parts, rated for 200 psi pressure at 250°F.
2. Valves 2" and under to have threaded ends with ground joint union; 2-1/2" and larger to have flanged ends.
3. Each automatic flow control valve to have pressure tappings with quick disconnect fittings suitable for use with portable measuring instrument specified, to verify pressure differential across flow control orifice.
4. Certified performance data based on independent laboratory tests to be available.
5. Manufacturers: Griswold, Autoflow or Dole
6. Furnish to Owner portable pressure-temperature measuring kit consisting of 2 pressure gauges with 4-1/2" dial, air bleed device, hoses, quick-connect fittings, protected thermometer, instructions and carrying case. Kit to be used to read pressure drop across flow control orifice and temperature at that point.

2.3 DOMESTIC COLD WATER SYSTEM VALVES

A. General:
   1. Valves 2" and smaller in steel piping shall have threaded ends.
   2. Valves 2" and smaller in copper piping shall have solder ends.
   3. Provide valve stem extensions with sufficient length to allow for insulation where insulation is specified.

B. Ball Valves:
   1. 2" and Smaller: ASTM B584 bronze body, stainless steel ball, full port, Teflon seat rings, blowout-proof stem, 2-piece construction, 600 psi WOG, 150 psi SWP, Apollo No. 70, Watts, Milwaukee BA-150, Hammond, Kitz or Anvil

C. Spring Loaded Check Valves:
   1. 2" and Smaller: bronze or iron body, Class 125, Nibco Figure T(S)-480, Mueller Figure 303-AP or Metraflex No. 700
   2. 2-1/2" and Larger: cast iron or ductile iron body, flanged or wafer type, 302/304 or 316 stainless steel spring, aluminum bronze, carbon steel or ductile iron totally encapsulated in EPDM disc, Buna-N or electroless nickel plated seat, Class 125, Nibco Figure F-910 or W-910, Milwaukee 1800 or 1400, Metraflex No. 700, Stockham Figure WG-970, Mueller Sure Check Model No. 71, or Crane Duo-check II
   3. For valves 8" and larger, provide lifting lugs or threaded holes for lifting eye bolts.

D. Globe Valves: Class 150, bronze, soldered ends, union bonnet, renewable seat and disc. Powell 1823.

E. Shut-Off Valves:
   1. 2" and Smaller: ball valves as specified in this Section

F. 2-1/2" and Larger: butterfly valves as specified in this Section

2.4 LOW PRESSURE STEAM AND CONdensate SYSTEM ValVES (15 PSig AND LOWER)

A. Gate Valves:
   1. 1-1/2" and Smaller: ANSI Class 800, forged steel body, constructed of ASTM A105, Grade 2 forged carbon steel with socket welded connections. Valves shall be integral or seal welded
outside screw and yoke design. Seat and wedges shall meet ASTM A-182-F6 chromium stainless steel. Seat rings shall be hard faced. Valves shall conform to ANSI B16-34 pressure-temperature rating. Valves shall be as manufactured by Vogt, Velan, or Powell.

a. For steam condensate system, ball valves may be used.
   1). Class 1500, socket welded, 316 stainless steel ball and stem, full port, Teflon seat rings, blowout-proof stem, three-piece construction, Valves shall be as manufactured by Apollo, Watts, Milwaukee or Hammond.

2. Above specified ball valve is rated for 150 psig saturated steam and 350 °F. Ball valve option to be included unless Owner requires no ball valves to be used.

3. 2-1/2" and Larger: ASTM A216, WCB, steel body, OS&Y, stainless steel or 13% chromium hard faced wedge and seat ring, but welded, bolted bonnet, Class 150, conforming to ASME B16.5, B16.10 and B16.34, Valve shall be as manufactured by Velan, Powell, Crane, or Williams.

4. Provide warm-up bypass around all shutoff valves 4" and larger. Warm-up bypass shall be provided within field piping for horizontal valve installations. Valves installed in vertical shall have integral drain tap.

B. Globe Valves:
   1. 2" and Smaller: 800 psi socket welded body, forged steel OS&Y hard forced seat, stainless trim, bolted bonnet. Valves shall be as manufactured by Vogt, Velan, or Powell.

   2. 2-1/2" and Larger: ASTM A216, WCB, steel body, stainless steel disc and seat rings, butt welded, bolted bonnet, Class 150, conforming to ASME B16.5, B16.10 and B16.34, Valve shall be as manufactured by Velan, Powell, Crane, or Williams.

C. Shut-Off Valves:
   1. Use gate valves as specified above.

D. Drain Valves:
   1. Threaded ball valve as specified above with hose thread adapter. Provide 3/4" minimum drain valve size except strainer blowdown valves to be blowdown connection size.

2.5 HIGH PRESSURE STEAM & CONDENSATE SYSTEM VALVES

A. Gate Valves:
   1. 2" and Smaller: ASTM B61, bronze body, threaded, rising stem, solid bronze wedge, union bonnet, stainless steel seat rings, malleable iron handwheel, Class 300 (300 psi WP steam), conforming to MSS SP-80, Powell Fig. No. 2377

   2. 2-1/2" and Larger: ASTM A216, WCB, steel body, OS&Y, stainless steel or 13% chromium hard faced wedge and seat ring, but welded, bolted bonnet, Class 300, (300 psi WP at 500 degrees F) conforming to ASME B16.5, B16.10 and B16.34, Stockham Figure 30-OF, Powell Fig. 3003N, Crane 33, Milwaukee 3050, Velan Fig. 1064C, or Williams 30F

B. Globe Valves:
   1. 2" and Smaller: ASTM B61, bronze body, threaded, union bonnet, stainless steel plug disc and seat rings, malleable iron handwheel, Class 300 (300 psi WP steam), conforming to MSS SP-80, Powell Fig. No. 2612

   2. 2-1/2" and Larger: ASTM A216, WCB, steel body, stainless steel disc and seat rings, flanged, bolted bonnet, Class 300, (300 psi WP steam at 500 degrees F), conforming to ASME B16.5, B16.10 and B16.34, Stockham Fig. 30-GSF, Powell Fig. 3031, Crane, Milwaukee 3060, Velan Fig. 1074C, or Williams 302

C. Swing Check Valves:
1. 2" and Smaller: ASTM B61, bronze body, threaded, regrinding, renewable TFE or cast bronze seat disc, Y pattern, Class 300 (300 psi WP steam), conforming to MSS SP-80, Nibco Fig. T-473.
2. 2-1/2" and Larger: ASTM A216, WCB, steel body, stainless steel seats and discs, bolted bonnet, Class 300, (300 psi WP steam at 500 degrees F), conforming to ASME B16.5, B16.10 and B16.34, Stockham Fig. 30-SF, Powell Fig. 3061, Crane, Milwaukee 3070, Velan Fig. 1114C, or Williams 301

D. Shut-Off Valves:
1. Use gate valves as specified above.

E. Drain Valves:
1. Gate valve as specified above with hose thread adapter and cap. Provide 3/4" minimum drain valve size, except strainer blowdown valves shall be blowdown connection size.

F. Triple Offset Valves (Isolation Valves)
1. Manufacturers: Adams, Zwick, Vanessa, or Quadax
2. Valves shall be triple offset design and constructed of metal construction with no elastomers or polymers used for sealing. Seat rings shall consist of laminations of 316SS and graphite. Valves shall meet API 598 shut-off rate of zero leakage, bi-directional. Valve shall be designed for operation in 300PSIG steam at 500 deg F.
3. Valves shall be double flanged. Steam valves shall be ANSI Class 300. Condensate valves shall be Class 150. Valve body shall be one piece cast double flanged, welded bodies not permitted.
4. Body shall be carbon steel ASTM A216WCB. Disc shall be conical, constructed of 316 (CF8M) stainless steel. Disc shall have one or two hubs and stem shall not be exposed to the flow.
5. Stem shall be one-piece design. Stem shall be stainless steel. Stem shall be provided with blow-out prevention ring outside of the pressure boundary.
6. Packing shall be a multi-piece adjustable packing gland and be high density, high purity, dye formed graphite, designed to provide leakproof operation at design conditions. Bearings shall be designed to minimize the load and wear. Bearings shall include replaceable graphite seal.
7. Valve shall be tested in accordance with API 598 and have zero leakage. Written test certificates shall be included with valve submittal.
8. Manual gear actuators shall be sized for installation of valve in non-preferred flow direction. Maximum rim pull for valve operation shall not exceed 100 pounds. Gear operated valves shall be provided with self-locking gears. The actuator mounting bracket shall be rigidly dowel pinned to the body to absorb torque loads and shall be centered by machined register between bracket and body.

2.6 BOILER BLOWDOWN AND EQUIPMENT DRAIN

A. Gate Valves:
2. 2 Inch and Larger: ANSI Class 150, flanged, cast steel body gate valve, constructed of ASTM designation A-216-GR-WCB carbon steel. Valves shall be bolted bonnet outside screw and yoke design with pressure-temperature rating conforming to ANSI B16-34-1977. Stems shall be 410 stainless steel. Wedge shall be flexible type and shall be A-216-WCB with 13%
ADDENDUM #2 ISSUED FOR BID & PERMIT
April 6, 2018 January 12, 2018

Valves shall be manufactured by Crane, Velan or Powell.

B. Globe Valves:
   1. 1-1/2 Inch and Smaller: Full port, ANSI Class 800, forged steel body, constructed of ASTM A105, Grade 2 forged carbon steel with threaded connections. Valves shall be bolted bonnet outside screw and yoke design. Seat and wedges shall meet ASTM A-182-F6 chromium stainless steel. Seat rings shall be hard faced. Valves shall conform to ANSI B16-34 pressure-temperature rating. Valves shall be manufactured by Powell, Velan or Vogt.
   2. 2 Inch and Larger: ANSI Class 150, flanged, cast steel body, constructed of ASTM designation A-216-GR-WCB carbon steel. Valves shall be bolted bonnet outside screw and yoke design with pressure-temperature rating conforming to ANSI B16-34-1977. Stems shall be 410 stainless steel. Seat ring shall be hard faced carbon steel or 13% chromium A-182-F6 stainless. Handwheels and nuts shall be steel. Valves shall be manufactured by Crane, Velan or Powell.

C. Check Valves:
   1. 1-1/2 Inch and Smaller: 800 psi forged steel, renewable disc, bolted bonnet, threaded ends, swing type. Valves shall be manufactured by Powell, Velan or Vogt.
   2. 2 Inch and Larger: Class 150, flanged, cast steel body, bolted bonnet, universal trim, swing type. Valves shall be manufactured by Crane, Velan or Powell.

2.7 SOFTENED WATER VALVES

A. Ball Valves:
   1. 2 1/2 Inch and Smaller: Ball valve with stainless steel ball and stem, full port, 600 psi (4137 kPa) WOG, two-piece bronze body, soldered connections, TFE seats and packing, FS WW-V-35. Apollo 77 Series; Watts or Jamesbury equal.

B. Butterfly Valves
   1. 3 Inch and Larger: Butterfly Valves, lug type 316 stainless steel body and disc-stem, Teflon seat and seal. Provide manual gear operator on valves 6 inch (150 mm) and larger. Bray Series 41 or approved equal.

C. Check Valves:
   1. 2 1/2 Inch and Smaller: Class 125, 200 psi (1380 kPa), bronze, swing check, renewable bronze disc, soldered connections. Crane 134L
   2. 3 Inch and 4 Inch: Class 125, 200 psi, bronze, swing check, renewable bronze disc and plugs, flanged ends, Crane 373.

D. Globe Valves: Class 150, bronze, soldered ends, union bonnet, renewable seat and disc. Powell 1823.

E. Shut-Off Valves:
   1. Use ball and butterfly valves as specified above.

F. Throttling Valves
   1. Use globe valves as specified above.

G. Drain Valves:
   1. Gate valve as specified above with hose thread adapter. Provide 3/4" minimum drain valve size except strainer blowdown valves to be blowdown connection size.
2.8 STEAM SAFETY VALVES

A. Size 1 1/2 Inch and Smaller: Threaded ends, spring loaded, all brass construction, brass trimmed. Capacities ASME certified and labeled. Bushings shall not be used. Valves shall be manufactured by Consolidated, Kunkle, Crane or Spirax Sarco.

B. Size 2 Inch and Larger: Flanged, outlets may be threaded, spring loaded, cast steel construction, brass/bronze trimmed. Capacities ASME certified and labeled. Valves shall be manufactured by Consolidated, Kunkle, Crane or Spirax Sarco.

C. Steam pressure safety (relief) valve discharge shall be provided with a drip pan elbow.

D. Steam pressure safety (relief) valves to conform to State Requirements.

E. The pressure at which each steam pressure safety (relief) valve shall open is designated on the Drawings. When such valves are ordered by the Contractor, he shall definitely specify the pressure at which each steam pressure safety (relief) valve is to be set. Each valve shall have a metal tag attached stamped with the valve identification plus the pressure setting.

F. Steam pressure safety (relief) valves shall be provided with body drain.

2.9 DRIP PAN ELBOWS

A. Manufacturers: Anvil, Kunkle, Grinnell or Spirax/Sarco.

B. Size to suit safety relief valves. Provide drain connections at bottom of elbow and pan.

C. Extend elbow pipe a minimum of 6 inches inside vent pipe

D. Material: As specified for steam pressure safety (relief) valves.

E. Manufacturers: Spence, Leslie, Mason Neilan, Spirax Sarco, or Fisher.

F. Valve body shall be cast steel, threaded, with stainless steel valve seat, discs, stems and diaphragm. No springs shall be located in the steam space and no stuffing box.

G. Valve threaded ends shall be seal welded.

H. Furnish valves with capacity for entering psi and discharge psi as shown. Valve pressure range shall be manually adjustable. Provide automatic capacity control from 5 to 100% of rated capacity and guaranteed to control delivery pressure with a 2 psi plus or minus variation.

I. Unless otherwise noted, valves shall be self-operated, integral mount pilot type, single seat, normally closed, designed for dead end service, balanced construction, secoweld, condensing chamber.

J. Pressure reducing valve shall be able to provide 97% accuracy in downstream pressure control. Unless otherwise indicated, provide noise attenuating devices as required to meet current requirements of Occupational Safety and Health Act for 8 h noise exposure or as necessary to limit valve noise to 85 dBA at 3 ft from valve. Furnish supporting data for each valve indicating compliance with requirements. Insulation will not be considered as sound attenuating devices.

K. Furnish manufactured removable insulation/jacket valve cover, similar to Spence Insulcap Jacket, with each pressure reducing valve.
2.10 GAUGE VALVES

A. Unless otherwise indicated, gauge valves for steam, steam condensate and feedwater services shall be gate valves. Gauge valves for all other services shall be needle valves, brass body, 2000 psig, 300°F, similar to Trerice Model 735. Gauge valve size shall match gauge pipe size as specified in Section 23 2116 - Pipe and Pipe Fittings.

2.11 CHAIN WHEEL OPERATORS

A. Similar to Babbitt cast iron or ductile iron adjustable sprocket rims and chain guides. Use galvanized or brass chain and chain closure links to form continuous loop of chain at each operator.

PART 3 - EXECUTION

3.1 GENERAL

A. Install valves as shown on plans, details and according to manufacturer's installation recommendations.

B. After piping systems have been pressure tested and put into service, but before final adjusting and balancing, inspect valves for leaks. Adjust, replace packing or replace valves to stop leaks.

C. Install control valves furnished under Control Systems. Provide reducing fittings as required.

D. Refer to Section 23 2116, Part 3 for reducing fittings requirement for valves smaller than pipe size.

E. Provide chain operators for manually operated valves 4" and larger, located more than 8 ft above equipment room floor.

3.2 SHUT-OFF VALVES

A. Provide shut-off valves at all equipment and at each automatic valve for servicing.

B. Install steam system shut-off valves in horizontal piping. Shut-off valves are not allowed in vertical piping.

3.3 BALANCING VALVES

A. Provide balancing valves where indicated on drawings and as required for complete balancing of water systems.

B. Provide straight inlet and outlet pipe length in accordance with manufacturer's recommendation.

C. For buildings with multiple stories, provide balancing valve in return line at riser take-offs at each floor. Provide shut off valve in supply line at each riser take-off.

3.4 GAUGE VALVES

A. Provide gauge valves at each pressure gauge as shown and at each pressure tapping where pressure sensing tubing is connected.

3.5 DRAIN VALVES

A. Provide drain valves at all low points of piping systems for complete drainage of systems.
3.6 SPRING LOADED CHECK VALVES
   
   A. Provide spring loaded check valve in each pump discharge line.

3.7 STEAM SAFETY VALVES

   A. Provide steam safety valves where indicated on the drawings.

   B. Provide vent to outside of building.

   C. If drip pan elbow is specified or indicated, install drip pan elbow at base of vertical discharge pipe and as close to safety valve outlet as possible. Support pipe to keep weight of pipe and accessories from resting on safety valve or drip pan elbow. Run drain lines from drip pan elbow to nearest drain point.

   D. Pitch horizontal discharge pipes minimum 1/8” per foot in direction of flow, and provide for complete condensate drainage through drip legs and thermostatic traps at points in discharge pipe where condensate will collect. Pipe outlet of thermostatic trap to nearest drain point.

   E. Pipe safety valve tapped body drains to nearest drain point.

   F. If "closed" connection to safety valve is indicated (directly hard piped or safety valve connected to discharge pipe through flexible connection) anchor discharge pipe immediately at outlet of safety valve, or immediately downstream of flexible connection. Support pipe to keep weight of pipe and accessories from resting on safety valve.

END OF SECTION
SECTION 23 0901A CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED WORK
A. Section 20 0513 - Motors
B. Section 23 0550 - Vibration Isolation
C. Section 23 0993 - Control Sequences
D. Section 23 2118 - Valves
E. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables
F. Section 26 0533 - Raceway and Boxes for Electrical Systems

1.2 REFERENCE
A. Work under this Section is subject to requirements of Contract Documents including General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.
D. BUILDING SYSTEMS COMMISSIONING
   1. “An independent third party Commissioning Agent will document completion of the Mechanical, Fire Suppression, Plumbing, HVAC, Electrical, Communications and Electronic Safety and Security Systems for the project. The Construction Manager, Division Contractors, and Control Contractor are members of the Commissioning Team and will facilitate completion of the Commissioning process. Refer to section 019113 “Building Systems Commissioning” for the project Commissioning requirements and roles and responsibilities of each member of the Commissioning Team.”

1.3 DEFINITIONS
A. The following abbreviations, acronyms, and definitions are used in addition to those details found elsewhere in contract documents.
   1. Actuator: Control device to provide motion of valve or damper in response to control signal
   2. AI: Analog Input
   3. AO: Analog Output
   4. Analog: Continuously variable state over stated range of values
   5. Auto-Tune: Software routine used to adjust tuning parameters based on historical data
   6. BAS: Building Automation System
   7. BMS: Building Management System
   8. DDC: Direct Digital Control
   9. DDCP: Direct Digital Control Panel
   10. Discrete: Binary or digital state
11. DI: Discrete Input (Sometimes referred to as Binary Input BI)
12. DO: Discrete Output (Sometimes referred to as Binary Output BO)
13. EMCS: Energy Management and Control System (Typically interchangeable with BAS or BMS)
14. E/P: Voltage to pneumatic transducer (Often a solenoid valve is referred to as an E/P transducer)
15. FA Field Adjustable
16. FC: Fail Closed position of control device or actuator. Device moves to closed position on loss of control signal or energy source
17. FMS: Facility Management System linking two or more BAS
18. FO: Fail Open position of control device or actuator. Device moves to open position on loss of control signal or energy source
19. I/P: Current to pneumatic transducer
20. Instrument: Device used for sensing input parameters or used for actuation
21. Modulating: Movement of a control device through an entire range of values proportional to an infinitely variable input value
22. Motorized: Control device with actuator
23. NC: Normally Closed position of switch after control signal is removed
24. NO: Normally Open position of switch after control signal is removed
25. Node: DDCP, operator workstation, or other control device connected to communication's network
26. Operator: Same as actuator for motorized devices. Also refers to an individual who physically "operates" the facility
27. PC: Personal Computer
28. Peer-to-Peer: Mode of communication between controllers in which each device connected to network has equal status and each shares its database values with all other devices connected to network.
29. P: Proportional control, control mode with continuous linear relationship between observed input signal and final controlled output element.
30. PI: Proportional - Integral control, control mode with continuous proportional output plus additional change in output based on both amount and duration of change in controlled variable (Reset control).
31. PID: Proportional - Integral - Derivative control, control mode with continuous correction of final controlled output element versus input signal based on proportional error, its time history (reset), and rate at which its changing (derivative).
32. Point: Analog or discrete instrument with addressable database value
33. Self-Tune: Same as Auto-Tune
34. Solenoid: Electric two position actuator (See E/P)
35. TCC: Temperature Control Contractor (Same as Control Contractor).
36. TCP: Temperature Control Panel

1.4 ACCEPTABLE CONTROL CONTRACTORS

A. Control Contractor shall have full service office within 100 miles of Project site. Full service office is defined as having complete parts inventory, having all required test and diagnostic equipment, and to be home office of Applications Engineers, Supervisors, and Field Technicians. Control
Contracts shall be factory authorized agent or dealer of controllers and control hardware as manufactured by:
1. Johnson Controls, Inc
2. Honeywell, Inc
3. Alerton Technologies
4. Distech

B. The systems integration contractor must have on staff the following number of key personnel as a minimum each with a minimum of 5 years of related controls installation experience:
1. Project Manager – 2 years
2. Controls applications Engineer – 2 years
3. Programmer – 2 years
4. Installation Supervisor – 2 years
5. Controls Technician – 5 years

C. Prefer contractor staff to include Niagara Tridium AX or N4 certified technicians, and one advanced certified.

D. Have experience with successful integrations of controls with Niagara Tridium systems.

E. Contractor to have a minimum of 3 years of installation history with the brand of controls being bid.

F. Must have help desk operation or staff available for phone contact 24/7 for providing technical support to university staff. Call forward and emergency service numbers are not acceptable during normal business hours.

G. Bids will be accepted only from prequalified Control Contractor per "Instruction to Bidders".

1.5 SYSTEMS DESCRIPTION

A. Control system shall be Direct Digital Control (DDC).

B. Damper and valve actuators shall be electric type, unless otherwise noted.

C. Provide supplementary BAS architecture, that is based on and consistent with the UK standard architecture, consisting of communication network, modular designed DDCPs with all points addressable and modifiable from existing BAS user workstations or from master DDCP using laptop computer. BAS shall communicate via BACnet/MSTP or BACnet/IP communications protocol between the room level controllers and the building level controllers and BACnet/IP communications protocol between the building level controllers and the existing BAS server. All system components shall be fully BACnet compliant without the use of integration gateways. BAS shall be fully expandable with addition of BACnet based hardware and/or software. Expansion shall not require removal of existing DDCPs, sensors, actuators, or communication networks.

D. System must be able to communicate with Tridium Niagara Framework at the University Medical Center Delta Room via Protocol Address assigned by the University at the building location. Provide PICS for Windows-based control software and every controller in system, including unitary controllers. PICS and BIBBS shall comply with Tridium PICS and BIBBS.

E. Ethernet network cabling shall be installed by Division 27 contractor with cable runs from central EIDF/IDF communication closet to multiple central locations on each floor. Ethernet cabling shall be utilized for BAS BACnet/IP communication from each zone to the existing BAS operator workstation. Controls contractor shall provide BACnet/IP to BACnet/MSTP small capacity Building
Level Controller in each zone. BACnet/MSTP communication network shall be provided and installed by controls contractor between each room level controller in zones to BACnet/IP to BACnet/MSTP Building Level Controller. BACnet/MSTP communication network node capacity for each small capacity Building Level Controller zone shall be limited to a maximum of 80% manufacturer's recommended DDC controller capacity or 25 devices per trunk total, whichever total number of nodes is smaller.

F. System intelligence shall be such that operator workstation(s) can be used for programming controls, performing analysis on filed data, generating maintenance and operation reports and providing permanent storage for programs and data.

G. System shall be web-based, telnet or HyperTerminal capable. No graphics shall be provided. All graphics will be owner provided to existing Tridium system.

H. All building automation products utilizing BACnet shall communicate using the protocols and network standards as defined by ANSI/ASHRAE Standard 135-2001, BACnet and be tested by BACnet Testing Laboratories (BTL) and have passed the necessary requirements for BACnet compliance and interoperability.

I. New BAS shall seamlessly integrate with existing site Tridium web server. Existing web server shall be able to access and read all input, output and calculated points and issue commands to all output points in new BAS by means of a standard web browser. Contractor shall provide necessary hardware and software components to accomplish this interface.

J. Provide modular designed stand-alone controllers capable of future BAS architecture with peer-to-peer and/or low/medium speed communication networks. Upgrade to full BAS architecture shall not require removal of existing controllers, sensors, actuators, etc.

K. BAS network architecture shall be based on an Open implementation of BACnet using ASHRAE 135-2012, exclusively as the communications protocol for communication between DDC Hardware devices, including BAS Web Server, to allow multi-vendor interoperability.

L. Contractor provided BAS Ethernet Network shall be physically separate from other building Ethernet networks.

M. Provide BAS architecture consisting of communication network, operator workstations, web servers and modular designed controllers with all points addressable and modifiable from operator workstations or from master controller using laptop computer. BAS shall be fully expandable with addition of hardware and/or software. Expansion shall not require removal of existing controllers, sensors, actuators, or communication networks.

N. System shall support operator workstations as specified and shall be capable of additional workstations, limited only by systems maximum node capacity.

O. Operator workstations connected to building Ethernet network shall be able to access BAS information as determined by Graphical User Interface (GUI) software through standard web browsing software (Internet Explorer, Mozilla Firefox, Opera, or Google Chrome). GUI software shall allow transparent access to each building component/system for control and/or monitoring.

P. System intelligence shall be such that operator workstation(s) can be used for programming controls, performing analysis on filed data, generating maintenance and operation reports and providing permanent storage for programs and data.

Q. Workstation PCs and printer will be furnished by Owner. Provide hardware interface card to communicate with BAS network and all required software for each workstation, as defined in this Section, to make each PC full function workstation.
R. All safety devices shall function in both auto and hand modes on starter.

S. All safety devices shall function in both VFD and bypass starter modes.
   1. Dampers interlocked with fans shall operate in both VFD and bypass starter modes to prevent dead-head of fans.
   2. Valves interlocked with pumps shall operate in both VFD and bypass modes of operation to prevent dead-head of pump.
   3. All safeties shall be hardwired through VFD/bypass starter safety circuit to prevent unsafe operation when in either VFD or bypass modes.

1.6 SCOPE OF WORK

A. Provide all labor and materials for complete and fully functioning control systems in accordance with Contract Documents including this Section.

B. Engineering services shall be performed by factory trained engineers that are employed by the control manufacturer. System shall be installed either by trained mechanics directly employed by Control Contractor or by subcontractors who are under direct supervision of Control Contractor’s representative. Owner reserves the right to exclude any project managers, engineers, field supervisors, or technicians whose past experience are not sufficient to meet needs of project. The manufacturer shall be responsible for the engineering, installation, startup, checkout, commissioning and warranty of control systems.

C. Engineering services shall be performed by Factory Trained Engineers. System shall be installed either by trained mechanics directly employed by Control Contractor or by subcontractors who are under direct supervision of Control Contractor’s representative. Engineer reserves right to exclude Project Managers, Engineers, Field Supervisors, or Technicians whose past experience is not sufficient to meet needs of Project.

D. Control Contractor’s Project Managers, Engineers and Digital System Programmers shall have previously performed in capacity that qualifies them to successfully engineer system of scope and magnitude similar to this Project.

E. Labor shall include, but not be limited to:
   1. Engineering services to size unscheduled valves and dampers based on design criteria, and confirm sizing of scheduled valves and dampers.
   2. Engineering services to produce requested submittals and working construction drawings and record drawings as specified here within.
   3. Engineering services for BAS Ethernet network design.
   4. Project management services as single point contact to coordinate construction related activities.
   5. Field mechanics for installation of control wiring and related control devices.
   6. Field technicians to startup, calibrate, adjust, and tune control loops.
   7. Field technicians to perform system checkout and testing, and to complete required reports.
   8. Field supervisor during controls installation and startup.
   9. Field technicians to assist Mechanical Contractor and Testing and Balancing (TAB) Contractor in adjusting controls and determining setpoints related to TAB work.
   10. Field representatives and/or classroom instructors to provide Owner training as specified.

F. Control Contractor shall be responsible for complete installation of control devices (except as noted), wiring terminations at controller locations to accomplish control sequences specified in project manual or on drawings. Control Contractor is required to provide power for air terminal
controllers and other field mounted devices that require 24 VAC, 60 Hertz and shall be powered from 120 to 24 VAC transformer panels provided by Control Contractor. Control Contractor shall also be responsible for additional instrumentation described in point schedules found in Contract Documents, which may not be directly related to specified control sequences.

1. Control contractor shall provide unique tag numbers for all devices under this specification and reference those tag numbers in control sequences and control diagrams.

2. If Owner has tagging convention, Control contractor shall utilize it. If no tagging convention exists, Control contractor shall provide one for all devices under this specification.

G. Mechanical Contractor shall furnish and install all wells, taps, and other mechanical interfaces required for control equipment mounting into piping systems. Mechanical Contractor shall install all in-line mounted devices, such as valves, dampers, flow meters, static pressure probes, etc., furnished by Control Contractor. Control Contractor is responsible for installation of all other control devices, such as actuators, linkages, sensors, air terminal controllers, flow transducers, remote mounted control devices, control panels, control transformers, etc.

H. Coordinate requirements above with Mechanical Engineer and Section 23 3600 – Air Terminal Devices, for required control devices. Define what is to be provided to the Air Terminal manufacturer for mounting at the factory, what the Mechanical Contractor is to install in the field and what the Control Contractor is to install in the field.

I. All electrical work required, as integral part of work is responsibility of Control Contractor. Provide final control power connections including conduit, wire, and/or disconnect switches to all control devices from appropriate electrical distribution panels.

   1. Electrical Contractor will provide circuit breakers, junction boxes, and wiring required to provide electrical power to DDCP’s panels.

   2. 120 to 24 VAC transformer panels shall be mounted adjacent to DDCP panels and powered from dedicated electrical circuit.

   3. Should any change in number of DDCPs or addition of other electrical equipment after contracts are awarded, Control Contractor shall immediately notify Electrical Contractor of change. Additional costs due to these changes shall be responsibility of this Contractor.

J. Materials shall be as specified unless approved through procedures for product substitution specified in Division 01. Control Contractor shall provide components not specifically indicated or specified, but necessary to make system function within the intent of specification.

K. All electrical products to be listed and labeled by UL and comply with NEMA Standards.

L. Provide weather protection cover or weatherproof control devices where required for control devices located outdoors.

M. Control Contractor is responsible for integration of the following independent systems into the Control System.

   1. Variable Frequency Drives (VFD):

      a. VFD provider will provide a termination point for a single point communication connection to the BAS utilizing BACnet MS/TP protocol. Contractor shall provide cabling and conduit to make an interface connection from the BAS to the VFD. Contractor and VFD provider responsible for translation of network protocols, testing of communications between systems, and joint commissioning of systems. Contractor to refer to P&ID’s, DDC Point Schedules, and Section 20 0514 Variable Frequency Drive (VFD) System for programming and monitoring requirements.
1.7 SUBMITTALS

A. Shop Drawings:
   1. Refer to Division 01 General Requirements.
   2. Submit manufacturer’s printed product data sheets for control devices and materials listed in bill of material in Control Contractor’s control drawings. An index listing of all control devices and equipment applicable to project to be listed in the following format:
      a. Room #
      b. Device Part #
      c. Device Description
      d. Sheet # where cut sheet is located
   3. Datasheets shall be submitted electronically in pdf format with bookmarks provided for each individual device and table of contents listing each device manufacturer and full model number with links to device pages. Organize sheets in order of model number, alphabetically, then numerically. If more than 20 product data sheets are submitted, provide front index and tabs for logical groups of devices. When a manufacturer’s data sheet refers to a series of devices rather than a specific model, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Data sheets shall include sufficient technical data to describe instrument parameters required as specified. Refer to Specification section 20-0000 General Mechanical Requirements for additional submittal requirements and formatting.

4. BAS manuals to be in two parts: 1) Operation and maintenance, and 2) System application manuals.

5. One (6) hard copy and (1) electronic copy of BAS manuals shall be provided to Physical Plant by BAS contractor at date of submittal completion.

6. Submit data concerning type of signal wiring and installation methods including raceway types and grounding methods.
   a. Submit voltage drop calculations for all low voltage DDC circuits. Voltage drop to include number of devices and wiring run lengths, calculated voltage available at each device.

7. Submit control drawings including, but not limited to, the following:
   a. Front sheet index for projects with more than 10 control drawing sheets.
   b. Overall system/network architecture drawings: Provide block diagram showing relationship of each controller, control panel, or other network devices relative to each other, label room location of each device, number and indicate model number of each device, indicate network types, and general cabling routing.
   c. Control Drawings: Provide graphic representation of systems with all major inline components to properly locate all control devices. Identify controlled devices with their software designation on drawings, including unique valve and damper tag numbers.
   d. Detailed wiring and piping diagrams show point-to-point hookup details of all transducers, relays, outputs, inputs and subsystem components. Label all pneumatic lines and control wires with field ID numbers/colors.
   e. Bill of Materials: Identify actual product model number used for each control device for each schematic control drawing.
      1). Bill of material shall be included on flow diagrams for each system and on panel layouts showing panel components.
   f. Sequence of operation: Provide written narrative describing each control sequence indicating method of control. Identify sensors, controllers, and actuators used with references to tag number of the controlled device. Include setpoints and offsets of each control loop.
8. Instrumentation submittals can be submitted as a separate submittal from control shop drawings but must be submitted at the same time as control shop drawings.

9. Layout Design Drawing for each control panel:
   a. The layout drawing shall be to scale with all devices shown in their proposed positions.
   b. All control devices shall be identified by name.
   c. All terminal strips and wire channels shall be shown.
   d. All control transformers shall be shown.
   e. All 120 VAC receptacles shall be shown.
   f. All IP connection points shall be shown.

10. Wiring/Pneumatic Design Diagram for each control panel.
   a. The control voltage wiring diagram shall clearly designate devices powered by each control transformer. If the control devices use half wave power, the diagram shall clearly show the consistent grounding of the appropriate power connection. All wire identification numbers shall be annotated on the diagram.
   b. The Field Bus wiring diagram shall clearly show the use of the daisy chain wiring concept, the order in which the devices are connected to the Field Bus, and the location of end of segment termination devices. All wire identification numbers shall be annotated on the diagram.
   c. If shielded communication wiring is used, the grounding of the shield shall be shown.
   d. The terminal strip wiring diagram shall identify all connections on both sides of the terminal strip. Wiring label numbers for all wiring leaving the control panel shall be annotated on the diagram.
   e. Detailed piping diagrams showing point-to-point hookup details of transducers, relays, outputs, inputs and subsystem components. Label pneumatic lines with field ID numbers/colors.

11. Wiring Design Diagram for individual components (controllers, protocol translators, etc.): The wiring diagram for each component shall identify all I/O, power, and communication wiring and the locations on the terminal blocks to which the wires are landed. Example: Fan Status sensor is wired from terminals 5/6 on the controller to terminals 17 and 18 on the terminal strip.

12. Installation Design Detail for each I/O device.
   a. A drawing of the wiring details for each sensor and/or end device.
   b. For devices with multiple quantities, a standard detail may be submitted.

   a. A two dimensional cross sectional diagram showing key components such as fans, coils, dampers, valves, pump, etc.
   b. Identify the locations and names of all sensors and end devices that are associated with the control system. Label the panel name and terminal numbers where the connections are landed.
   c. A legend shall be provided for all symbols used.

14. BACnet Compliance Documentation:
   a. The Protocol Implementation Conformance Statement (PICS) for each component.

15. Direct Digital Control System Hardware Technical Data.
   a. A complete bill of materials of equipment to be used indicating quantity, manufacturer, and model number.
   b. Manufacturer’s description and technical data for each unique device to include performance curves, product specification sheets, and installation instructions. When a manufacturer’s data sheet refers to a series of devices rather than a specific model, the
data specifically applicable to the project shall be highlighted or clearly indicated by other means.

c. This requirement applies to:
   1). Controllers
   2). Transducers/Transmitters
   3). Sensors
   4). Actuators
   5). Valves
   6). Relays and Switches
   7). Control Panels
   8). Power Supplies
   9). Batteries

16. An Instrumentation List for each controlled system.
   a. The list shall be in a table format.
   b. Include name, type of device, manufacturer, model number, and product data sheet number.

17. Sequence of Control: A sequence of control for each system being controlled. Include the following as a minimum.
   a. Process control sequence for each end device.
   b. Supervisory logic sequence of control for each system.
   c. The impact of each global application program on the sequence of control (Example: Demand Control).
   d. A list of all physical inputs and outputs associated with each sequence.
   e. Within the sequence of control, all application parameters that are to be user adjustable from an Operator Workstation shall be annotated with (FA) after the name of the parameter. This shall include set points, reset schedule parameters, calibration offsets, timer settings, control loop parameters such as gain, integral time constant, sample rates, differentials, etc.
   f. Within the sequence of control, all calculated values that are to be viewable at the Operator Workstation shall be annotated with (rpt) after the name.
   g. All points that shall be subject to manual control from an operator workstation.
   h. A list of all alarm points, a description of the alarm and a description of the alarm criteria.
   i. A list of all variables for which historical trending will be applied, the sample rates and any criteria used to start and stop the historical trending.

18. Binding Map
   a. A list of the device to device data flow. This shall not include the flow of data from devices to the presentation system.
   b. Include:
      1). Description of the variable.
      2). Sending device.
      3). Receiving device.

19. Submit valve schedules with shop drawings that indicate unique tag numbers for each device, equipment or system served, device model numbers, sizes, shutoff head required, actuator air pressure or force required to meet shutoff head, torque requirements for rotary valves, flow coefficients (Cv) for 10% and 100% valve stem travel, actual flow requirements based on
equipment shop drawings, calculation of actual pressure drops, actuator model number, actuator torque capacities and pilot positioner locations.

20. Valve and damper shop drawing submittals will not be processed unless all supporting data and sizing calculations are included.

21. Submit damper schedules with shop drawings that indicate unique tag numbers for each device, equipment or system served, device model numbers, duct sizes, damper sizes, flow rates, pressure differentials, calculation of actual damper pressure drops, approach velocities, leakage rates, torque requirements, actuator model number, actuator torque capacities and pilot positioner locations.

22. Select dampers to meet their intended service with respect to maximum approach velocities and maximum pressure differential. Damper materials shall match duct construction materials in which they are installed (galvanized steel, aluminum, 304 or 316 stainless steel, etc.).

23. Aluminum dampers may be used in galvanized ductwork.

B. Operation and Maintenance Manuals:
1. Refer to Division 01 - General Requirements.
2. Operation and maintenance manuals shall provide descriptions of maintenance on all system components, including sensors and controlled devices. These shall include inspection requirements, periodic preventative maintenance, fault diagnosis, and repair or replacement of defective components, calibration instructions, parts lists, and name, address, and phone number of manufacturers' representative.

C. Software Manual:
1. As part of operation and maintenance manuals, submit one software manual per workstation plus one extra copy for archive use. Software manuals shall be divided into separate parts with tabs for each part.
2. Software Manual parts shall include:
   a. Complete description of operating system including all commands, configuration programs, printouts, logs, database functions and passwords. Describe general operating procedures, starting with system overview and proceeding to detailed description of each software command feature with sample printed displays and system function description for each option. Include instructions on verifying errors, status, changing passwords and initiating or disabling control programs.
   b. Complete description of programming language including all commands, configuration programs, control loop functions and testing. Describe general programming procedures, starting with system overview and proceeding to detailed description of each software command feature. Include instructions on creating or modifying any control algorithm or parameter, debugging, etc. This shall include all control functions, algorithms, mathematic equations, variables, setpoints, time periods, messages, and other information necessary to load, alter, test and execute custom or pre-written programs.
   c. Software Backup: Upon successful completion of acceptance testing, submit to Owner 2 archive copies of all accepted versions of source code and compiled code for all application programs and data files, on CD ROM backup disks. All control software must be readily accessible by Owner using BAS workstation hardware and software.

D. Record Drawings:
1. Refer to Division 01 - General Requirements.
2. Submit revised Shop Drawings indicating all changes made during project.
1.8 FCC COMPLIANCE

A. All digital equipment furnished under this contract shall have been tested and made to comply with limits for Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against interference when operated in commercial environment. All literature shall so note and all equipment shall be so labeled to show this compliance.

PART 2 - PRODUCTS

2.1 GENERAL

A. Pressure and temperature ratings of devices indicated in Part 2 are minimum required. All devices shall be designed to withstand maximum pressure and temperature encountered in the system.

2.2 CONTROL WIRING

A. Control wiring shall be in accordance with National Electric Code and local electrical codes. Final connection points at devices and panels shall be made at terminal blocks either integral to device or separate terminal blocks mounted inside of control panel enclosures. Use of wire nuts and crimped connections are not allowed for terminating control wiring unless approved by Engineer.

B. Refer to Division 26 for specification requirements for conduits and conductors, except as noted.

C. Signal and Power Conductors (24 V and Under):
   1. No wire smaller than #18 AWG shall be used, except for manufacturer supplied instrument specific wire, or unless otherwise specified. Use 2 wire stranded twisted/shielded pair 24 VDC for analog and/or discrete input and 24 VAC/VDC output devices. For RTD signal wiring, use #18 AWG stranded, tinned copper twisted/shielded three lead conductor.
   2. Conductors not concealed in raceway shall have UL listed plenum rated teflon insulation.
   3. Communication Cable: Use control system manufacturer’s standard communications cable or #22 to #24 AWG twisted, shielded pairs, coaxial cable, or fiber optics for communications between remote control panels/devices. Provide 250 ohm, 5 watt, 0.1% tolerance dropping resistors in 4 – 20 mA circuits as required to generate 1 to 5 V signals in 24 VDC powered instrument loops. Provide isolated instrument grounding system per manufacturer's recommendations.
   4. 24 VAC Power Conductors shall be #18 AWG, 2-wire twisted pair or larger. Provide Metal Oxide Varistors (MOV’s) on 24 VAC/VDC discrete outputs connected to inductive loads to reduce noise levels (i.e., solenoid valves, motor contactors, relays, damper/valve electric actuators, etc.).
   5. Stranded twisted/shielded control conductors are required with the shields to be terminated within variable frequency Drive enclosures to reduce the effects of noise from VFD. Follow VFD manufacturer's installation instructions for wiring control conductors to VFD.

2.3 LOCAL CONTROL PANELS

A. Local control panels shall be constructed of steel or extruded aluminum with hinged door and keyed lock, with baked enamel finish of manufacturer's standard color. Construction shall comply with NEMA 1 Standards for interior panels, NEMA 4 for exterior panels.

B. Controlling instruments, temperature indicators, relays, switches and gauges shall be factory installed and permanently labeled. Devices shall be located inside or mounted on face of panel.
C. Unless otherwise indicated, mount control and adjusting switches, temperature indicators and other indicating or manually operated devices on front face of panel with black phenolic engraved nameplates.

2.4 DIRECT DIGITAL CONTROL PANEL (DDCP)

A. General:
   1. Direct Digital Control Panels (DDCP) shall be microprocessor based, field programmable controllers, capable of performing control and energy management functions, and shall be UL Listed as Signaling Systems. Each DDCP shall include its own microprocessor, power supply, input/output modules, and termination modules as required to perform its intended function.
   2. DDCP shall receive discrete electrical or analog electronic field input signals, convert signals for use by controller, perform control sequences, convert controller information into output signals, and provide control output signals to actuators and field control device. All inputs and outputs, including communication connections, shall be electrically or optically isolated from controller.
   3. DDCP with analog input modules shall be capable of accepting any form of linear or non-linear voltage (0-5 VDC or 0-10 VDC), current (4-20 mA) or resistive input (0-1000 ohm).
   4. DDCP with discrete input modules shall be capable of accepting discrete inputs from any device with isolated, dry-type contacts (no grounds or no voltage) of either normally open (NO) or normally closed (NC) configuration. Provide visible status lights (LEDs) to indicate input point status.
   5. Provide input modules capable of interfacing with pulsed output type sensors as required.
   6. DDCP with discrete output modules shall have isolated, dry-type contacts (no grounds or no voltage) of either normally open (NO) or normally closed (N.C.) configuration.
   7. Provide manual H-O-A override switch for each discrete output point. Provide feedback point to BAS to indicate when output point has been overridden. Provide visible status lights (LEDs) to indicate output point status.
   8. DDCP shall have capability to scale, offset, and display proper analog value without field hardware modification. DDCP shall convert analog input signals to digital values (A/D conversion) and convert digital values to analog outputs (D/A conversion) for modulating control purposes.
   9. Failsafe hardware shall be provided such that BAS failures result in immediate return to local control. If DDCP uses database values from other DDCP and communication network fails or malfunctions, control loop outputs shall continue to function using last value received from BAS.
   10. DDCP shall have ability to interface and communicate with central BAS through a dedicated network. DDCP shall be fully operable from and have all points and functions available to centrally alarm at any master DDCP or PC workstation connected to BAS network.

B. DDCP Operator's Interface:
   1. Provide communications port to connect display device for operator access to all information and all operating system functions except database reports and graphics functions in each mechanical room.
   2. Display keyboards to be alphanumeric with special dedicated keys for functions such as manual-auto, test, function, value, and enter.
   3. Keyboard/display units shall be able to display analog variables, binary conditions, point values and condition, and other information required for analysis and adjustment.
   4. Provide minimum of one permanent panel mounted keyboard and display for each mechanical equipment room. If manufacturer does not offer dedicated panel mounted keyboard and display unit, provide portable hand held keyboard and display unit. If manufacturer does not
offer dedicated hand held keyboard and display unit, provide battery powered portable PC unit with proper software and hardware to interface with local DDCP.

2.5 DIRECT DIGITAL CONTROL SOFTWARE

A. DDCP control strategies shall be Owner definable from operator terminals or workstations.

B. Software functions and algorithms shall be sufficient to enable implementation of control sequences as specified and able to maintain continuous control as intended.

C. Control functions shall include both mathematical and logical operators. Control algorithms shall include proportional, integral and derivative control (PID). Adaptive (self-tuning) PID loop parameters, if offered by DDCP manufacturer, shall not be used unless adaptive limits are used to adjust limit values based on system status; or written request is submitted and approved by Engineer.

D. Allow operator to assign unique identifiers of their choice to each connected point. Identifiers must have at least 8 alpha/numeric characters. All reference to these points in programs, reports and command messages shall be by these identifiers.

E. Provide access control (user defined passwords) for system operation. There shall be minimum of 3 access levels. First level shall allow system monitoring only. Second level shall allow monitoring and setpoint, and scheduling revision. Third level shall allow modification of control algorithms. System shall return to secured (monitoring only) mode after 5 minutes of inactive operation.

F. Each DDCP shall contain self-diagnostics that continuously monitor proper operation of panel.

G. If microprocessor malfunctions, control loop outputs shall continue to function using last value received from microprocessor.

H. Control software and hardware for equipment operation shall be selected and engineered such that equipment shall function according to sequence of operation described in section 23 0993 – Control Sequences with interruption to network communication for extended periods of time.

I. Configuration software for all controllers shall be embedded in the controllers and shall be accessible through Internet Explorer, telnet, or hyper terminal.

2.6 BACNET BUILDING CONTROLLER (B-BC):

A. BACnet Building Controllers (B-BCs) shall provide direct connection to high speed, BACnet/IP Local Area Network (LAN) and Campus Ethernet network and serve as communications router for other controllers on slower speed BACnet MS/TP or BACnet over ARCNET Floor Level Network (FLN).

1. B-BC controllers shall be either:
   a. Tridium N4 JACE 8000
   b. NAE55

B. Communication between B-BC’s shall be through BACnet/IP communication.

C. B-BC’s shall have sufficient processor capabilities, hard-drive storage and RAM to implement all types of custom software applications and shall provide supervisory control, scheduling, trend logging & alarm handling functions as follows:
   1. Scheduling:
      a. Each B-BC shall support a minimum of 250 BACnet Schedule Objects and 250 BACnet Calendar Objects.
2. Trending:
   a. Any object in the system (real or calculated) may be logged. Sample time interval shall be adjustable at the operator’s workstation.
   b. B-BC shall periodically upload trended data to networked BAS Web Application Server for long term archiving.
      1. Archived data shall be stored in standard database format and shall be made available for use in third-party spreadsheet or database programs.
3. Alarm Generation:
   a. Alarms may be generated within the system for any object change of value or state either real or calculated. This includes analog object value changes, binary object state changes, and various controller communication failures.
   b. B-BC shall periodically upload alarm logs to networked BAS Web Application Server for long term archiving.
4. B-BC’s shall have uninterrupted real time clocks capable of time of day, week, and year information to the system as needed to perform software functions. Clock shall be programmed to reset twice per year to allow for Daylight Savings Time. Clocks in multiple DDC Controllers shall be synchronized to automatically match designated B-BC’s or Web server. Accuracy shall be within 1 second per day.
5. All control sequences programmed into the B-BC shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained. Power failures shall not cause the GDC memory to be lost, nor shall there be any need for batteries to be recharged or replaced to maintain the integrity of the controller database. The B-BC shall allow for the creation of unique application control sequences. Batteries shall maintain real time clocks for a period of at least 72 hours during power failure. Batteries shall be maintenance free and have minimum life of 2 years. When power has been restored, the following shall occur automatically:
   a. Orderly startup of controlled equipment (user defined)
   b. Continuation of control algorithms
   c. Database revision
   d. Logging of power interruption and restoration times
   e. Battery recharging
6. Provide local visual indication and system annunciation of low battery power for each battery.
7. Each B-BC shall include its own micro-processor, power supply, input/output modules, and termination modules as required to perform intended function. Systems that only allow selection of sequences from a library or table are not acceptable.
8. BACnet UDP port number to always be set to 47808 (BAC0).

2.7 OPERATOR’S WORKSTATION HARDWARE
A. Workstations shall communicate with BAS on as-needed basis such that other executionable programs may be processed without affecting control functions of BAS.
B. Owner will provide operator’s workstations for operator interface to BAS for monitoring, control, and database management. Each workstation shall consist of the following as a minimum:

2.8 BACNET ROUTER
A. BACnet MS/TP to BACnet/IP and BACnet/ARCNET to BACnet/IP Routers shall perform layer 3 routing of BACnet MS/TP or BACnet/ARCNET packets over an IP network in accordance with ASHRAE 135 Annex J. The router shall provide the appropriate connection to the IP network and connections to the BACnet MS/TP or BACnet/ARCNET network. BACnet Routers shall be capable
of configuration via DHCP and Write-Broadcast-Distribution-Table messages but shall not rely on these services for configuration.

B. One router in the IP subnetwork shall be designated as the BBMD (BACnet Broadcast Management Device) and shall be indicated as so on the Network Architecture.

C. BACnet router functionality can also be incorporated into BACnet Building Controllers.

2.9 NETWORK HARDWARE

A. Provide network interface hardware for each device connected to network. Each device shall have sufficient performance as not to degrade processing speed specified.

B. Provide network cabling with sufficient performance as not to degrade communication speed specified. Cabling shall be compatible with proposed system.

C. Provide other network support devices that are required for proper operation of network, such as file servers, signal repeaters, network hubs, etc.

2.10 GENERAL INSTRUMENTATION

A. General:
   1. No devices containing mercury will be allowed under this specification.

B. Pressure Gauges:
   1. Refer to Section 23 2120 - Piping Specialties.

C. Thermometers (Dial-Type):
   1. Refer to Section 23 2120 – Piping Specialties.

D. Analog Electronic Instrument Indicators:
   1. Electronic indicators, used for displaying sensor and/or output values as measured by current or voltage, shall be panel mount type and at least 2" square. Output may be analog needle type or digital with 1/2" high LED or backlit LCD displays.
   2. Electronic indicators shall be marked in appropriate units (Degrees, psi, %RH, gpm, cfm, etc.) and with appropriate range of values. Panel mounted indicators shall have minimum accuracy of 1% of scale range. Digital units shall be scaled to show 3 digits plus 1 decimal point.

2.11 DISCRETE ELECTRIC INSTRUMENTATION

A. General:
   1. Electrical devices, switches, and relays shall be UL listed and of type meeting current and voltage characteristics of the project. Terminal connections shall be made at terminal blocks inside of NEMA 1 enclosures unless otherwise specified. Outdoor units shall be NEMA 4 with concealed adjustment.
   2. Ratings of normally open and closed contacts shall be adequate for applied load (Minimum 5 amps at 240 V).
   3. Accuracy of devices shall be ± 1% of scale with adjustable offset unless otherwise specified.

B. Temperature Switches (Electric Thermostats):
   1. Line voltage or low voltage type suitable for application with adjustable setpoint and setpoint indication.
   2. Low voltage type to have heat anticipation.
3. Thermostats with remote sensing bulb shall have liquid filled sensing element and exposed setpoint adjustment.
4. Wall mounted space thermostat enclosure shall have concealed sensing element and exposed setpoint adjustment.
5. Unless otherwise stated, space thermostat covers shall be brushed aluminum or brushed nickel.
6. Manufacturer's standard plastic covers may be used in lieu of metal covers.

C. Temperature Switches (Aquastats):
1. Electric 2-position type with strap-on or immersion temperature sensing element. Switch contacts closed on increasing temperature to provide start signal for unit heaters, cabinet unit heaters and high limit control for heating hot water heat exchangers.
2. Sensing element shall be set for 100°F (FA) for unit heater control. For setpoints to aquastats for hot water heat exchangers, refer to control sequences for each hot water system. Provide screw-type terminals in NEMA 12 switch enclosure for field mounting at the unit heaters.

D. Relays:
1. Equal to IDEC type RH2B-U, miniature 8 blade pilot relay with DPDT silver cadmium oxide contacts rated at 15A, 30 VDC, or 120 VAC. Coil shall match control circuit characteristics. DDC outputs shall be 24 VDC with maximum current burden of 50 milliamps. Rectangular base socket mount with blade type plug-in terminals and polycarbonate dust cover.
2. Provide DIN rail mountable (Snap type) mounting sockets equal to IDEC SH2B-05.

E. Pressure Differential Switches:
1. Adjustable set point, differential pressure type. Select switches for accuracy, ranges (20 to 80% of operating range) and dead-band to match process conditions, electrical requirements and to implement intended functions.
2. Pressure differential switches for air systems shall have pressure rating of at least 10" WG.
3. Pressure indicating differential switches for air systems shall be equal to Dwyer Series 3000 photohelic gauge.
4. Pressure differential switches for water systems shall be rated for 150 psig unless otherwise noted. Chilled water pressure differential switches shall be provided with totally sealed vapor tight switch enclosure on 300 psi body. Differential pressure switches to have 3-valve manifold for servicing.
   a. Max Temperature Rating: 300°F
   b. Repeatability: ± 1%

F. Position Switches (End Switches):
1. Provide damper position switches, as required to meet specified sequence. Rotary switches shall be cam action, lever, or proximity type. Provide damper brackets and connecting rods for connecting position switch actuation levers to damper blades or jackshafts.
2. “Tip Switches” or other position switches that contain mercury shall not be used for damper and valve end switch applications.

G. Current Switches - Constant Load, Constant Speed:
2. These shall be induction type sensors clamped over single-phase conductor of AC electrical power and shall be solid-state sensors with adjustable threshold and normally open contacts. Each current switch shall be selected for proper operating range of current.
a. Output: Solid state relay or relay contacts
b. Trip Setpoint: Adjustable by multi-turn potentiometer
c. Operating Temperature: 0 to 55°C (32 to 131°F)
d. Response Time: < 0.5 second

H. Current Switches - Variable Load, Variable Speed
   1. Manufacturers: Veris Industries, N-K Technologies or approved equal
   2. These shall be induction type sensors clamped over single-phase conductor of AC electrical power and shall consist of solid-state sensors with self-calibrating threshold and normally open contacts. Each current switch shall be selected for proper operating range of current.
      a. Output: Solid state relay or relay contacts
      b. Trip Setpoint: Self-calibrating through microprocessor
      c. Operating Temperature: 0 to 55°C (32 to 131°F)
      d. Response Time: < 0.5 seconds

I. Indicator Lights:
   1. 1/4” minimum size. Use green for normal, yellow for warning (low/high values), and red for alarm or fail (low-low or high-high conditions). AC or DC type with voltage matched to control circuit without transformers.

2.12 ANALOG ELECTRONIC INSTRUMENTATION

A. Duct Mounted or Insertion Temperature Sensors:
   1. Nickel or platinum RTD type, with the following minimum performance:
      a. Temperature Coefficient: 0.00385 ohm/ohm/°C
      b. Accuracy: ±0.54°F + (0.005 X T) (Class B)
      c. Accuracy: ±0.27°F + (0.005 X T) (Class A)
         T = Temperature of interest
      d. Conformance: DIN-IEC 751
      e. Operating Range: -50 to 170°F
         0 to 99% rh
   2. Install insertion sensors in stainless steel probes or wells.
   3. Outside air sensors shall be weatherproof of noncorrosive construction and protected with solar shield. Mount outside air sensors on north side of building or in area intake wells for air handling systems to avoid thermal effects from direct sunlight.
   4. Sensors mounted in air streams, such as air handling units, supply ducts, exhaust ducts or return ducts, shall be averaging type. Mount averaging sensor across duct area in a “Z” pattern using mounting clips specific for averaging temperature sensor probes.
   5. Thermistors or nickel RTD will be acceptable in lieu of platinum RTD provided thermistor carries 5 year guarantee that the device will maintain its accuracy within a tolerance of ± 0.36°F between 32°F and 150°F, and 0.5°F between -20°F and 212°F.

B. Pressure (E-P) Transducers:
   1. Manufacturers: Brandt, Johnson Controls, Honeywell, Fairchild, Kele & Associates, Siemens, Moore Industries, or TAC
   2. Provide pressure transducers integral to DDC panels or separate components to convert digital analog signal to variable pneumatic air pressure signal. Units to have following characteristics:
      a. Input: 4-20 mA or 0-5 VDC
b. Linearity 1% of span
c. Hysteresis 0.75% of span
d. Maximum air consumption 0.008 scfm @ 20 psi

C. Magnetic Flowmeter/Transmitter:
1. Manufacturers: Onicon F-3500, or approved equal.
2. Electromagnetic induction type with linear response proportional to flow rate. Selected span shall be not greater than twice design flow range. Select units for 10:1 turndown.
3. Unit shall be complete with 150 lb raised face flanged flowtube, PTFE, EPDM neoprene or PFA liner, magnetic coils, self-cleaning 316 stainless steel or Hastelloy C4 electrode, and 4-20 mA transmitter/power supply housed in NEMA 4 enclosure. Transmitter shall be fully field configurable microprocessor based unit.
   a. Minimum Accuracy: ± 0.5% of Span including hysteresis
   b. Repeatability: ± 0.1% of reading
   c. Operating Temperature: 15-250°F
   d. Power Requirements: 120 VAC / 60 Hz
4. Transmitter shall be integral mounted on flow meter.
5. Provide remote mounted indicator/transmitter. Indicator to be 1/2" LCD or back lit LED type.

D. Ultrasonic Flowmeter (For WFM-CHW):
1. Manufacturer: Flexim Fluxus F70x
2. These shall be transient time ultrasonic type flow meters to provide linear output signal proportional to flow rate. Sensors shall be mounted to pipe according to pipe size and materials per manufacturer’s installation instructions.
3. Instrument shall be microprocessor based and shall be fully field configurable via Highway Addressable Remote Transmitter (HART) communication protocol from controller.
   a. Sensor Mounting: Strap-on to pipe
   b. Converter Mounting: Remote Wall Mount
   c. Process Temperature Limits: 0°F to 300°F
   d. Performance:
      e. Accuracy: ± 0.5% of Span
      f. Repeatability: ± 0.5% of Span
4. Process Media Requirements:
   a. Maximum Entrained Gas: 0.75% minimum
   b. Maximum Turbidity: 7500 ppm minimum
5. Power Requirements: 120VAC / 60 Hz
6. Minimum Turn-Down: 10 to 1 of full scale
7. Minimum Enclosure Rating: NEMA 4
8. Output: 4-20 mA DC current or 10 kHz Frequency
9. Materials of Construction:
   a. Sensor: 316 Stainless Steel
   b. Strap Material: 316 Stainless Steel
10. Options:
    a. Local Indication: Digital LCD 3 digit minimum
    b. Smart Transmitter Protocol: HART
11. Calibration Shift and Ambient Effects:
a. Position: Transmitter shall operate in any position.
b. Vibration: Transmitter shall not be affected by industry normal piping vibration when operating within its normal range.
c. Ambient Temperature: Transmitter shall not be in error more than 1.0 percent of span over change in ambient temperature of 100°F.

E. Conditioning Orifice Plate Meter (COP):
1. Manufacturer: Rosemount 3051SFC
2. The COP shall consist of four symmetrical orifice holes to allow flow separation independent of flow rate, pressure or temperature. Meter shall have both volumetric and mass flow outputs. COP shall be capable of installing between Orifice Flange Unions.
3. Instrument shall be microprocessor based and shall be fully field configurable via Highway Addressable Remote Transmitter (HART) communication protocol from controller.
   a. Sensor Mounting: Paddle type
   b. Converter Mounting: Remote Wall Mount
   c. Process Temperature Limits: -40°F to 450°F
   d. Process Pressure Limits: 6000 psig at 100°F
   e. Accuracy: ± 1.15% of Span
   f. Repeatability: ± 1.15% of Span
4. Power Requirements: 120VAC / 60 Hz
5. Minimum Turn-Down: 14 to 1 of full scale
6. Minimum Enclosure Rating: NEMA 4
7. Output: 4-20 mA DC current or 10 kHz Frequency
8. Materials of Construction:
   a. Primary Element: 316 Stainless Steel
9. Options:
   a. Local Indication: Digital LCD 3 digit minimum
   b. Smart Transmitter Protocol: HART
10. Calibration Shift and Ambient Effects:
    a. Position: Transmitter shall operate in any position.
    b. Vibration: Transmitter shall not be affected by industry normal piping vibration when operating within its normal range.
    c. Ambient Temperature: Transmitter shall not be in error more than 1.0 percent of span over change in ambient temperature of 100°F.

F. Verabar (Alternate):
1. Manufacturer: Verabar
2. The meter shall consist of self-averaging primary flow sensor measures the critical static pressure component on both sides of the sensor with dual, multiple ports located ahead of the point at which the fluid separates from the probe.
3. Instrument shall be microprocessor based and shall be fully field configurable via Highway Addressable Remote Transmitter (HART) communication protocol from controller.
   a. Converter Mounting: Remote Wall Mount
b. Process Temperature Limits: -40°F to 450°F

4. Power Requirements: 120VAC / 60 Hz

5. Minimum Turn-Down: 10 to 1 of full scale

6. Minimum Enclosure Rating: NEMA 4

7. Output: 4-20 mA DC current or 10 kHz Frequency

8. Materials of Construction:
   a. Primary Element: 316 Stainless Steel

9. Options:
   a. Local Indication: Digital LCD 3 digit minimum
   b. Smart Transmitter Protocol: HART

10. Calibration Shift and Ambient Effects:
    a. Position: Transmitter shall operate in any position.
    b. Vibration: Transmitter shall not be affected by industry normal piping vibration when operating within its normal range.
    c. Ambient Temperature: Transmitter shall not be in error more than 1.0 percent of span over change in ambient temperature of 100°F.

G. Electronic Controllers:
   1. Provide dedicated function type controllers with electronic analog and/or discrete electric type inputs and electronic analog and/or discrete electric type inputs, capable of performing sequences specified. Analog loop controllers shall have PID programs. Units shall have faceplate with adjustable setpoints, calibration, offset, gain factors, and visual display of all parameters.

PART 3 - EXECUTION

3.1 GENERAL

A. Install control equipment, wiring and air piping in neat and workmanlike manner to satisfaction of Architect and/or Engineer, and in accordance with manufacturer's recommendations. Maintain clearances, straight length distances, etc. required for proper operation of each device. Mark and detail exact location of inline devices, wells, and taps to be installed by Mechanical Contractor on Coordination Drawings.

B. Coordinate timely delivery of materials and supervise activities of other trade contractors to install inline devices such as immersion wells, pressure tappings, any associated shut-off valves, flow switches, level switches, flow meters, air flow stations, and other such items furnished by Control Contractor that are to be installed by Mechanical Contractor.

C. Install control devices in accessible location.

D. Mount motor control devices within 5 ft of disconnect switch, or starting device furnished by Electrical Contractor unless noted otherwise. Maintain required NEC clearances.
3.2 CONTROL WIRING

A. Provide all electrical wiring required for complete functional control systems, including power circuit to control panels, both line and low voltage, in accordance with all applicable local codes, and the latest version of National Electric Code and NFPA when applicable.
   1. Voltage drops for all low voltage circuits shall be calculated prior to installing low voltage circuits. Voltage drop calculations shall be made available to Engineer on demand.

B. Control panels serving equipment fed by emergency power shall also be served by emergency power. Equipment fed by emergency power is so indicated on mechanical equipment schedules and electrical motor schedules.

C. Control panels shall be powered by local UPS (Uninterruptible Power Supply) to ensure continued control of equipment powered by site standby power sources when primary power source is lost. Devices such as Operator Workstations, Floor Level and Building Level Controllers and other critical devices shall be provided with UPS power.

D. Power wiring to control compressors and dryers will be provided by Electrical Contractor. Provide field mounted starters to Electrical Contractor for installation and supervise installation.

E. Install control wiring in raceway system per Division 26 - Electrical, unless otherwise noted.

F. BAS Network Communication Cable:
   1. Run communication cable in separate raceways or in cable trays with proper clearances.
   2. Install special cable connectors in accordance with manufacturer's recommendations.
   3. BAS network communication cable shall not be spliced.

3.3 LOCAL CONTROL PANELS

A. Provide local control panel for each system where more than one control device requires field mounting (air handling units, exhaust fans, miscellaneous control systems including pump controls, heat exchanger controls, etc.). Single devices may be exposed mounted on piping, wall or ductwork. Install local control panel where indicated on drawings or suitable location adjacent to system served.

B. Mount panel on wall with suitable brackets or on self-supporting stand. Mount top of panel no higher than 6 ft above floor. Install panels so front cover door can swing full open without interference.

C. Label all local control panels with its respective unique ID number per Section 20 0553 - Mechanical Systems Identification.

3.4 ADJUSTMENT AND COMPLETION CHECK LIST

A. After completion of installation, follow check standard list procedures defined by instrument vendors to adjust and calibrate all thermostats, control valves, control actuators, controllers, sensors, and other equipment provided in this Contract.

3.5 OWNER TRAINING

A. Provide minimum of 8 hrs of on-site training to Owner's representatives. Conduct training sessions during normal business hours after system start-up and acceptance by Owner. Scheduling of training session(s) will be established by Owner.
3.6 OVERALL BAS ARCHITECTURE

A. Provide hardware/software to update database in less than 1 second for fast-acting control loops such as pressure control, air or water volume control, and air handling unit temperature control, or 10 seconds or less for all other control loops.

B. Control loop software algorithm for each analog control loop shall reside on the same controller as all inputs and outputs required for that specific control loop.

C. Networks that operate via polled response or other types of protocols that rely on central processors, file servers, or other such devices to maintain or manage peer-to-peer communications shall have redundant components to maintain network in the event of failure at central device. Provide automatic changeover to redundant device upon failure of any central type processor without operator intervention.

D. Network shall be multi-drop digital transmission network. Network shall provide communication link between operator’s workstation and all remote DDCP and field panels.

E. Each multi-drop trunk shall be within manufacturer's allowable line lengths without signal degradation. All multi-drop trunks shall be interfaced to system via standard EIA or other industry recognized interfaces so that single failure does not disrupt or halt network.

F. Communications between DDCP’s and operator’s workstations shall allow multiple users to access and use system simultaneously with no loss of system performance.

G. Provide levels of connected networks to connect all DDCP, including terminal DDCP. Communications to terminal devices shall be similar to capabilities and functions of other DDCP and shall be transparent to operator.

H. Number of nodes (devices connected) on any one network shall not exceed 50 % of maximum node capacity published by equipment manufacturer. Provide additional hardware, DDCP, network controllers, etc.) to meet this requirement.

I. Alarm reports from DDCP shall not be impeded by use of either remote or local monitor, nor control stations on network either in access mode or programming mode.

J. Provide telephone modem for remote access to system from remote operator’s workstation. Coordinate telephone communications with Owner for modem connection point.

3.7 DIRECT DIGITAL CONTROL PANELS

A. DDC Panel Usage:
   1. Select DDCP to provide speed of response required for each control loop type.
   2. Each DDCP shall have sufficient I/O capacity to perform specified control sequences and/or included points listed in any point schedules. If DDCP does not have sufficient capacity, provide additional panels to achieve required point count.
   3. Analog and critical safety discrete control loops shall have inputs and outputs into/from the same DDCP. Analog control loops for major equipment (chilled water, hot water, convertors, air handling units, etc.) shall have PID control.
   4. For valves and dampers within 100 ft of its DDCP, mount current to pneumatic (I/P’s) convertors within DDCP or in adjacent panel. Otherwise mount I/P convertors at valve or damper. Provide pressure gauges on main air, and all control output signals.
B. Cabinets:
   1. Provide local control cabinets for all DDCP. DDCP cabinets may be used directly if enclosures are rated for NEMA 1. All cabinets shall utilize one masterkey. Provide 2 spare key sets to Owner.

3.8 SOFTWARE
   A. Software from panels shall be permanently stored on CD ROM.
   B. Provide the latest version of all standard software, including, operating system and control software. Include any software updates for period of 1 yr coinciding with warranty period. No beta released software shall be used.

3.9 INITIAL PROGRAMMING
   A. Control Contractor shall provide initial programming of all controllers to accomplish sequences specified.
   B. Provide back-up documentation per software manual submittals for all programs in both written and magnetic media formats.
   C. Provide programming of menus to assist new users in accessing screen displays of each point group. Point groups (user definable) shall be initially arranged by DDCP for major equipment and by floor and area for terminal devices. Terminal devices shall also be grouped by air handling system where applicable.
   D. Program historical file for run-times and number of start/stops of all motor driven equipment and filters.
   E. Program maintenance alarms based on run-times and number of start/stops for all motor driven equipment.
   F. Program alarms using the following levels:
      1. Level 1 - Maintenance alarm, requiring attention within one to 2 days. (Examples; 2-3°F temperature variance from setpoint, 15-25% relative humidity variance, etc.)
      2. Level 2 - Low Level Alarm, requiring attention within 8 hours, preferably during the same shift. (Examples; 4°F or more variance from setpoint, 30% relative humidity or more variance from setpoints, etc., excess start/stops per day, etc.)
      3. Level 3 - Critical Alarm, requiring immediate attention. (Examples; non-operation of primary equipment, H-O-A overrides.)
      4. Level 1 and 2 alarms shall not interrupt current user operation, but shall be logged into alarm summary file indicating status, acknowledgment, and by whom. Level 3 alarms shall interrupt user via audible and/or flashing warning until acknowledged without losing any work in progress. When alarms are acknowledged, the program shall display point group or appropriate graphic display. Level 3 alarms shall also be logged into alarm summary file similar to Level 1 and 2 alarms.

3.10 POINT LIST
   A. Provide all points required to implement control sequences specified, whether or not they are listed in schedules. In addition to control points, provide additional monitoring points.
   B. All outputs, whether sequenced or not, shall have separate programmable hardware outputs. For air handling units, minimum outside air, maximum (economizer) outside air, return, relief air, smoke
dampers, heating coil valves, cooling coil valves, humidifier valves, etc., shall each have separate output.

3.11 GENERAL INSTRUMENTATION

A. Pressure Gauges (Pressure Indicators):
   1. Install pressure gauge for indication of supply and control pressure in pneumatic systems at output of controllers, I/P transducers, electric air solenoid valves and pressure switches, and other points where visible indication of air pressure is required for operation and maintenance purposes.
   2. Provide test port for quick connection of test gauges at valve, damper motor and other actuator branch lines.
   3. Pressure gauge tappings in piping will be installed by Mechanical Contractor.

B. Thermometers (Temperature Indicators):
   1. Install thermometers at each point of temperature transmission and control except those indicated at local control panels. Install thermometers to permit easy reading from floor or operating platform (within 3 ft of line of sight). Provide remote bulb thermometers with readout indicators mounted within 3 ft of line of sight whenever sensing point is more than 3 ft from line of sight.
   2. Thermometer wells in piping will be installed by Mechanical Contractor.

3.12 LOCAL CONTROL PANELS

A. Install remote mounted devices, controllers, I/O terminal blocks, power supplies, etc. inside of local control panels.

B. Locate panels as shown on drawings.

C. Locate panels adjacent to equipment served with a minimum of 3 ft clearance in front of the door. Provide sufficient clearances to allow full door swing and full access to all internal components. Submit proposed panel locations with shop drawings.

D. Mount top of panel between 5 and 6 ft above floor so gauges and indicators are at eye level.

3.13 DISCRETE AND ANALOG INSTRUMENTATION

A. Wall Mounted Space Sensors:
   1. Install space thermostats/sensors where indicated, as required to perform specified controls, or directed to meet job site conditions.
   2. Mount thermostats/sensors 5 ft above floor unless otherwise indicated.
   3. Mount space thermostats/sensors with accessible setpoint adjustment or temperature reading (thermometer or digital temperature readout) at 4 ft above floor meeting ADA requirements.
   4. Any room thermostats/sensors mounted on exterior walls shall be mounted on thermally insulated sub-base.
   5. Relocate room thermostats/sensors if required due to draft, interferences with cabinets, chalkboards, etc., or improper sensing.
   7. Room thermostats/sensors in corridor, stairways, vestibules and toilets shall be aspirating type.

B. Water Flow Meters and Flow Switches:
1. Install flow measuring devices with recommended straight pipe diameters upstream and downstream of elbows, tees, valves, or other fittings, that cause uneven turbulent flow conditions.

2. If no recommendations are given, provide straight pipe equal to 10 pipe diameters upstream and 5 pipe diameters downstream of flow measuring device.

C. Sensor Wells:
   1. Mount sensor wells as shown on drawings as required by other contract documents. Wells mounted in pipe 3” and larger may be installed in horizontal or vertical lines provided element is always in flow (for condensate and other gravity return lines, install in bottom of pipe). Wells mounted in pipe 2-1/2” and smaller shall be installed at elbow tee fittings with well pointed upstream. Minimum of 2” pipe size for elbow tee installation.

D. Transmitters and Indicators:
   1. Locate transmitters at sensing device or within 100 ft for remote mounted transmitters. For hot systems (150°F and higher) mount electronics on side of pipe or remotely mount. For indicating type instruments, locate indicating element with 6 ft of floor with readout easily visible from floor level. Provide remote readouts if necessary.

END OF SECTION
DESCRIPTION OF WORK

EXISTING GENERATOR

PIPE DISTANCE TO INLET OF METER.

MODIFY PIPE AS NEEDED TO ENSURE INSTALL NEW GAS METER IN AND.

EXISTING GAS TRAIN

C.U.P HVAC PLAN CUP BUILDING FIRST FLOOR - LOWER LEVEL

EXISTING REFRIGERANT LEAK MONITORING

X - 14X14 EA

28X28 EA

VD

X - 40X40 EA UP TO EF-4

26X24 EA BOD 15'-8" FAN

REFRIGERANT EXHAUST ON ROOF.

X - 20X18 EA

X - 14X14 EA

LEAK SENSOR

REFRIGERANT

X - 14X14 EA

X - 20" CTR

AAV

FOB

5

54"Ø

X-24X20 EA

X - 16"Ø EA

X - 20"Ø CTS

10 14 VD

10 14 DN

16"Ø DN

16"Ø EA DN

5400 5400 5400

CH

6

2

1

" ALUMINUM PIPE DOWNSTREAM OF 54"Ø

CWS PIPE SHALL BE DIRECTLY DOWNSTREAM OF VALVE.

EXISTING INSULATION, PROVIDE FLANGE AND ROUTE REMOVE EXISTING BLIND VALVE AND CONNECT TO NEW 16"Ø CWS DN WITH VALVE AND CONNECT TO EXISTING AND ROUTE DOWN TO BASEMENT LEVEL. CORRDINATE WITH EQUIPMENT REMOVAL AS REQUIRED PER MANUFACTURERS RECOMMENDATIONS.

PIPING ROUTED ABOVE CHILLER SHALL BE INSTALLED AT A SUITABLE ELEVATION TO ALLOW FOR MAINTENANCE ACCESS AND PUMP ARE AT SAME ELEVATION AS CHILLER CONNECTION.

PROVIDE FLANGED CONNECTIONS TO CHILLER, PER CHILLER SPEC. MECHANICAL GROOVED COUPLINGS SHALL NOT BE ALLOWED.

PROVIDE DIFFERENTIAL PRESSURE SWITCH ON CHILLED WATER AND CONDENSER WATER. REFER TO CONTROLS ALONG WITH SENSOR.

ROUTE AIR VENT PIPING ALONG SIDE OF CHILLER DOWN TO FLOOR DRAIN

PROVIDE 16"H X 24"W X 144" L CONCRETE SUPPORT BLOCKS ON EACH END OF NEW CHILLER.

FOR NEW R-134A MACHINE, PROVIDE REFRIGERANT LEAK SENSOR AT THIS LOCATION AND EXPAND OFF OF MAIN CONTROL PANEL

CONCRETE PAD.

ACCESSIBLE FROM FLOOR LEVEL. IF THIS IS NOT POSSIBLE DUE TO THE CHILLER CONFIGURATION A FIXED OSHA APPROVED 460 VOLT, 3 PHASE, 60 HERTZ POWER WITH VARIABLE SPEED DRIVES PROVIDED BY OTHERS. THE FILTER MANIFOLD SHALL BE INSTALLED AT A SUITABLE ELEVATION TO ALLOW FOR MAINTENANCE ACCESS.

ROUTE CHILLED WATER DOWNSTREAM OF VALVE WITH A 30"X30" (MIN.) STAND OFF PLATFORM SHALL BE PROVIDED AT EACH CHILLER LADDER WITH A 30"X30" (MIN.) STAND OFF PLATFORM SHALL BE PROVIDED AT EACH CHILLER CONCRETE PAD. FOR NEW R-134A MACHINE, PROVIDE REFRIGERANT LEAK SENSOR AT THIS LOCATION AND EXPAND OFF OF MAIN CONTROL PANEL

CONCRETE PAD.

ACCESSIBLE FROM FLOOR LEVEL. IF THIS IS NOT POSSIBLE DUE TO THE CHILLER CONFIGURATION A FIXED OSHA APPROVED 460 VOLT, 3 PHASE, 60 HERTZ POWER WITH VARIABLE SPEED DRIVES PROVIDED BY OTHERS. THE FILTER MANIFOLD SHALL BE INSTALLED AT A SUITABLE ELEVATION TO ALLOW FOR MAINTENANCE ACCESS.

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CONCRETE PAD.

ACCESSIBLE FROM FLOOR LEVEL. IF THIS IS NOT POSSIBLE DUE TO THE CHILLER CONFIGURATION A FIXED OSHA APPROVED 460 VOLT, 3 PHASE, 60 HERTZ POWER WITH VARIABLE SPEED DRIVES PROVIDED BY OTHERS. THE FILTER MANIFOLD SHALL BE INSTALLED AT A SUITABLE ELEVATION TO ALLOW FOR MAINTENANCE ACCESS.

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ROUTE CHILLED WATER DOWNSTREAM OF VALVE WITH A 30"X30" (MIN.) STAND OFF PLATFORM SHALL BE PROVIDED AT EACH CHILLER LADDER WITH A 30"X30" (MIN.) STAND OFF PLATFORM SHALL BE PROVIDED AT EACH CHILLER CONCRETE PAD. FOR NEW R-134A MACHINE, PROVIDE REFRIGERANT LEAK SENSOR AT THIS LOCATION AND EXPAND OFF OF MAIN CONTROL PANEL

CONCRETE PAD.

ACCESSIBLE FROM FLOOR LEVEL. IF THIS IS NOT POSSIBLE DUE TO THE CHILLER CONFIGURATION A FIXED OSHA APPROVED 460 VOLT, 3 PHASE, 60 HERTZ POWER WITH VARIABLE SPEED DRIVES PROVIDED BY OTHERS. THE FILTER MANIFOLD SHALL BE INSTALLED AT A SUITABLE ELEVATION TO ALLOW FOR MAINTENANCE ACCESS.
TABLE OF CONTENTS

ARTICLE 01 GENERAL INFORMATION ........................................................................ 3
ARTICLE 02 FIELD CONDITIONS ............................................................................. 3
ARTICLE 04 CONSULTANT ....................................................................................... 3
ARTICLE 06 TIME FOR COMPLETION ........................................................................ 3
ARTICLE 07 LIQUIDATED DAMAGES ........................................................................ 3
ARTICLE 08 SUBMITTALS AND SHOP DRAWINGS ............................................... 4
ARTICLE 09 PLANS, DRAWINGS, AND SPECIFICATIONS ...................................... 9
ARTICLE 10 PROGRESS MEETINGS ........................................................................ 10
ARTICLE 11 CRITICAL PATH METHOD (CPM) SCHEDULE .................................... 10
ARTICLE 12 WALK-THROUGH ............................................................................... 13
ARTICLE 13 OWNER’S CONSTRUCTION REPRESENTATIVE .................................. 13
ARTICLE 14 FIELD OFFICE ................................................................................. 13
ARTICLE 15 TELEPHONE SERVICE ....................................................................... 14
ARTICLE 16 CONSTRUCTION FENCE ..................................................................... 14
ARTICLE 17 PROJECT SIGN .................................................................................... 15
ARTICLE 18 PARKING ............................................................................................. 15
ARTICLE 19 SANITARY FACILITIES ...................................................................... 15
ARTICLE 20 RULES OF MEASUREMENT ............................................................... 16
ARTICLE 21 ALLOWANCES ................................................................................... 16
ARTICLE 22 CONSTRUCTION CONTINGENCY FUNDS .......................................... 16
ARTICLE 23 SEQUENCE OF CONSTRUCTION ...................................................... 17
ARTICLE 24 CRANE & MATERIAL HOIST OPERATIONS ....................................... 18
ARTICLE 25 UTILITIES .......................................................................................... 18
ARTICLE 26 CLEANING AND TRASH REMOVAL ............................................... 19
ARTICLE 27 BLASTING ......................................................................................... 20
ARTICLE 28 CUTTING AND PATCHING - NEW AND EXISTING WORK .............. 20
ARTICLE 29 UNRELATED PROJECTS ....................................................................... 21
ARTICLE 30 OWNER SUPPLIED MATERIALS ....................................................... 21
ARTICLE 31 REMOVED ITEMS .............................................................................. 21
ARTICLE 32 INTERIOR ENCLOSURE AND DUST ENCAPSULATION .................... 21
ARTICLE 33 UKIT COMMUNICATIONS AND NETWORK SYSTEMS .................... 23
ARTICLE 34 EMERGENCY VEHICLE ACCESS .................................................... 23
ARTICLE 35 SMOKE DETECTORS / FIRE ALARM SYSTEMS- EXISTING AND/OR NEW FACILITIES ................................................................. 23
ARTICLE 36 SURVEYS, RECORDS, REPORTS ....................................................... 23
ARTICLE 37 SMOKING IS PROHIBITED ................................................................. 24
ARTICLE 38 ALTERNATES ..................................................................................... 24
ARTICLE 39 FIELD CONSTRUCTED MOCK UPS ............................................... 25
ARTICLE 40 PROJECT COORDINATION VIA COMPUTER .................................... 26
ARTICLE 41 HOT WORK PERMITS ......................................................................... 27
ARTICLE 42 INSURANCE ......................................................................................... 27
ARTICLE 01 GENERAL INFORMATION

1.1 These Special Conditions are intended to modify, supplement, or delete from, applicable Articles of the General Conditions.

1.2 Where any Article of the General Conditions is supplemented by these Special Conditions, the Article shall remain in effect and the supplement shall be added thereto.

1.3 Where Special Conditions conflict with General Conditions, provisions of the Special Conditions take precedence.

ARTICLE 02 PERMITS AND FEES

The Lexington Fayette Urban County Government (LFUCG) Sewer Tap Fee shall be secured and paid for by the Construction manager at the current rate at the time of application.

ARTICLE 03 (NOT USED)

ARTICLE 04 CONSULTANT

4.1 Wherever in these Contract Documents reference is made to the Consultant, it shall be understood to mean Champlin Architecture of Cincinnati, Ohio or their duly authorized representatives. (See Article 2 of the General Conditions.)

ARTICLE 05 GEOTECHNICAL REPORT

5.1 No subsurface or geotechnical survey information is available at this time.

ARTICLE 06 TIME FOR COMPLETION

6.1 The time for Substantial Completion as further defined in Article 1 of the General Conditions shall be January 17, 2019 as specified in the Work Order letter, and Final Completion shall be 30 days thereafter.

ARTICLE 07 LIQUIDATED DAMAGES

7.1 Should the Construction Manager fail to achieve Substantial Completion of the Work under this Contract on or before the date stipulated for Substantial Completion (or such later date as may result from extensions in the Contract Time granted by the Owner), he agrees that the Owner is entitled to, and shall pay the Owner as liquidated damages the sum of Two Thousand Three Hundred Ninety ($2,390.00) for each consecutive calendar day that Substantial Completion has not been met. See Article 3 of the Agreement.

7.2 Should the Construction Manager fail to achieve Final Completion of the Work under this Contract on or before the date stipulated for Final Completion (or such later
date as may result from extensions in the Contract Time granted by the Owner), he agrees that the Owner is entitled to, and shall pay the Owner as liquidated damages the sum of One Thousand Two Hundred Dollars ($1,200.00) for each consecutive calendar day until Final Completion is reached. See Article 3 of the Agreement.

ARTICLE 08 SUBMITTALS AND SHOP DRAWINGS

8.1 SUBMITTALS - GENERAL

8.1.1 The Construction Manager shall submit each set of Shop Drawings, product data and samples as a separate item in UK E-Communication®. Projects not utilizing UK E-Communication® must submit all items electronically to the Consultant and the UK Project Manager and Administrative Coordinator.

8.1.2 All sample selections for color shall be submitted for approval at the same time. Color selections shall not be submitted individually.

8.1.3 Any deviation from the Contract Documents shall be noted on the transmittal form comment section.

8.1.4 All submittals are to be reviewed by the Construction Manager for compliance with the Contract Documents before submission for approval. All submittals are to be initiated by the Construction Manager. Submittals made directly to the Consultant by sub-contractors, manufacturers or suppliers will not be accepted or reviewed.

8.1.5 Re-submittals shall conspicuously note all changes from earlier submissions. Special notation by the Construction Manager shall be made to any changes other than those made in response to the Consultant's review.

8.1.6 Manufacturers shall, when requested by the Consultant, submit test reports prepared by reputable firms or laboratories certifying as to performance, operation, construction, wearability, etc., to support claims made by the manufacturer of the equipment or materials proposed for inclusion in the Work. Construction Manager shall also submit a list of three (3) installations where said equipment or materials have been in service for a minimum of five (5) years.

8.2 SUBMISSIONS - REVIEW

8.2.1 Review of submittals is only for compliance with the design concept and the contract documents. THE CONSULTANT SHALL NOT BE RESPONSIBLE FOR CHECKING DEVIATIONS FROM CONTRACT DOCUMENT REQUIREMENTS OR CHANGES FROM EARLIER SUBMISSIONS NOT SPECIFICALLY NOTED.

8.2.2 The following shall be verified prior to making submittals:
Field Measurements, Field Construction Criteria, Catalog numbers and similar data, Quantities and Capacities, and Compliance with requirements, including verification of all dimensions,

8.2.3 Review Stamp designations shall be as follows:

8.2.3.1 “NET = No Exceptions Taken”: Proceed with the Work, no corrections needed.

8.2.3.2 "FC= Furnish as Corrected”: Proceed with the Work, noting the corrections/conditions of the approval.

8.2.3.3 "RR = Revise and Resubmit": Do not proceed with the Work, as the submittal does not comply with the Contract Documents. Revisions to the submittal are required for approval. On projects utilizing UK E-Communication, “Send Back a Step” is used in lieu of “Revise and Resubmit”

8.2.3.4 "R = Rejected": Do not proceed with the Work, the submittal is rejected.

8.3 SUBMISSIONS - SPECIAL PROVISIONS

8.3.1 In making a submittal, the Construction Manager shall be deemed to be making the following representations:

8.3.1.1 The Construction Manager understands and agrees that he shall bear full responsibility for the products furnished. The Construction Manager expressly warrants that products described in the attached submittal will be usable and that they conform to the Contract requirements unless specifically noted otherwise.

8.3.1.2 The Construction Manager understands and agrees that, without assuming design responsibility, he expressly warrants that products described in the attached submittal are capable of being used in accordance with the intent of the design documents and that they conform to the Contract requirements unless specifically noted otherwise.

8.3.1.3 The Construction Manager acknowledges that the Owner will rely on the skill, judgment, and integrity of the Construction Manager as to conformance requirements and subsequent usability.

8.4 SHOP DRAWING AND PROCUREMENT SUBMITTAL LOG

8.4.1 The Construction Manager, within ten (10) days after the Pre-Construction meeting, shall begin uploading submittals using UK E-Communication®, to generate a log fixing the dates for submission of Shop Drawings, special order material items, certifications, guarantees, and any other items required to be submitted to the Consultant for review, approval or acceptance. Projects not utilizing UK E-Communication® will submit a Shop Drawing Log provided by the Owner during the Pre-Construction
8.4.2 The log shall track all submittals to date. The updated log shall then be reviewed and discussed at each progress meeting to determine items that may impact the construction schedule.

8.5 Shop Drawings

8.5.1 The Construction Manager shall review, approve, and submit Shop Drawings to the Consultant, in accordance with the Consultant's Shop Drawing & Procurement Submittal Log or UK E-Communication®, as herein detailed. By approving and submitting Shop Drawings, the Construction Manager represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

8.5.2 The Construction Manager shall submit Shop Drawings required for the Work and the Consultant will review and take appropriate action. The review and approval shall be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The approval of a separate item will not indicate approval of the assembly in which the item functions.

8.5.3 The Construction Manager shall make any corrections required by the Consultant for compliance to the Contract and shall return the required number of corrected copies of Shop Drawings and resubmit new samples until approved. The Construction Manager shall direct specific attention, in writing, or on resubmitted Shop Drawings, to revisions other than the corrections called for by the Consultant on previous submissions. The Construction Manager's stamp of approval on any shop drawing or sample shall constitute a representation to Owner and Design Consultant that the Construction Manager has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar date, or he assumes full responsibility for doing so, and that he has reviewed or coordinated each shop drawing or sample with the requirements of the Work and the Contract Documents.

8.5.4 Where a shop drawing or sample submission is required by the specifications, no related Work shall be commenced until the submission has been approved by the Design Consultant. A copy of each approved shop drawing and each approved sample shall be kept in good order by the Construction Manager at the site and shall be available to the Consultant.

8.5.5 The Consultant's approval of Shop Drawings or samples shall not relieve the Construction Manager from his responsibility for any deviations from the requirements of the Contract Documents unless the Construction Manager has in writing called the Consultant's attention to such deviation at the time of submission and the Consultant has given written approval to the specific deviation. Any approval by the Consultant shall
not relieve the Construction Manager from responsibility for errors or omissions in the Shop Drawings.

8.5.6 All submittals are to be submitted electronically by the contractor. Workflow in UK E-Communication® will be established during the workflow meeting. Each individual Shop Drawing shall have its respective specification number and description highlighted.

8.5.7 Where Shop Drawings include fire alarm, communication systems schematics, sprinkler systems, etc., a mylar sepia of each drawing shall be submitted to the Consultant as part of the "Record" set of drawings.

8.6 SUBMISSIONS - SAMPLES

8.6.1 Office samples shall be of sufficient size and quantity to clearly illustrate functional characteristics of the product with integrally related parts and attachment devices, and full range of color, texture, and pattern.

8.6.2 Products shall not be used until the sample has been submitted to and approved by the Consultant.

8.6.3 A minimum of two (2) samples are required to be submitted to the Consultant for review and approval and will be distributed as follows:

   a) One to be retained by the University;
   b) One to be returned to the Design Consultant;
   c) An additional sample or samples may be submitted, at the Construction Manager's option, for distribution to a third party.

8.6.4 Field samples (block, brick, etc.) of materials to be constructed at the site shall be submitted for review as required by the individual section of the Contract Documents.

8.7 SUBMISSIONS - OPERATION AND MAINTENANCE MANUALS

8.7.1 The University requires a minimum of two (2) bound copies and one (1) digital copy of the final installation, training, operation, maintenance, and repair manuals to be turned over to the Owner's Project Manager and approved for content by the Consultant by or before the time construction is 75% complete.

8.7.2 Manuals provided must be of sufficient detail to enable the Owner or others to install, calibrate, train, operate, maintain, service and repair every system, subsystem, and/or piece of equipment installed on or as part of this Contract. Each manual must contain:
8.7.2.1 Project Title, Project number, Location, dates of submittals, names, addresses and phone number for the Consultant, Construction Manager, and Construction Manager's Sub-contractors;

8.7.2.2 An Equipment Index that includes vendors’ names, addresses, and telephone numbers for all equipment purchased on the Project;

8.7.2.3 Emergency instructions with phone numbers and names of contact persons on warranty items shall be uploaded to UK E-Communication®;

8.7.2.4 Copies of each system's air balancing record and each system's hydronic balancing record;

8.7.2.5 Copy of valve tag list;

8.7.2.6 Copy of As-Built temperature control system drawings and components and sequence of operation;

8.7.2.7 Original copies of the following provided by the manufacturer:

- Installation manuals
- Instruction Manuals
- Training manuals
- Calibration manuals
- Service Manual
- Operation manuals
- Parts list
- Repair manuals
- Reviewed Shop Drawings
- Wire list
- Keying Bit List

8.7.2.8 Any Computer, Micro controller, and/or Microprocessor equipped equipment installed shall be provided with source code copies of all software and firmware (prom, eprom, rom, other) supplied on this Contract; and

8.7.2.9 Copies of all inspection and guarantee certificates, manufacturers' warranties with the University of Kentucky listed as the Owner for all equipment provided and/or installed.

8.7.2.10 All manuals shall be as follows: Bound in hard cover three(3) ring (D-type) binder, 1", 1.5" or 2" maximum, indexed and in CSI format, tabbed (4,5,8 or 16th cut), no more than 80% binder fill, white vinyl, presentation type with clear vinyl view cover on front, back and spine and with pockets on front and back. Maximum drawing size in binder shall be folded 11"x17" and shall be hole punched and reinforcements added. Do not put drawings in pockets. Top of all drawings shall be at top or spine side of the manual. Complete drawings must be viewed without opening rings. Provide binders as manufactured by Universal Office Products, Des Plaines, IL. 1"(S# B2-20742), 1.5"(B2-20744), or 2"(B2-20746) or equal.
8.7.2.11 If the binder includes manuals from any one vendor covering several different model numbers, the model used on the Project must be highlighted.

8.7.2.12 Included in the front of the "Operation and Maintenance Manual" shall be a copy of the Interior and Exterior Finish plan and Schedule listing all finish materials, the manufacturer, the finish color, and the manufacturer's paint number.

8.7.2.13 Photograph album containing photos and negatives or digital images on CD (.pdf format) showing buried utilities and concealed items shall be included.

8.8 SUBMISSIONS – AS - BUILT SET OF DRAWINGS

8.8.1 The Construction Manager shall submit one (1) electronic copy of As - Built set of drawings in PDF format and one (1) hard copy indicating all deviations of construction as originally specified in the Contract Documents. These As-Built Drawings will compile information from the Construction Manager as well as all Sub-contractors. The Construction Manager shall provide a qualified representative to update the As - Built set of drawings as construction progresses.

8.8.2 The Construction Manager shall provide and utilize a camera to photograph the installation of buried utilities and concealed items. The Construction Manager shall provide standard 3 1/2" x 5" photographs with negatives, or digital images on CD (.jpeg format), which shall be submitted as part of the Operation and Maintenance Manuals submission. These photos should be mounted in a bound album with labeling as to subject of photo, date, and Project. Such album is to be kept at job site with the As - Built Set of Drawings until submittal of same.

8.8.3 Approval of the Final Payment request will be contingent upon compliance with these provisions. The Construction Manager's As – Built set of drawings shall be delivered to the Consultant at their completion so that the Consultant may make any changes on the original contract drawings.

ARTICLE 09 PLANS, DRAWINGS, AND SPECIFICATIONS

9.1 The successful Construction Manager can purchase any number of sets of plans and specifications from Lynn Imaging, Lexington, Kentucky (http://www.ukplanroom.com/) or Phone Lynn Imaging @1.800.888.0693 or 859.255.1021). The Construction Manager will be required to pay Lynn Imaging for the cost of duplication for all sets required.

9.2 The University will provide two sets of the ‘Official Contract Documents’ to the successful Construction Manager. One set is to be for his office and the other set is for the jobsite.
9.3 All drawings, specifications and copies, thereof, prepared by the Consultant, are the property of the University of Kentucky. They are not to be used on other Work.

ARTICLE 10 PROGRESS MEETINGS

10.1 In addition to specific coordination and pre-installation meetings for each element of Work, and other regular Project meetings held for other purposes, progress meetings will be held as outlined at the Preconstruction Meeting. Each entity then involved in planning, coordination or performance of Work shall be properly represented at each progress meeting. The following areas will be covered at each progress meeting: current status of work in place, CM’s review of upcoming work (1 month look ahead), schedule status, upcoming outages, new outage requests, shop drawings due from Sub-contractors, shop drawings being reviewed, outstanding RFI’s, outstanding RFQ’s, new RFQ’s, change orders pending approval, new business, As-Built updated, close-out documents status, defective work in place issues, review “pencil copy” of payment application, safety issues and new business or other issues not covered above. With regard to schedule status, discuss whether each element of current work is ahead of schedule, on time, or behind schedule in relation with updated progress schedule; determine how behind-schedule Work will be expedited, and secure commitments from entities involved in doing so; discuss whether schedule revisions are required to ensure that current Work and subsequent Work will be completed within Contract Time; and review everything of significance which could affect the progress of the Work.

10.2 Construction Manager shall prepare and submit at each progress meeting an updated schedule indicating Work completed to date and any needed revisions.

10.3 With the express purpose of expediting construction and providing the opportunity for cooperation of affected parties, progress meetings will be held and attended by representatives of:

(1) The Owner's Project Manager
(2) The Consultant.
(3) Construction Manager.
(4) Subcontractors.
(5) Others requested to attend (as deemed necessary by CPMD).
(6) Physical Plant Division Representative

10.4 A location near the site will be designated where such progress meetings will be held. Participants will be notified of the dates and times of the meetings by the Consultant.

ARTICLE 11 CRITICAL PATH METHOD (CPM) SCHEDULE

11.1 Construction Manager shall prepare schedules as a critical path chart with separate divisions for each major portion of the Work or operation. The schedules submitted for this Project shall be prepared using Primavera scheduling software
(Primavera Contractor; Primavera SureTrak with files saved in Concentric P3 format; Primavera P3; or Primavera P6). All schedule submittals shall include both hard copies (maximum sheet size shall be 30" x 42") as well as a complete copy of the schedule in Primavera electronic file format.

11.1.1 The schedule shall include divisions for Work to be accomplished remote from the central construction site, (for example, modular or prefabricated units to be constructed off-site, or utilities from outside the construction site to the site such as chill water, steam, electrical, communications, and fire service). Such Work shall be scheduled so that disruption resulting from construction will be minimized. Start dates and completion dates for such Work must be maintained and completed in the shortest reasonable time.

11.2 Initial Baseline Schedules shall be submitted to the Consultant and to the Owner within thirty (30) calendar days after award of the first bid Package or trade contract, and shall include detailed information regarding Work to be performed during the first ninety (90) days of the Project as well as milestone dates for all major elements of the remainder of the Work. Any necessary revisions to this Initial Milestone Schedule shall be completed prior to submittal of the Final Critical Path Baseline Schedule.

11.2.1 If the Project is to be constructed in multiple phases or using multiple Bid Packages, the date for the start of work on each phase of the Project shall be the date on which the University approves the award of the first Trade Contract for work in that phase or Bid Package.

11.3 The Final Critical Path Baseline Schedule shall be submitted to the Consultant and to the Owner within seventy five (75) calendar days after award of the first bid Package or trade contract, shall be consistent with the information contained in the Initial Baseline Schedule prepared in accordance with Article 11.2 above, shall include all activities necessary to complete the Work, and shall show the complete sequence of construction by activity, with dates for beginning and completion of each element of construction as well as an indication of whether the activity might reasonably be delayed or impacted by unusual inclement weather. Sub-schedules shall be provided as may be necessary to define critical portions of the entire schedule.

11.3.1 A separate schedule of submittal dates for Shop Drawings, product data, and samples shall be required. Such separate schedules shall show decision dates for selection of finishes and delivery dates for Owner furnished items, if any, and shall identify dates and durations for major utility outages requiring coordination with the Owner and the Owner’s operations. Activities, including Outages, which require action by or which are the responsibility of, the Owner or the Consultant under the terms of the Contract shall be properly indicated, and the responsible party shall be identified in the CPM schedule.

11.4 The Consultant will review the schedule only for compliance with the intent of the contract documents. Such review shall not relieve the Construction Manager of any
responsibility for compliance with the provisions of the Contract nor shall such review or any review comments constitute an amendment or modification of the contract requirements. The Construction Manager shall be solely responsible for identifying all necessary activities, establishing activity sequencing and assigning activity durations and relationships and for the means and methods to be employed to assure constructions proceeds in accordance with the submitted schedule.

11.5 Up-dated Progress Schedules shall be submitted to the Consultant and to the Owner with each Application for Payment to indicate progress of each activity to date of submittal and the projected completion of each activity. Schedules shall show accumulated percentage of completion of each item, and total percentage of Work completed, as of the data date of the update. Each submittal of an update to the schedule shall include a narrative report that identifies and explains activities modified since the previous submittal, major changes in scope and other identifiable changes, problem areas, anticipated delays and impact on the schedule, and report corrective action taken, or proposed, and its effect. Schedules will be uploaded in UK E-Communication®’s Schedules Item Log.

11.6 Up-dated Progress Schedules shall be submitted to the Consultant and to the Owner with each Application for Payment. Submissions shall include at least one opaque reproduction and as well as a complete copy of the schedule in Primavera electronic file format along with a transmittal letter and related narrative report.

11.7 Copies of reviewed Schedules are to be provided to the job site file and, as appropriate, to subcontractors, suppliers, and other concerned entities, including separate contractors. Recipients are to be instructed to promptly report, in writing, problems anticipated by Projections shown in Schedules.

11.8 The processing of all progress payments is contingent upon the submission of critical path schedules. Only payment for bonds and limited Construction Manager mobilization costs will be approved for processing prior to acceptance of the baseline schedule(s).

11.9 The processing of all change orders requesting a time extension to the contract are subject to the terms of Article 21 of the General Conditions to this Contract and are contingent upon the submission of a critical path schedule showing the change order does indeed impact the critical path. Time extensions for Change Orders that do not impact the Substantial and/or Final Completion of the Work will not be considered.

11.10 All time extensions shall be negotiated and made full, equitable and final, and incorporated in a revised CPM schedule at the time of Change Order issuance. No reservation of rights shall be allowed.

11.11 Float available in the schedule at any time shall not be considered for the exclusive use of either party to the contract, but will be a resource available to both the Owner and the Construction Manager. (Free float is the length of time the start of an
activity can be delayed without delaying the start of a successor activity. Total float is the length of time along a given network path that the actual start of an activity or activities can be delayed without delaying the Project completion.) No time extensions will be granted for a delay unless the delay impacts the Project’s critical path, consumes all available float or contingency time, and extends the Work beyond the current Contract completion date.

ARTICLE 12 WALK-THROUGH

12.1 After the "Work Order" is issued but before Work by the Construction Manager is started, a walk-through of the area is required to document the condition of the space, surfaces, or equipment. It is the responsibility of the Construction Manager to schedule the walk-through with the Owner’s Project Manager, the Consultant, and other interested parties.

12.2 During the walk-through, Construction Manager shall identify all damaged surfaces or other defective items that exist prior to construction.

12.3 The walk-through shall be attended by Owner’s Project Manager, a Representative of the user of the facility, the Construction Manager and the Consultant.

12.4 Written documentation of the walk-through is to be provided by the Consultant with copies distributed to all parties. Polaroid type color photographs are to be provided and labeled by Construction Manager and one (1) copy of such photographs are to be given to Consultant. (Digital photos in a .jpg format are acceptable if submitted on a CD) All parties attending the walk-through agree on the list of damages.

ARTICLE 13 OWNER’S CONSTRUCTION REPRESENTATIVE

13.1 The Owner may have full time personnel or representatives on this job. If so, the Construction Manager is to provide, at no additional cost to the Owner, an office for the duration of the Project specifically for the use of Owner personnel. The office should be furnished with all required utilities, including HVAC, and the following:

- 2 Desks
- 2 Desk chairs
- 2 Side chairs
- 2 4-drawer filing cabinets
- 2 telephones
- 2 DSL / cable modem connections
- 1 Layout table
- 1 hanging plan rack

ARTICLE 14 FIELD OFFICE
14.1 Construction Manager shall make his own provision for field office for his own personnel and for incidental use by their Subcontractors. Quantity and location are subject to approval of the Consultant and the Owner's Project Manager.

ARTICLE 15 TELEPHONE SERVICE

15.1 Construction Manager shall arrange through UKIT Communications and Network Systems for installation of on-site phone, internet and other communications services. Telephone service during the length of construction shall be paid for by the Construction Manager. (Cell phone/Nextel service in lieu of UKIT Communications and Network Systems phone service may be utilized at Construction Manager’s option.)

ARTICLE 16 CONSTRUCTION FENCE

16.1 Construction fencing will be designed and erected around job sites where there is a possibility of injury to employees, students or the public. Special precautions must be taken to protect the visually impaired, disabled, children and others using the University facilities. During active excavation/trenching operations, fencing shall be erected to prevent unauthorized entry into the site. All fencing shall comply with the current requirements of the International Building Code except where the following requirements are more stringent.

16.1.1 All job site perimeter fencing within 5 feet of a walkway, street, plot line, or public right-of-way shall be 8 feet in height. Perimeter fencing that blocks sidewalks must include signs directing pedestrians to a safe walkway or crosswalk. Signage may be attached to the fence, but may also be required to inform pedestrians of sidewalk closures and detours prior to arriving at the closed area.

16.1.2 All job site perimeter fencing more than 5 feet from a walkway, street, plot line, or public right-of-way shall be a minimum of 6 feet in height unless International Building Code requirements are more restrictive due to the height of the structure and setback.

16.1.3 All fencing shall be of a woven material such as chain link or a solid type fence. Fencing shall include gates required for construction operations. Gates shall be lockable with both the Construction Manager's lock, and a lock provided by the Owner. Lock by Owner shall be keyed for the University Best GA key core. All locks to be “daisy-chained” to provide access to the Owner.

16.1.4 It shall be the Construction Manager’s responsibility to determine the proper quality of materials and methods of installation of the fencing, with the understanding that it must be maintained in good condition, good appearance, rigid, plumb, and safe throughout the construction period. The fence does not have to be new material. The fence is to be erected on fence posts securely anchored in the ground. Provide a top bar or, with prior approval of the Owner, a wire shall be run through the top of the fence and attached to the end posts. A tension control device shall be installed as necessary. Use of
sandbags, concrete weights, stakes, etc. to hold fence posts in place are not allowed. Penetrations in pavement or landscape walking surfaces may not be made without the approval of the Owner. Any damage caused by the fence installation shall be repaired in a manner satisfactory to the Owner. When fencing is to remain in place for 6 months or more a green fabric mesh must be provided for the full height and length of the fence. Fabric should be omitted for one section of fencing where blind corners occur or at pedestrian/vehicle intersections.

16.1.5 The Construction Manager shall be responsible for removing and replacing any fence sections and/or posts necessary for access to the site on a daily basis. The Construction Manager shall police such conditions to assure the fence and posts are reset in a timely manner and are specifically in place at the close of the working day.

16.1.6 If the Construction Manager fails to comply with the requirements of this Article 16, the Owner may proceed to have the work done and the Construction Manager shall be charged for the cost of the Work done by unilateral deductive change order.

16.1.7 Plastic construction fencing is not acceptable as a perimeter protection fence.

ARTICLE 17 PROJECT SIGN

17.1 The Construction Manager shall furnish, install and maintain a Project sign during this Project. This sign shall be 4' x 8' x 3/4" exterior grade plywood mounted on 4" x 4" posts. Design shall be as provided by the Owner at a later date and shall include the name of the Owner, Project, Consultant, and Construction Manager.

17.2 No signs, except those attached to vehicles or equipment, may be displayed without permission from the Consultant and the Owner's Project Manager. No political signs will be permitted.

ARTICLE 18 PARKING

18.1 No on-campus parking is available. The Construction Manager shall develop a parking plan as part of the required Pre-Construction Services element of this Contract in anticipation that the majority of required parking will have to be off-campus.

ARTICLE 19 SANITARY FACILITIES

19.1 At the beginning of the Project, before any Work is started, the Construction Manager shall furnish, install and maintain ample sanitary facilities for the workforce. Permanent toilets in the existing building shall not be used during construction of the Project. Drinking water shall be provided from an approved safe source, piped or transported as to be kept clean and fresh and served from single service containers or satisfactory types of sanitary drinking stands or fountains. All such facilities and services shall be furnished in strict accordance with existing governing health regulations.
ARTICLE 20 RULES OF MEASUREMENT

20.1 Rules of Measurement shall be established by the Consultant in the field. Actual measurement shall be taken in the field. These amounts shall become binding upon the Construction Manager and be adjusted as before mentioned.

20.2 The Construction Manager shall pay for and coordinate through the Consultant and/or the Owner's Project Manager all associated Work by utility companies including relocation of utility poles, installation of new street lights, relocation of overhead or underground lines, and any other Work called for on the Plans and in the Specifications.

ARTICLE 21 ALLOWANCES

21.1 As stated in the General Conditions to the Contract, the Construction Manager shall have included in the Contract Amount all costs necessary to complete the Work. Costs based on “allowances” shall be permitted only for objectively quantifiable items and only with the prior written approval of the Owner. No allowances shall have been included in the calculation of the Construction Manager’s fixed fee quotation in par. 8.0 of the RFP.

21.2 Costs based on allowances may be included in Subcontract bid packages only with the prior written approval of the Owner, and only for objectively quantifiable material items.

21.3 Any allowance amounts included in a Subcontract bid package, but not expended for the approved task during the course of the work of that Subcontract, shall be deducted from the Construction Manager’s contract by Change Order. Any additional amounts necessary to pay for additional cost of an allowance in a Subcontract bid package shall be funded from the Construction Contingency Fund.

21.4 The University of Kentucky has entered into a price contract agreement with SimplexGrinnell for procurement of fire alarm and security systems. SimplexGrinnell will provide an allowance for this project which may include Fire Alarm Equipment and Security Equipment, including all required cable/wire, labor to install cable and wire and terminations of SimplexGrinnell supplied devices and panels. SimplexGrinnell will be a sub-contractor under a trade contract.

21.4.1 The Construction Manager shall include an allowance to be determined later for the work by SimplexGrinnell in the appropriate trade contractor’s scope of work.

21.4.2 The electrical contractor is to provide and install conduits and back boxes/junction boxes. All conduits will include a pull string. SimplexGrinnell will furnish and install all fire alarm and security equipment and wiring.
ARTICLE 22 CONSTRUCTION CONTINGENCY FUNDS

22.1 The Owner shall include an amount in the Project construction budget equal to one percent (1%) of the total cost of the construction, including the Construction Manager’s fixed fee, as a Construction Contingency Fund. The following are general / typical categories of changes to the Work that may, with the Owner’s prior written specific approval, be funded from this source:

22.1.1 Reasonable errors & omissions in the Construction Manager’s bidding and scoping processes;

22.1.2 Reasonable costs associated with schedule recovery that is not a direct result of the construction managers or a trade contractor’s failure to perform;

22.1.3 Any costs or expenses incurred by the Construction Manager, for provision of management services necessary to complete the Project in an expeditious and economical manner consistent with the Contract for Construction and the best interests of Owner, that were not included in the Construction Manager’s General Conditions Cost as submitted in the original fee proposal

22.1.4 Amounts necessary to fund cost overruns in approved allowance items within Subcontract bid packages, as described in Article 21.3, above.

ARTICLE 23 SEQUENCE OF CONSTRUCTION

23.1 The project will be Phased to accommodate the design process, minimize impact on University operations and minimize all temporary conditions and expenses.

23.2 All materials and equipment are to be brought into the project site from the approved staging location and are not to be brought through the existing buildings or loading docks. Any and all exceptions shall be approved by, and closely coordinated with, the Owner’s Project Manager in advance of scheduling or performing the work.

23.2.1 The Construction Manager shall coordinate any road and sidewalk closings, utility disruptions, etc. which will affect the use of the existing building(s) with the Owner’s Project Manager prior to commencing that Work.

23.3 The adjacent buildings and public areas will remain in use and the Owner shall have access to the existing building(s) throughout the duration of the Project. The Construction Manager shall coordinate construction activity to assure the safety of those who must cross the Project site and shall provide and maintain the necessary barriers and accommodations for a completely safe route of accessibility. The Construction Manager is to insure that all exits provide for free and unobstructed egress. If exits must be blocked, then prior arrangements must be made with the Owner's Project Manager.
23.4 The Construction Manager shall cooperate with the Owner in minimizing inconvenience to, or interference with normal use of existing buildings and grounds by staff, students, other Contractors, or the public. Construction Manager shall conduct operations to prevent damage to adjacent building structures and other facilities and in such a manner to protect the safety of building's occupants.

23.5 Special effort shall be made by the Construction Manager to prevent any employee from entering existing buildings for reasons except construction business. In particular, use of toilets, drinking fountains, vending machines, etc. is strictly prohibited.

ARTICLE 24 CRANE & MATERIAL HOIST OPERATIONS

24.1 Construction Manager shall provide appropriate barriers around crane and material hoist to protect pedestrian and vehicular traffic around operating area. When crane is operating or moving, flag men provided by Construction Manager shall be utilized to prevent pedestrian and vehicular traffic from crossing pathway of crane lift. Construction Manager's flag men shall coordinate these activities with the appropriate security personnel.

24.2 Crane and material hoist shall be safely secured and inaccessible during non-operating hours. Construction Manager shall coordinate operation or erection of a crane or material hoist in the vicinity of the Medical Center with Medical Center Aeromedical Operations (Med-evac helicopter).

24.3 Any damage to trees, shrubs or plant material at the placement of crane or material hoist shall be repaired by tree surgery or replaced as directed by Consultant.

ARTICLE 25 UTILITIES

25.1 When the various building systems are energized and connected to Owner's utility systems, but prior to turnover to and occupancy by the Owner, the Construction Manager is responsible to reimburse the Owner for Owner furnished utilities. These utilities include but not limited to steam, chilled water, domestic water, and electricity, provided by the Owner up to the date of Substantial Completion. Reimbursement will be payable monthly via a deductive change order to the contract. Unit costs for campus are as follows:

25.1.1 Steam is $17/million BTU (1000 lb.) condensate measured through the building condensate meter (all condensate is to be returned).

25.1.2 Chilled Water is $14/million BTU (1000 lb.) measured through the building BTU meter.

25.1.3 Electricity is $0.068/KWH measured through the building electric meter.
25.1.4 Water is supplied by Kentucky American Water Company (KAWC). Construction Manager shall pay KAWC directly until the Owner's beneficial occupancy date. The Construction Manager shall pay KAWC directly for fire service.

25.1.5 Construction Manager shall furnish gas meter and Columbia Gas Company directly for service until the until the Owner's beneficial occupancy date.

25.1.6 Construction Manager shall obtain from and pay UKIT Communications and Network Systems for the use of telephone services.

25.2 UTILITY OUTAGES

25.2.1 Interruption of Utilities and Services: No utilities or services may be interrupted without full consent and prior scheduling of the Owner. Owner approval is required in writing for each disruption.

25.2.1.1 ENTIRE BUILDING OUTAGE. The Owner's Project Manager is the Construction Manager’s contact with the University for requesting Utility Outages. The Owner's Project Manager will contact the proper departments and divisions within the University and receive approval from those units prior to allowing a planned outage to occur. The established standard within the University Departments and Divisions of an entire building or group of buildings shall be three weeks written notice. The written notice shall include the type of utility to be interrupted, reason for outage, length of outage, what will be affected by the outage, and a statement of whether or not the materials are on hand to complete the Work. If a specific time is desired for the outage it should be included. The Owner's Project Manager will insure that all parties affected are contacted and that a time which is least disruptive to all parties is selected. At the appointed outage time, Work shall begin and proceed continuously with all required manpower until Work is complete at no added cost to the University. The Owner's Project Manager will then notify all affected departments or divisions.

25.2.1.2 SECTION OF A BUILDING OUTAGE. The Owner's Project Manager is the Construction Manager’s contact with the University for requesting Utility Outages. The Owner's Project Manager will contact the proper departments and divisions within the University and receive approval from those units prior to allowing a planned outage to occur. The established standard within the University Departments and Divisions of a section of a building shall be a written request one week prior to outage. The written request shall include the type of utility to be interrupted, when the outage is desired, reason for outage, length of outage, and what will be affected by the outage. The Owner's Project Manager will insure that all parties affected are contacted and that a time which is least disruptive to all parties is selected. At the appointed outage time Work shall begin and proceed continuously with all required manpower until Work is complete at no added cost to the University. The Owner's Project Manager will then notify all affected departments or divisions.
ARTICLE 26 CLEANING AND TRASH REMOVAL

26.1 The Construction Manager shall keep clean the entire area of new construction and shall keep streets used as access to and from the site free of mud and debris.

26.2 All exit ways, walks, drives, grass areas, and landscaping must be kept free from debris, materials, tools and vehicles at all times. Trim weeds and grass within the site area.

26.3 Upon completion of the Work, Construction Manager shall thoroughly clean and re-sod grass areas damaged to match existing areas.

26.4 The Construction Manager shall be responsible for removal from the site of all liquid waste or other waste (i.e., hazardous, toxic, etc.) that requires special handling on a daily basis.

26.5 Dumpsters will be provided and maintained by the Construction Manager.

26.6 During Work at the Project site, the Construction Manager shall clean and protect Work in progress and adjoining Work on a continuing basis. Construction Manager shall apply suitable protective covering on newly installed Work where needed to prevent damage or deterioration until the time of Substantial Completion. Construction Manager shall clean and perform maintenance on newly installed Work as frequently as necessary through remainder of construction period.

26.7 The Construction Manager shall be responsible for daily cleaning of spillage's and debris resulting from his and his Subcontractor's operations, (includes removal of dust and debris from wall cavities), and for providing closed, tight fitting (dustproof if required), waste receptacles to transport construction debris from the work area to the dumpster. Broom clean all floors no less than once a week. The Construction Manager shall empty such receptacles into the trash container when full or when directed to be emptied by the Consultant and/or Owner's Project Manager, but not less than weekly. The use of the Owner’s waste and trash receptacles is strictly prohibited, except as otherwise provided by the Project specifications.

26.8 Failure to comply with the above requirements shall be cause for stopping work until the condition is corrected.

ARTICLE 27 BLASTING

27.1 There shall be no blasting under any conditions on University of Kentucky property unless specified in these Special Conditions.
ARTICLE 28 CUTTING AND PATCHING - NEW AND EXISTING WORK

28.1 New Work - Cutting and patching shall be done by craftsmen skilled and experienced in the trade or craft that installed or furnished the original Work. Repairs shall be equal in quality and appearance to similar adjacent Work and shall not be obviously apparent as a patch or repair. Work that cannot be satisfactorily repaired shall be removed and replaced.

28.2 Existing Construction - Refer to Architectural, Mechanical, and Electrical drawings for cutting and patching. All new Work shall be connected to the existing construction in a neat and workmanlike manner, presenting a minimum of contrast between old and new Work. Do all patching of the existing construction as may be required for the new construction to be completed. Necessary patching, closing of existing openings, repairing and touching up shall be included as required for a proper, neat and workmanlike finished appearance. Any existing item that is to remain and is damaged during construction shall be replaced at the Construction Manager's expense.

ARTICLE 29 UNRELATED PROJECTS

29.1 Unrelated construction projects may be under way in the vicinity of this Project or the site utility work during the course of the Work related to this Project. The Construction Manager for this Project must coordinate with any other contractors regarding overlapping areas. See Article 42 - Separate Contracts of the General Conditions.

ARTICLE 30 OWNER SUPPLIED MATERIALS

30.1 Owner, in an effort to expedite this Project, has pre-ordered certain long lead time items. The following is the list of material that has been pre-ordered:

1. To Be Determined

30.2 All Pre-Ordered Material was specified to be shipped to the BBSRB loading dock. It will be the Construction Manager’s responsibility to receive and off load the Pre-Ordered Material. If there is damage to the Pre-Ordered Material, then the Construction Manager is to notify the Owner's Project Manager immediately so that the Owner can seek replacement material.

ARTICLE 31 REMOVED ITEMS

31.1 The following is a list of items to be turned over to the Owner by the Construction Manager after removal by the Construction Manager. If there are additional items listed in the drawings to be turned over to the Owner, but not listed here, it shall be construed as being listed here.

1. To Be Determined
31.2 All items which are identified to be turned over to the Owner must be treated with the utmost of care and protected from damage during removal and transport.

31.3 Materials to be turned over to the Owner by the Construction Manager shall be delivered to a warehouse within a five (5) mile radius of the Project site.

ARTICLE 32 INTERIOR ENCLOSURE AND DUST ENCAPSULATION

32.1 Areas under construction or renovation shall be separated from occupied areas by suitable temporary enclosures furnished, erected and maintained by the Construction Manager. Temporary enclosures shall be dust and smoke tight and constructed of non-combustible materials to prohibit dirt and air borne dust from entering occupied spaces. Construction Manager to review with Consultant ways to provide ventilation for dust generated by demolition and fumes/vapors produced during installation of new materials.

32.2 Construction Manager is responsible for coordinating with the Owner’s Project Manager any equipment to be turned off prior to erecting temporary enclosures.

32.3 Construction Manager shall protect all exhaust diffusers, equipment and electrical devices from the collection of dust. All areas shall be checked and cleaned prior to final acceptance of Work.

32.4 Dust and debris from Work operations shall be held to a minimum.

32.5 Construction Manager shall construct temporary dust partitions at locations and as detailed on drawings. Closures used for dust barricades shall be constructed of non-combustible materials, (metal studs and gypsum board or fire retardant plywood).

32.6 Construction Manager shall provide additional devices and materials as required to contain dust within Work area and protect personnel during course of Work.

32.7 Areas of minor renovation, consisting of the removal of doors and frames, blocking of openings, and other limited Work shall be separated by a dust partition of fire retarded polyethylene on studs.

32.8 Existing corridor doors may serve as dust barriers, except if removed for refinishing. In such cases, temporary wood doors must be substituted until original doors are replaced.

32.9 The Construction Manager may assume existing walls which extend full height of floor shall be deemed appropriate to contain air borne dust. Cover any voids or penetrations.
32.10 Doors or windows in the perimeter walls surrounding the project work area shall be sealed off with protective materials in a manner to prohibit dust from escaping the work area. These shall be left in place until all work creating dust is completed. Protective materials shall consist of fire retardant wood, metal studs, gypsum board or flame resistant plastic.

32.11 Entry passage to Work area shall be sealed off with zippered plastic opening, or other acceptable means which allows periodic entry and closure of barricade closure.

32.12 Install and maintain a “sticky mat” on the floor in locations where construction crews leave the construction area and prior to entering ANY existing space in the building.

32.13 Install and maintain a temporary floor covering in any and all elevators being utilized for this project.

ARTICLE 33 UKIT COMMUNICATIONS AND NETWORK SYSTEMS

33.1 The communications wiring is to be provided, installed and terminated by the Construction Manager using a certified and approved communications contractor. All work shall be done in compliance with the latest UKIT-Communications and Network Systems’ Standards, and closely coordinated with UKIT-Communications and Network Systems.

ARTICLE 34 EMERGENCY VEHICLE ACCESS

34.1 Emergency Vehicle Access must be maintained during construction. The Construction Manager shall coordinate with the local Fire and Emergency Medical Services department(s) that would respond to an emergency during the initial start up of construction to ensure a complete understanding of their requirements.

ARTICLE 35 SMOKE DETECTORS / FIRE ALARM SYSTEMS- EXISTING AND/OR NEW FACILITIES

35.1 Construction Manager shall protect all smoke detectors in Work areas to prevent false alarms. The Construction Manager will be responsible for any false alarm caused by dust created in their Work areas or dust traveling to areas beyond the Work, past inadequate protection barriers. If there is a need for an existing or newly installed fire alarm system or parts of that system to be serviced, turned off, or disconnected, prior approval must be obtained from the Owner's Project Manager and notification given to the Campus Dispatch Office. The Construction Manager must follow the procedure outlined for Utility Outages and any documented costs charged by the responding fire department due to a false alarm shall be paid by the Construction Manager. As soon as all Work is completed notification must be given to the Owner's Project Manager and to the Campus Dispatch Office prior to reactivation of the system. Prior to Final Payment to the Construction Manager, all protected smoke detectors will be uncovered and tested.
35.2.1 When any fire alarm, detection or suppression system is impaired, a temporary system shall be provided. Construction Manager shall provide daily reports indicating the Superintendent has walked through the project at the end of each work period, to satisfy himself there are no present conditions that may result in an accidental fire. Portable fire extinguishers shall be on site during this time. The Construction Manager is responsible for inspecting and testing any temporary systems on a monthly basis.

35.2.2

ARTICLE 36 SURVEYS, RECORDS, and REPORTS

36.1 General: Working from lines and levels established by property survey, and as shown in relation to the Work, the Construction Manager will establish and maintain bench marks and other dependable markers to set lines and levels for Work at each area of construction and elsewhere on site as needed to properly locate each element of the entire Project. The Construction Manager shall calculate and measure from the bench marks and dependable markers required dimensions as shown (within recognized tolerances if not otherwise indicated), and shall not scale drawings to determine dimensions. Construction Manager shall advise Sub-contractors performing Work of marked lines and levels provided for their use in layout of Work.

36.2 Survey Procedures: The Construction Manager shall verify layout information shown on drawings, as required for his own Work. As Work proceeds, surveyor shall check every major element for line, level, and plumb (as applicable), and maintain an accurate Surveyor's log or Record Book of such checks available for Construction Manager or Design Consultant's reference at reasonable times. Surveyor shall record deviations from required lines and levels, and advise Design Consultant or Construction Manager promptly upon detection of deviations exceeding indicated or recognized tolerances. The Construction Manager shall record deviations which are accepted (not corrected) on Record Drawings.

ARTICLE 37 SMOKING IS PROHIBITED

37.1 For areas located within Fayette County, Kentucky, the use of all tobacco products is prohibited on all property that is owned, operated, leased, occupied, or controlled by the University. “Property” for purposes of this paragraph includes buildings and structures, grounds, parking structures, enclosed bridges and walkways, sidewalks, parking lots, and vehicles, as well as personal vehicles in these areas. To view the Lexington campus boundaries: http://www.uky.edu/TobaccoFree/files/map.pdf.

37.2 For areas not located within Fayette County, Kentucky, smoking is prohibited in all owned, operated, leased, or controlled University buildings and structures, parking structures, enclosed bridges and walkways, and vehicles. Smoking is also prohibited outside buildings and structures within 20 feet of entrances, exits, air intakes, and windows, unless further restricted by division policy.
37.3 Construction Manager's employees violating this prohibition will be subject to dismissal from the Project.

37.4 For the full Administrative Regulation see University AR 6:5.  
http://www.uky.edu/Regs/files/ar/ar6-5.pdf

ARTICLE 38 ALTERNATES

38.1 Alternate(s) will be accepted in the sequence of the Alternates listed on the Bid Form, and the lowest Bid Sum will be computed on the basis of the sum of the base Bid and any alternates accepted, within the budgeted amount.

38.2 Schedule of Alternates: To Be Determined

ARTICLE 39 FIELD CONSTRUCTED MOCK UPS

39.1 Exterior Finishes

39.1.1 After sample selection but prior to ordering exterior finish materials, Construction Manager shall accumulate enough material samples to erect sample wall panels to further verify selection made for color and textural characteristics, and to represent completed Work for qualities of appearance, materials and construction including sample masonry units (face and back-up wythes, plus accessories), window units, roofing finish, etc. to provide a complete representation of the exterior facade for approval by the Consultant; build mock-ups to comply with the following requirements:

39.1.2 Build mock-ups well in advance of the time the finish materials will be needed for inclusion in the Work.

39.1.3 Locate mock-ups at location as reviewed and approved by the Architect and University’s Project Manager, generally within 10 feet of existing building, parallel to existing face of building, and exposed to sunlight during daylight hours. Mock-Up to be reviewed twice, one in direct sunlight and one in shade to confirm color characteristics of samples.

39.1.4 Mock-ups Size(s) for the following types shall be approximately 6’ long by 4’ high by full thickness.

Each type of exposed Work.

39.1.5 Protect mock-ups from the elements with weather resistant membrane.
39.1.6 Retain mock-ups during construction as a standard for judging completed Work. When directed by the University’s Project Manager or by the Consultant, demolish mock-ups and remove from the site.

39.2 Interior Finishes

39.2.1 After sample selection but prior to ordering interior finish materials, Construction Manager shall accumulate enough material samples to erect sample to further verify selection made for color and textural characteristics, and to represent completed Work for qualities of appearance, materials and construction; include samples of interior finishes, including paint, wood stain, vinyl wallcovering, flooring and ceiling materials to provide a complete representation for approval by the Consultant; build mock-ups to comply with the following requirements:

39.2.2 Build mock-ups well in advance of the time the finish materials will be needed for inclusion in the Work. Mock-ups may be on newly installed wall surfaces.

39.2.3 Locate mock-ups with adequate illumination for observation under intended light levels.

39.2.4 Retain mock-ups during construction as a standard for judging completed Work. When directed by the University’s Project Manager or by the Consultant, remove mock-ups from site or incorporate into the completed work.

ARTICLE 40 PROJECT COORDINATION VIA COMPUTER

40.1 The Construction Manager is required to have an active email account to facilitate coordination of the project during construction and warranty.

40.2 To facilitate project construction coordination between the Consultant, the Construction Manager, and the University of Kentucky as the Owner, UK Capital Project Management Division (CPMD) is hosting an Internet/ Web-based Project Management System (WPMS) to help improve project communication and collaboration. The Consultant shall participate in the use of the WPMS (UK E-Communication® or other system at the Owner’s discretion) providing collaboration between Owner, the Consultant and selected contractors.

40.2.1 Owner shall provide the Construction Manager with up to six user accounts and appropriate training for the web-based project management tool.

40.2.2 Utilization of, and training in the use of, the WPMS will be arranged for and supervised by Owner.

40.2.3 Participation of Construction Manager is mandatory; others as determined by Owner.
40.2.4 All participants are required to have access to the internet and the Microsoft Internet Explorer browser (version 5.0 or higher). A broadband connection to the internet (e.g. Cable modem, ISDN, DSL) is recommended, but not required.

40.2.5 The WPMS shall be utilized for the following functions, as a minimum: Posting Project Files, AE Amendments, Architect’s Supplemental Information (ASI’s), Closeouts, Defective Work in Place, Meeting Minutes, Reports (Contractor Daily Reports, Field Reports, Commissioning Reports), Punch Lists, RFIs, Schedules, Submittals, Proposed Change Orders – Change Orders (PCO to CO’s), Contracts, Pay Apps (pencil review), and Schedules. The Document Library (Bid set Plans, Specifications and Addenda will be uploaded by Lynn Imaging.

40.2.6 Site camera monitors may be included at Owner’s discretion.

40.2.7 Utilization of the WPMS shall be implemented by the Owner’s representative.

40.2.8 Use of the system will provide consistent, real-time information for decision making. Additionally, all project data entered into the system will be archived to facilitate project record keeping. It is anticipated that proper use of the WPMS will improve efficiency of communications and reduce project related paperwork and clerical workload.

**ARTICLE 41 HOT WORK PERMITS**

41.1 All work involving open flames or producing heat and or sparks in occupied buildings on the University of Kentucky campus will require the Construction Manager to obtain approval to perform “Hot Work” on site. This includes, but is not limited to: Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch Applied Roofing, and Cad welding. A copy of the Hot Work Permit and the Hot Work Permit Procedure will be passed out at the Preconstruction Conference for the Construction Manager’s use.

**ARTICLE 42 INSURANCE**

42.1 Employers’ Liability Insurance. The Construction Manager shall acquire and maintain Employers’ Liability insurance with at least $500,000/$500,000/$500,000 limits of liability for all employees who will be working at the Project site.

42.2.1 Commercial General Liability Insurance. If the work involved requires the use of helicopters, a separate aviation liability policy with limits of liability of $100,000,000 will be required. If cranes and rigging are involved, a separate inland marine policy with liability limits of $100,000,000 will be required.

42.2.1.1 The limits of liability shall not be less than $5,000,000 each occurrence combined single limits for bodily injury and property damage. If split limits are used, they shall not be less than $2,000,000 for each person and each occurrence and $1,000,000 for property damage.
42.2.2 Comprehensive Automobile Liability Insurance. Policy limits shall not be less than $2,000,000 for combined single limits for bodily injury and property damage for each occurrence. As an alternative, split limits of not less than $1,000,000 for bodily injury and $500,000 for property damage for each occurrence shall be maintained.

42.2.3 Excess or Umbrella Liability Insurance. This policy shall have a minimum of $50,000,000 combined single limits for bodily injury and property damage for each occurrence in excess of the applicable limits in the primary policies.

42.2.4 Workers’ Compensation- Statutory Requirements (Kentucky)

ARTICLE 43 KEY ACCESS

43.1 If Construction Cores are NOT utilized, then one set of keys for access to the renovation project area will be provided to the Construction Manager/Vendor’s Project Manager/Superintendent by the University’s Project Manager. The Construction Manager/Vendor’s holder of the key(s) assumes responsibility for the safekeeping of the key(s) and its use. When leaving the renovation area all doors must be secured.

43.2 All keys must be returned to the University’s Project Manager upon completion of project work as one of the requirements for Final Payment. Failure to return the keys may require re-keying of all doors in the work area up to and including the entire building if master keys are issued. The cost of re-keying of the door(s) accessed by the key(s) will be subtracted from the remaining contract dollars including contract retainage.

43.3 All lost or stolen keys must be reported immediately to the University’s Project Manager.

ARTICLE 44 CEILING CLEARANCE

44.1 Work above ceiling: All work above an area with lay-in ceiling must be coordinated and installed so there is a minimum of 4” between the top of the ceiling grid runners and bottom of the installation. Installation shall not obstruct equipment access space or equipment removal space. Also, conduit and pipe attached to the wall must be above the 4” minimum level.

44.2 Coordination Between Trades: Request and examine all drawings and specifications pertaining to the construction before installing above ceiling work. Cooperate with all other contractors in locating piping, ductwork, conduit, openings, chases, and equipment in order to avoid conflict with any other contractor’s work. Give special attention to points where ducts or piping must cross other ducts and piping, and where ducts, piping and conduit must fur into the walls and columns. Make known to other trades intended positioning of materials and intended order of work. Determine intended position of work of other trades and intended order of installation.
ARTICLE 45 METAL ANCHORS

45.1 All anchoring devices utilized to secure materials to the building shall be metal. Plastic or plastic expansion components shall not be used. This shall include all fasteners for mechanical/electrical hangers.

ARTICLE 46 CONTRACTOR/SUPERINTENDANT EXPERIENCE

46.1 The General Contractor and Superintendent are required to both have a minimum of five (5) years of construction experience in the past 10 years in fully operating campus environment.
NOTE: The following Form of Proposal shall be followed exactly in submitting a proposal for this work. If this copy is lost, an additional copy will be furnished upon written request to the authority issuing Contract Documents.

This Proposal is submitted by: _______________________________

(NAME AND ADDRESS OF BIDDER)

Date: _______________________________  Telephone: _______________________________

TO: BID CLERK

UNIVERSITY OF KENTUCKY
CAPITAL CONSTRUCTION
PROCUREMENT
RM. 322 SERVICE BUILDING
411 SOUTH LIMESTONE
LEXINGTON, KY 40506-0005

INVITATION TO BID: CCK-2283-18

BID OPENING DATES: 17 April 2017
TRADE CONTRACT DESCRIPTION: ______
Mechanical & Plumbing
TRADE CONTRACT NO.: 23V
TIME: 3:00 P.M. E.D.T.

The Bidder, in compliance with your Invitation for Bids for the above referenced Project, having carefully examined the site of the Work, the Drawings and complete Contract Documents as defined in Article I of the General Conditions, as well as the Specifications affecting the work as prepared by the Consultant, hereby proposes to furnish all labor, materials, supplies and services required to construct the Project in accordance with the Contract Documents, within the time set forth therein, and at the price stated below without qualification.

The Bidder hereby acknowledges receipt of the following Addenda:

ADDENDUM NO. ___________ DATED ___________
ADDENDUM NO. ___________ DATED ___________
ADDENDUM NO. ___________ DATED ___________
ADDENDUM NO. ___________ DATED ___________
ADDENDUM NO. ___________ DATED ___________

(Insert the number and date of any Addenda issued and received. If none has been issued and received, the word NONE should be inserted.)
FORM OF PROPOSAL

AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST

I hereby certify:

1. That I am the Bidder (if the Bidder is an individual), a partner in the Bidder (if the Bidder is a partnership), or an officer or employee of the bidding corporation having authority to sign on its behalf (if the Bidder is a corporation);

2. That the submitted Bid or Bids covering Capital Construction Procurement Section Invitation No. have been arrived at by the Bidder independently and have been submitted without collusion with, and without any agreement, understanding or planned common course of action with, any other contractor, vendor of materials, supplies, equipment or services described in the Invitation to Bid, designed to limit independent bidding or competition; as prohibited by provision KRS 45A.325;

3. That the contents of the Bid or Bids have not been communicated by the Bidder or its employees or agents to any person not an employee or agent of the Bidder or its surety on any bond furnished with the Bid or Bids and will not be communicated to any such person prior to the official opening of the Bid or Bids;

4. That the Bidder is legally entitled to enter into the contracts with the University of Kentucky and is not in violation of any prohibited conflict of interest, including those prohibited by the provisions of KRS 164.390, and 45A.330 to 45A.340 and 45A.455;

5. This offer is good for 60 calendar days from the date this Bid is opened. In submitting the above, it is expressly agreed that upon proper acceptance by the Capital Construction Procurement Section of any or all items Bid above, a contract shall thereby be created with respect to the items accepted;

6. That I have fully informed myself regarding and affirm the accuracy of all statements made in this Form of Proposal including Bid Amount.

7. Unless otherwise exempted by KRS 45.590, the Bidder intends to comply in full with all requirements of the Kentucky Civil Rights Act and to submit data required by the Kentucky Equal Employment Act upon being designated the successful contractor.

8. That the bidding contractor and all Subcontractors to be employed do not and will not maintain any facilities they provide for employees in a segregated manner and they are in full compliance with provisions of 41 CFR 60-1.8 that prohibits the maintaining of segregated facilities.

9. In accordance with KRS45A.110(2), the undersigned hereby swears under penalty of perjury that he/she has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky and that the award of a contract to the bidder will not violate any provision of the campaign finance laws of the Commonwealth of Kentucky.

READ CAREFULLY - SIGN IN SPACE BELOW – FAILURE TO SIGN INVALIDATES BID

SIGNED BY_____________________________   TITLE_____________________________
PRINT NAME_____________________________   FIRM_____________________________
ADDRESS_______________________________   PHONE ( )________________________
                                                                         FAX ( )________________________
CITY_________________   STATE_________   ZIP CODE_________________________
DATE____________________

Work Category – 23V  Page 2 of 16
Contractor Report of Prior Violations of
Chapters 136, 139, 141, 337, 338, 341, and 342

Pursuant to KRS 45A.485, the Contractor shall, prior to the award of a Contract, reveal
final determinations of any violations of the provisions of KRS Chapters 136, 139, 141,
337, 338, 341, and 342 by the Contractor that have occurred in the previous five (5)
year period.

This statute also requires for the duration of the Contract established, the Contractor be
in continuous compliance with the provisions of Chapters 136, 139, 141, 337, 338, 341,
and 342 that apply to the Contractor’s operations. The Contractor’s failure to reveal a
final determination of a violation of KRS Chapters 136, 139, 141, 337, 338, 341, and
342, or failure to comply with any of the above cited statutes for the duration of the
Contract shall be grounds for the cancellation of the Contract, and the disqualification
from eligibility for future contracts for a period of two (2) years.

The Contractor, by signing and submitting a Bid on this Invitation, agrees as required by
KRS 45A.485 to submit final determinations of any violations of the provisions of KRS
Chapters 136, 139, 141, 337, 338, 341, and 342 that have occurred in the previous five
(5) years prior to the award of a Contract and agrees to remain in continuous
compliance with the provisions of these statutes during the duration of any contract that
may be established. Final determinations of any violations of these statutes, must be
provided to the University by the successful Contractor prior to the award of a Contract.
LUMP SUM PROPOSAL

The Bidder, in compliance with the Invitation to Bid CCK-2152-17 having examined the drawings, specifications, related documents and having visited the site of the proposed work, and being familiar with all the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby submits the following bid to furnish all labor, materials, and supplies and to construct the project in accordance with the Bid Documents within the time set forth therein and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Bid is a part.

The Bidder agrees to furnish all labor, materials, supplies and services required to complete the Work, for the above referenced Project, for the Capital Construction Procurement Section, University of Kentucky, as described in the Specifications and Contract Documents and shown on the Drawings enumerated below and as modified by the Addenda listed above.

Bidder hereby agrees that all escalation cost associated with materials and/or labor have been included in the stated unit cost, through the projected duration dates as stated in the preliminary project construction schedule.

FOR THE LUMP SUM OF ____________________________________________

___________________________ DOLLARS AND ______________________ CENTS.

(USE WORDS) (USE WORDS)

($________________________) (USE FIGURES)
BUSINESS CLASSIFICATION

Please complete this form which is necessary for the University of Kentucky vendor database. Mark only one classification. Refer to "Definitions" for assistance in determining correct classification.

(01) Small Business          (06) Woman-Owned Large Business
(02) Large Business          (07) Disadvantaged Woman-Owned Small Business
(03) Disadvantaged Small Business
(04) Disadvantaged Large Business
(05) Woman-Owned Small Business

DEFINITIONS

(01) SMALL BUSINESS: A business concern that is organized for profit, is independently owned and operated, is not dominant in the field of operations in which it is bidding, and meets the size standards as prescribed in the Code of Federal Regulations, Title 13, Part 121. Consult your local or district Small Business Administration (SBA) office if further clarification is needed.

(02) LARGE BUSINESS: A business concern that exceeds the small business size code standards established by SBA.

(03) DISADVANTAGED SMALL BUSINESS: A business concern (a) that is at least 51 percent owned by one or more socially and economically disadvantaged individuals (as defined below), or a publicly owned business, having at least 51 percent of its stock owned by one or more socially and economically disadvantaged individuals; and (b) has its management and daily business operations controlled by one or more such individuals. Socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans and other minorities or individuals found to be disadvantaged by the SBA.

(04) DISADVANTAGED LARGE BUSINESS: A concern that meets the definition of socially and economically disadvantaged individuals, but which is not a small business by the SBA's size standards.

(05) WOMAN-OWNED SMALL BUSINESS: A small business that is at least 51 percent owned by a woman or women who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" means actively involved in the day to day management.

(06) WOMAN-OWNED LARGE BUSINESS: A concern that meets the definition of woman owned and operated, but which is not a small business by the SBA's standards.

(07) DISADVANTAGED, WOMAN-OWNED SMALL BUSINESS: A concern that meets the definition of both (03) and (05) above.

(08) DISADVANTAGED, WOMAN OWNED LARGE BUSINESS: A concern that meets the definition of both (04) and (06) above.

(09) OTHER: A concern that does not meet any of the above definitions.
THE FOLLOWING ITEMS ARE HEREBITH ENCLOSED AS REQUIRED BY KRS 45A.185

1. Bid Bond or Certified Check in an amount not less than five percent (5%) of total Bid.

2. List of Proposed Subcontractors and Unit Prices. (if required)

3. Authentication of Bid and Statement of Non-Collusion and Non-Conflict of Interest.

4. List of Materials and Equipment.

5. VENDOR NUMBER: It is imperative that you furnish your Federal Employer Identification Number in the space provided below. Failure to do so may delay the processing of purchase orders issued to your firm.

(Nine Digit Number)

BIDDER'S QUALIFICATIONS

The Commonwealth of Kentucky Model Procurement Code (KRS 45A.080) requires contracts to be awarded, "to the responsive and responsible bidder whose bid offers the best value" to the University of Kentucky. In order to determine if the Bidder has the experience, qualifications, resources and necessary attributes to provide the quality workmanship, materials and management required by the plans and specifications, the Bidder may be required to complete and submit the information requested on the University of Kentucky Contractor Bidder Determination of Responsibility questionnaire. Failure to provide the information requested on the questionnaire or failure to provide any additional submittals or information that may be requested to make this determination may be grounds for a declaration of non-responsibility with respect to the Bidder. A copy of the Contractor Determination of Responsibility questionnaire is available upon request to all Bidders.

TIME LIMIT FOR EXECUTION OF CONTRACT DOCUMENTS

It is further agreed, that in the event this Proposal is accepted by the Owner and the undersigned shall fail to execute the Contract and furnish satisfactory Payment and Performance Bond within ten (10) consecutive calendar days from the date of notification of the award of the Contract, the Owner may at his option, determine that the undersigned has abandoned the Contract and thereupon, the Proposal shall become null and void and the Bid guarantee, check or Bid bond which accompanied it shall be forfeited and become the property of the Owner as liquidated damages for each failure and no protest pursuant to such action will be made. If the Undersigned shall execute the Contract, and furnish satisfactory Payment Bond and Performance Bond, it is understood that the Bid Guarantee or Bid Bond will be returned to the undersigned by the Owner.
UNIT PRICES

NOTE: Unit Prices shall include the furnishing of all labor, materials, supplies and services and shall include all items of cost, overhead and profit for the Contractor and any Subcontractor involved, and shall be used uniformly without modifications for either additions or deductions. The Unit Prices as established shall be used to determine the equitable adjustment of the Contract Price in connection with changes, deletions or extra work performed under the Contract and the "Rules of Measurement" set forth in the General Conditions shall govern.

All Bidders are required to complete and submit the following information with their bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

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<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>COST PER UNIT</th>
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<tbody>
<tr>
<td>Chilled Water Piping</td>
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<tr>
<td>Condensate Piping</td>
<td>LF</td>
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<tr>
<td>Welding</td>
<td>HR</td>
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<tr>
<td>Concrete</td>
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<td>Core Drilling</td>
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<tr>
<td>Rock Removal</td>
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<td></td>
</tr>
<tr>
<td>Blowdown Piping</td>
<td>LF</td>
<td></td>
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</tbody>
</table>
PRIMARY LIST OF PROPOSED SUBCONTRACTORS

All Subcontractors are subject to the approval of the Capital Construction Procurement Section and Capital Project Management Division, University of Kentucky, Lexington, KY.

If certain branches of the Work are to be done by the Prime Contractor, so state.

*The apparent low bidder will be required to complete and submit to the University the following information by twelve (12) noon of the first working day following the bid opening. The information requested in this submittal is required to assist the University in determining contractor responsibility to complete the project being bid.*

*The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.*

Provide the address, phone number and contact information for the following Subcontractor/suppliers:

<table>
<thead>
<tr>
<th>DIVISION OF WORK</th>
<th>NAME AND ADDRESS OF SUBCONTRACTOR</th>
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LIST OF MATERIALS AND EQUIPMENT

Each item listed under the different phases of construction must be clearly identified so that the Owner will definitely know what the Bidder proposes to furnish.

The use of a manufacturer's or dealer's name only, or stating "as per Plans and Specifications," will not be considered as sufficient identification.

Where more than one "Make" or "Brand" is listed for any one item, the Owner has the right to select the one to be used.

The apparent low bidder will be required to complete and submit to the University the following information by twelve (12) noon of the first working day following the bid opening. The information requested in this submittal is required to assist the University in determining contractor responsibility to complete the project being bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

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IDENTIFICATION OF MINORITY SUBCONTRACTORS AND MATERIAL SUPPLIERS

Participation of Minority and Women owned Contractors and businesses.

The University of Kentucky encourages and supports the participation of minority and women owned businesses.

1. Minority and Women Subcontractors

2. Minority and Women Material Suppliers

SUPERINTENDENT

In accordance with Article 17 of the General Conditions a full-time superintendent will be required on this project. Below, please list the superintendent your firm will employ on this project. The successful Bidder will be required to furnish a resume of the superintendents’ qualifications and or past projects.

List the Superintendent’s Name

Revised 3/22/06
TRADE CONTRACT – 23V – Chiller 6 and Associated Work

This section defines in summary, without limitations by the descriptions, significant items of the scope of work to be performed by the Subcontractor and any special provision related to the Subcontractor’s execution of the Work and the Project. The details of the scope of work are further defined in Drawings, Specifications, and other provisions contained in the Project Documents.

Unit 23V – Chiller 6 Mechanical and Plumbing

This work shall include all items indicated in Section A: General Scope of Work, as such items apply to this work unless specifically noted otherwise herein.

This work primarily includes, but is not limited to the following specification sections as well as related work specified or shown elsewhere in the Contract Documents:

- Division 1 – General Requirements
- Division 2 - Existing Conditions
  - 024119 - Selective Demolition (as it pertains to this scope of work)
- Division 3 – Concrete
  - 033000 – Cast in Place Concrete
- Division 5 – Metals
  - 051200 – Structural Steel
- Division 20 – Mechanical Requirements
  - 200000 – General Mechanical Requirements
  - 200513 – Motors
  - 200520 – Excavation and Backfill
  - 200529 – Mechanical Supporting Devices
  - 200533 – Mechanical Systems Identification
  - 200573 – Mechanical Systems Firestopping
  - 200700 – Mechanical Systems Insulation
- Division 22 – Plumbing
  - 220000 – General Plumbing Requirements
  - 221118 – Water Distribution System
  - 221314 – Sanitary Waste and Storm Drainage Systems
- Division 23 – Mechanical Requirements
  - 230000 – General HVAC Requirements
  - 230550 – Vibration Isolation
  - 230594 – Water Systems Test Adjust Balance
  - 230598 – Acceptance Testing of Rotating Equipment
  - 230901A – Control Systems
  - 230993 – Control Sequences
  - 232116 – Pipe and Pipe Fittings
  - 232118 – Valves
  - 232120 – Piping Specialties
  - 232123 – Pumps
  - 232514 – Chemical Treatment Systems and Final System Fill
  - 233114 – Ductwork
  - 236000 – Primary Cooling Equipment
- Division 31 - Excavations
  - 315000 – Excavation Retention, Shoring, and Bracing

1. Scope of Work – It is the intent for this project that this Subcontractor perform all work scoped herein and as specified in the Project Manual and Contract Drawings. This subcontract includes selective demolition,
concrete, structural steel, mechanical/HVAC, plumbing, electrical, and excavation work for the Campus Utility Plant and Spline portion of the project. This Subcontractor will generally perform but not be limited to the following:

a) Chiller install (Chiller purchased by others)
b) Shoring of CUP Basement for Chiller Install
c) Core drilling
d) Saw cutting
e) Condenser and chilled water pump furnish and install
f) Selective demolition of HVAC piping system and removal
g) Excavation to include rock removal, backfill, and removal of excess earthwork
h) Cast-in-place concrete curbs, trenches, equipment pads, support blocks, and basin
i) Structural steel, pipe supports, and checker plate
j) Piping discharge containment and removal
k) Chiller exhaust duct
l) HVAC Ductwork
m) Blowdown piping rerouting and associated valve work
n) Condenser water retention tank furnish and install
o) Condensate supply and return piping
p) Chilled water supply and return piping
q) Chiller vent and drain piping
r) Continuous blowdown heat exchanger and blowoff tank furnish and install
s) Chiller VFD furnish and install, including associated powers and controls
t) Pipe insulation and painting
u) Utility marking
v) Furnish and install sewage ejector pumps, sump pumps, and associated piping
w) Penetration waterproofing
x) Penetration fireproofing
y) Flow Meters
z) Penetration sleeves
aa) Miscellaneous plumbing
bb) Housekeeping pads
cc) General conditions

d) Saw cutting

2. **Full-time Project Manager** - Subcontractor shall provide full time project manager or competent person onsite at all time work is being performed.

3. **PlanGrid License** – This Subcontractor has included the necessary license(s) to PlanGrid for their office and field staff for field reference and notifications. Please note that drawings posted on PlanGrid do not supersede the Contract Documents and should only be used for reference and notifications. All submittals, RFIs, and installation work should conform to the Contract Documents.

4. **Engineering** – This Subcontractor shall be responsible for engineering and design of the chilled water and high pressure steam systems as required by specifications. Furnish and install all seismic bracing required by local code for this scope of work. Provide complete engineering for seismic systems. Furnish and install vibration isolation for all equipment and piping per contract documents for this scope of work. Provide complete engineering for isolation systems.

5. **Selective Demolition** – Complete piping demolition as required by the contract documents. Remove all demolition materials from site upon completion of demolition unless otherwise noted by Whiting-Turner.

6. **Sleeves** – Furnish sleeves at all appropriate penetrations. Provide shop drawings to installing contractor identifying height and locations of wall sleeves.
7. **Core drilling** – As required to complete mechanical work detailed in drawings and with plan approval by the structural engineer. This subcontract will provide core drilling as shown, approved, or required. Structural Steel Supports for all penetrations and where otherwise required per the drawings.

8. **Housekeeping Pads** – All floor mounted equipment will be assumed to have a housekeeping pad whether indicated on the drawings or not. This Subcontractor will provide concrete pads for all floor mounted equipment.

9. **Shoring** - Provide shoring as required to sustain existing C.U.P floor for installation of 2500 ton chiller, sewage ejector basin, and as otherwise required. Shoring will be provided by professional scaffolding/shoring contractor Subcontractor shall provide engineering of shoring system as needed to demonstrate chiller can be installed without damage to existing structure. Additionally, Subcontractor will provide 3rd party professional rigging contractor to rig and install new chiller. Rigging and installation will be off-shift/weekend work to avoid traffic around parking garage.

10. **Access Doors** – Furnish and install all access doors for access to HVAC systems, if required.

11. **Fire Stopping** - Provide fire stopping at all penetrations in floors, ceilings, and walls where required by contract documents. Including pipe penetrations into manholes, and buildings.

12. **Waterproofing** – This Subcontractor shall provide appropriate waterproofing of all penetrations as called out in the contract documents.

13. Subcontractor shall seal all penetrations where HVAC piping, ductwork and equipment penetrates interior or exterior partitions. Ensure that all penetrations through exterior walls to receive waterproofing have been properly sealed according to the requirements of the Contract Documents and manufacturer’s recommendations before waterproofing is installed.

14. **Roof Penetrations** – This Subcontractor will provide all fireproofing, flashing, sealing, waterproofing, sleeves, curbs, supports, and roof patching etc. for roof penetrations required by the contract documents.

15. **General Conditions** – This Subcontractor will provide general conditions for this bid package scope. This will include port a johns for this and 26V tradesman. Dumpsters for 23V and 26V for general waste and debris. Safety barricades etc. will all be provided along with misc signage where required. This Subcontractor will also be responsible for temporary fence installation between the stair tower and the Central Utility Plant to include a 20 foot wide entrance; the use of temporary panels is not authorized.

16. **General Scope Items** – It is the intent that this Subcontractor will perform all work as detailed on the contract documents minus that work which is specifically listed in the 26V work scope. Where items are determined to not specifically be in the 26V work scope this trade will be primarily responsible for performing that work item.

17. Provide patching of spray fireproofing damaged by this Subcontractor.

18. **Structural Steel Support** – Subcontractor is responsible for proper support of all mechanical piping and work. Where not specified on the structural drawings, this Subcontractor shall be responsible for all structural supports of mechanical work, associated embeds, and coordination for their installation.

19. **Protection** - This Subcontractor shall be responsible for identification and protection of all work that will remain exposed after installation. Costs to repair or replace inadequately protected work that becomes damaged shall be borne by this Subcontractor.

20. Furnish and install labels and signage which meet contract documents along with the governing code for HVAC systems.
21. Furnish and install all insulation and jacketing required by specification, drawings and governing energy codes for this scope of work. Additionally, this Subcontractor shall be responsible for all pipe and insulation painting as specified.

22. Subcontractor shall be responsible for flushing, cleaning and certification of HVAC piping and duct systems as required by contract documents and codes.

23. **Controls** - This Subcontractor is responsible to furnish and install conduit, wiring, devices, controllers, panels, workstation, software and programming for controls associated with the Spline contract. Provide controls conduit, wiring, interface, power and actuators to control devices. Provide controls interconnect and interlock wiring between systems and components. All controls cabling and wiring is to be in conduit. Connect to and monitor owner-furnished equipment. This Subcontractor shall provide connection from new controls devices back to owner’s BMS network. This Subcontractor shall provide power wiring from electrical panels to Controls Panels and to all devices. Coordinate with Division 26V for connections to switchgear and power monitoring, and provide conduit and cabling to tie these systems back to BMS. Test and calibrate all devices and test/tune control loops prior to start of commissioning activities. Replace any devices found to be damaged, malfunctioning, or out of specifications prior to start of commissioning. Provide Whiting-Turner access to temporary workstation during construction, until the building BMS is brought onto the campus network. Provide alarming capability to Whiting-Turner and owner through temporary workstation. Coordinate with Whiting-Turner and owner’s commissioning agent for trending requirements and provide trending before commissioning. Provide weekly updates of point to point check out status.

24. Subcontractor is responsible for the locations and requirements of power feeds and/or receptacles needed for all equipment provided by this scope of work. Provide electrical interconnect wiring for HVAC equipment to provide a single point electrical connection.

25. Subcontractor is responsible for Testing & Balancing of plumbing systems, and any coordination thereof. All testing paperwork shall be delivered to Whiting-Turner for records.

26. Provide extended warranties for period of temporary use of equipment during construction. Provide maintenance of all equipment used during the temporary power and heating periods according to manufacturer’s recommendations. Maintain a log of all maintenance performed through the temporary construction period until substantial completion. Submit a sample log to Whiting-Turner for approval before the start of temporary use.

27. **Utility markers** – Where required this Subcontractor will provide all surface utility marking as required by the contract documents.

28. **Mechanical Equipment**: This Subcontractor shall provide; or receive and install, the following Mechanical and HVAC equipment including but not limited to:
   a) Receive and install 2500 ton York Centrifugal Chiller (to be purchased by the University of Kentucky)
   b) Furnish, and install new dedicated vertical turbine chilled water pump
   c) Furnish, and install new dedicated vertical turbine condenser water pump
   d) Furnish, and install submersible sanitary sewage ejector
   e) Furnish, and install submersible sanitary effluent sump pump
   f) Furnish, and install continuous blowdown heat exchanger
   a) Furnish, and install blow off tank
   b) Furnish, and install water flow meters
   c) VFDs

29. **Temporary Mechanical** – it is the responsibility of this Subcontractor to install all temporary chilled water, high pressure steam, fuel oil lines, condensate lines etc. as specified in the contract documents. This Subcontractor will also be responsible for disposing of temporary mechanical infrastructure as project completion requires.

30. **Misc. Extra Work** – This Subcontractor will be responsible for miscellaneous extra work including but not limited to excavation, concrete, plumbing, mechanical, and/or electrical scopes of work. Subcontractor will seek
to identify and bid these items per the contract documents, but will carry a $20,000 dollar allowance for misc.
extra work not identified on drawings that may be required. Any unused portion of equipment hours, labor
hours, or material allowance will be returned to the Construction Manager as a deductive credit at any time as
designated by the Construction Manager.

31. Coordination – It is the intent that this Subcontractor will make all necessary coordination with other trades for
complete installation of mechanical equipment as required by the contract documents. It is also the intent that
this Subcontractor contact Whiting-Turner for coordination of work that will require the University of Kentucky
to shut down any existing equipment. A minimum 2 week notice to Whiting-Turner is mandatory for all
shutdown requests.

32. Central Utility Plant:
   a) Provide for all connections, piping, welding, demolition, and insulation as required by contract
documents, drawings, and specifications; in order to install all mechanical equipment
   b) Move roof vents as required for pipe penetrations as required by contract documents and project
      manual.

33. Chiller Installation:
   a) Provide and install condensate and chilled water pumps as required by contract documents.
   b) Provide and install 20” CTS and CTR piping, supports, flowmeters, differential pressure switches,
      flanged connections, couplings, valves, anchors, gaskets, etc. as required by the contract documents.
   c) Provide and install chiller exhaust ductwork, bird screen, ductwork supports, anchors, etc. as required
      by the contract documents.
   d) Provide, or reroute, and install provide blowdown piping, valves, supports, etc. to new and existing
      equipment as required in the contract documents.
   e) Provide and install 16” CWS and CWR chiller piping, differential pressure switches, flanged
      connections, couplings, supports, valves, flowmeters, reducers, etc. as required by the contract
      documents.
   f) Provide and install concrete supports as required by contract documents
   g) Provide basement reshore, engineering, etc. for movement of chiller on first floor.

34. Blowoff Tank and Continuous Blowdown Heat Exchanger:
   a) Provide and install blowoff tank, concrete housekeeping pad, piping, insulation valves, fittings,
      supports, etc. as required by contract documents.
   b) Provide and install water piping, sanitary piping, drain piping, valves, unions, insulation, and sump
      cover penetration as required by contract documents
   c) Provide and install continuous blowdown heat exchanger, concrete housekeeping pad, piping, valves,
      fittings, supports, etc. as required by the contract documents.
   d) Provide and install vent piping for blowoff tank and heat exchanger as required by the contract
      documents. Subcontractor shall provide all sealants, firestopping, caulking, vapor barriers, support
      steel, roofing silicone seals, clamps, flashing, and counterflashing for a complete watertight system per
      contract documents.

35. Cup Basement Excavation, Concrete, and Plumbing:
   a) Excavate, form, and pour trenches and sewage ejector basin as required by contract documents. All
      excess shall be removed from site.
   b) Provide and install sewage ejector pump, condenser water retention tank and all associated drainage
      piping, support steel, insulation, valves, fittings, and drain plugs as required per contract documents.
   c) Provide and install vent from sewage ejector pump through floor slab and roof.
   d) Provide and install pressurized discharge piping from sewage ejector pump to existing sanitary piping
      in stair tower pit as required per contract documents.
   e) Daily cleaning and removal of spoils trash etc. will be provided by this Subcontractor. No spoils will
      be retained in any condition inside the building.
36. **Testing** – This Subcontractor shall be responsible for all testing of systems installed under this scope of work. Provide factory testing and third party testing as required. Coordinate all testing and inspections with Authority Having Jurisdiction and Whiting-Turner. Provide multiple testing of installations as required to meet the project schedule. Provide duct leakage testing and coordinate with testing and balancing contractor.

37. **Temporary Power** – This Subcontractor will provide, where necessary, all temporary power for completing this scope of work.

38. **Temporary Chilled Water** – This Subcontractor has accounted for installation and demolition of temporary chilled water lines as specified in the construction documents.

39. **Commissioning**: Provide commissioning support including but not limited to the following:
   a) Completion of commissioning documentation
   b) Attendance in commissioning meetings when directed by Whiting-Turner
   c) Onsite support during functional testing
   d) Onsite support to resolve any commissioning issues with installed work

40. **Site Conditions** – All existing site conditions are to be verified prior to start of construction. Any variances in conditions must be documented prior to construction. If Whiting-Turner is not notified in writing, it shall be the responsibility of this Subcontractor to make any corrections or remediation necessary at no additional cost. In addition, this Subcontractor shall protect all existing conditions and surroundings as so not to damage during construction. This includes any damage that could result from surface water. If any existing items, which are to be left undisturbed, are damaged by this Subcontractor it shall be its responsibility to repair.

41. **Traffic Control** – This Subcontractor is fully aware that the construction site is within a high traffic campus corridor with continuing operations throughout the construction process. To that end, this Subcontractor will work hand in hand with the Construction Manager to ensure deliveries, manpower, and general construction traffic are conducted in such a manner as to provide a safe and undisturbed environment for the pedestrian and vehicular traffic, which includes but is not limited to: cleanup of all vehicle debris, mud, materials, adjusting haul routes and hours, adjusting exit routes, parking in designated areas, deferring to campus traffic, etc.

42. **Schedule / Weather** – This Subcontractor shall make all provisions for an accelerated construction schedule. Contract extensions will not be considered for abnormal weather conditions. As a Team we must anticipate and do everything reasonable and prudent to get over, through and/or around the obstacles that beset every construction project.

**END OF SPECIFIC SCOPE**
UNIVERSITY OF KENTUCKY
CAPITAL CONSTRUCTION PROCUREMENT SECTION
FORM OF PROPOSAL
RESEARCH BUILDING #2

Subcontract 26V – Chiller 6 Electrical

Project No. 2425.0 Project Title: Chiller 6 and CUP Revisions
Purchasing Officer: Mike Mudd

NOTE: The following Form of Proposal shall be followed exactly in submitting a proposal for this work. If this copy is lost, an additional copy will be furnished upon written request to the authority issuing Contract Documents.

This Proposal is submitted by: ____________________________
(NAME AND ADDRESS OF BIDDER)

Date: ____________________________

Telephone: ____________________________

TO: BID CLERK INVITATION TO BID: CCK-2283-18
UNIVERSITY OF KENTUCKY
CAPITAL CONSTRUCTION
PROCUREMENT
RM. 322 SERVICE BUILDING
411 SOUTH LIMESTONE
LEXINGTON, KY 40506-0005

The Bidder, in compliance with your Invitation for Bids for the above referenced Project, having carefully examined the site of the Work, the Drawings and complete Contract Documents as defined in Article I of the General Conditions, as well as the Specifications affecting the work as prepared by the Consultant, hereby proposes to furnish all labor, materials, supplies and services required to construct the Project in accordance with the Contract Documents, within the time set forth therein, and at the price stated below without qualification.

The Bidder hereby acknowledges receipt of the following Addenda:

ADDENDUM NO. DATED
ADDENDUM NO. DATED
ADDENDUM NO. DATED
ADDENDUM NO. DATED
ADDENDUM NO. DATED

(Insert the number and date of any Addenda issued and received. If none has been issued and received, the word NONE should be inserted.)
FORM OF PROPOSAL

AUTHENTICATION OF BID AND STATEMENT OF NON-COLLUSION AND NON-CONFLICT OF INTEREST

I hereby certify:

1. That I am the Bidder (if the Bidder is an individual), a partner in the Bidder (if the Bidder is a partnership), or an officer or employee of the bidding corporation having authority to sign on its behalf (if the Bidder is a corporation);

2. That the submitted Bid or Bids covering Capital Construction Procurement Section Invitation No. CCK-2152-17 have been arrived at by the Bidder independently and have been submitted without collusion with, and without any agreement, understanding or planned common course of action with, any other contractor, vendor of materials, supplies, equipment or services described in the Invitation to Bid, designed to limit independent bidding or competition; as prohibited by provision KRS 45A.325;

3. That the contents of the Bid or Bids have not been communicated by the Bidder or its employees or agents to any person not an employee or agent of the Bidder or its surety on any bond furnished with the Bid or Bids and will not be communicated to any such person prior to the official opening of the Bid or Bids;

4. That the Bidder is legally entitled to enter into the contracts with the University of Kentucky and is not in violation of any prohibited conflict of interest, including those prohibited by the provisions of KRS 164.390, and 45A.330 to 45A.340 and 45A.455;

5. This offer is good for 60 calendar days from the date this Bid is opened. In submitting the above, it is expressly agreed that upon proper acceptance by the Capital Construction Procurement Section of any or all items Bid above, a contract shall thereby be created with respect to the items accepted;

6. That I have fully informed myself regarding and affirm the accuracy of all statements made in this Form of Proposal including Bid Amount.

7. Unless otherwise exempted by KRS 45.590, the Bidder intends to comply in full with all requirements of the Kentucky Civil Rights Act and to submit data required by the Kentucky Equal Employment Act upon being designated the successful contractor.

8. That the bidding contractor and all Subcontractors to be employed do not and will not maintain any facilities they provide for employees in a segregated manner and they are in full compliance with provisions of 41 CFR 60-1.8 that prohibits the maintaining of segregated facilities.

9. In accordance with KRS45A.110(2), the undersigned hereby swears under penalty of perjury that he/she has not knowingly violated any provision of the campaign finance laws of the Commonwealth of Kentucky and that the award of a contract to the bidder will not violate any provision of the campaign finance laws of the Commonwealth of Kentucky.

READ CAREFULLY - SIGN IN SPACE BELOW – FAILURE TO SIGN INVALIDATES BID

SIGNED BY__________________________ TITLE__________________________
PRINT NAME_________________________ FIRM__________________________
ADDRESS____________________________ PHONE (____)__________________
                             FAX (____)____________________
CITY__________________ STATE______ ZIP CODE________________________

Work Category – 26V        Page 2 of 14
Pursuant to KRS 45A.485, the Contractor shall, prior to the award of a Contract, reveal final determinations of any violations of the provisions of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 by the Contractor that have occurred in the previous five (5) year period.

This statute also requires for the duration of the Contract established, the Contractor be in continuous compliance with the provisions of Chapters 136, 139, 141, 337, 338, 341, and 342 that apply to the Contractor’s operations. The Contractor’s failure to reveal a final determination of a violation of KRS Chapters 136, 139, 141, 337, 338, 341, and 342, or failure to comply with any of the above cited statutes for the duration of the Contract shall be grounds for the cancellation of the Contract, and the disqualification from eligibility for future contracts for a period of two (2) years.

The Contractor, by signing and submitting a Bid on this Invitation, agrees as required by KRS 45A.485 to submit final determinations of any violations of the provisions of KRS Chapters 136, 139, 141, 337, 338, 341, and 342 that have occurred in the previous five (5) years prior to the award of a Contract and agrees to remain in continuous compliance with the provisions of these statutes during the duration of any contract that may be established. Final determinations of any violations of these statutes, must be provided to the University by the successful Contractor prior to the award of a Contract.
LUMP SUM PROPOSAL

The Bidder, in compliance with the Invitation to Bid CCK-2269-18 having examined the drawings, specifications, related documents and having visited the site of the proposed work, and being familiar with all the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby submits the following bid to furnish all labor, materials, and supplies and to construct the project in accordance with the Bid Documents within the time set forth therein and at the prices stated below. These prices are to cover all expenses incurred in performing the work required under the Contract Documents, of which this Bid is a part.

The Bidder agrees to furnish all labor, materials, supplies and services required to complete the Work, for the above referenced Project, for the Capital Construction Procurement Section, University of Kentucky, as described in the Specifications and Contract Documents and shown on the Drawings enumerated below and as modified by the Addenda listed above.

Bidder hereby agrees that all escalation cost associated with materials and/or labor have been included in the stated unit cost, through the projected duration dates as stated in the preliminary project construction schedule.

FOR THE LUMP SUM OF ________________________________

______________________________________________________

(USE WORDS)

______________________________________________________

DOLLARS AND ____________________ CENTS.

(USE WORDS)  (USE WORDS)

($________________________)

(USE FIGURES)
BUSINESS CLASSIFICATION

Please complete this form which is necessary for the University of Kentucky vendor database. Mark only one classification. Refer to "Definitions" for assistance in determining correct classification.

(01) Small Business (06) Woman-Owned Large Business
(02) Large Business (07) Disadvantaged Woman-Owned Small Business
(03) Disadvantaged Small Business (08) Disadvantaged Woman-Owned Large Business
(04) Disadvantaged Large Business (09) Other
(05) Woman-Owned Small Business

DEFINITIONS

(01) SMALL BUSINESS: A business concern that is organized for profit, is independently owned and operated, is not dominant in the field of operations in which it is bidding, and meets the size standards as prescribed in the Code of Federal Regulations, Title 13, Part 121. Consult your local or district Small Business Administration (SBA) office if further clarification is needed.

(02) LARGE BUSINESS: A business concern that exceeds the small business size code standards established by SBA.

(03) DISADVANTAGED SMALL BUSINESS: A business concern (a) that is at least 51 percent owned by one or more socially and economically disadvantaged individuals (as defined below), or a publicly owned business, having at least 51 percent of its stock owned by one or more socially and economically disadvantaged individuals; and (b) has its management and daily business operations controlled by one or more such individuals. Socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans and other minorities or individuals found to be disadvantaged by the SBA.

(04) DISADVANTAGED LARGE BUSINESS: A concern that meets the definition of socially and economically disadvantaged individuals, but which is not a small business by the SBA's size standards.

(05) WOMAN-OWNED SMALL BUSINESS: A small business that is at least 51 percent owned by a woman or women who also control and operate it. "Control" in this context means exercising the power to make policy decisions. "Operate" means actively involved in the day to day management.

(06) WOMAN-OWNED LARGE BUSINESS: A concern that meets the definition of woman owned and operated, but which is not a small business by the SBA's standards.

(07) DISADVANTAGED, WOMAN-OWNED SMALL BUSINESS: A concern that meets the definition of both (03) and (05) above.

(08) DISADVANTAGED, WOMAN OWNED LARGE BUSINESS: A concern that meets the definition of both (04) and (06) above.

(09) OTHER: A concern that does not meet any of the above definitions.
THE FOLLOWING ITEMS ARE HEREWITH ENCLOSED AS REQUIRED BY KRS 45A.185

1. Bid Bond or Certified Check in an amount not less than five percent (5%) of total Bid.

2. List of Proposed Subcontractors and Unit Prices. (if required)

3. Authentication of Bid and Statement of Non-Collusion and Non-Conflict of Interest.

4. List of Materials and Equipment.

5. VENDOR NUMBER: It is imperative that you furnish your Federal Employer Identification Number in the space provided below. Failure to do so may delay the processing of purchase orders issued to your firm.

(Nine Digit Number)

BIDDER'S QUALIFICATIONS

The Commonwealth of Kentucky Model Procurement Code (KRS 45A.080) requires contracts to be awarded, "to the responsive and responsible bidder whose bid offers the best value" to the University of Kentucky. In order to determine if the Bidder has the experience, qualifications, resources and necessary attributes to provide the quality workmanship, materials and management required by the plans and specifications, the Bidder may be required to complete and submit the information requested on the University of Kentucky Contractor Bidder Determination of Responsibility questionnaire. Failure to provide the information requested on the questionnaire or failure to provide any additional submittals or information that may be requested to make this determination may be grounds for a declaration of non-responsibility with respect to the Bidder. A copy of the Contractor Determination of Responsibility questionnaire is available upon request to all Bidders.

TIME LIMIT FOR EXECUTION OF CONTRACT DOCUMENTS

It is further agreed, that in the event this Proposal is accepted by the Owner and the undersigned shall fail to execute the Contract and furnish satisfactory Payment and Performance Bond within ten (10) consecutive calendar days from the date of notification of the award of the Contract, the Owner may at his option, determine that the undersigned has abandoned the Contract and thereupon, the Proposal shall become null and void and the Bid guarantee, check or Bid bond which accompanied it shall be forfeited and become the property of the Owner as liquidated damages for each failure and no protest pursuant to such action will be made. If the Undersigned shall execute the Contract, and furnish satisfactory Payment Bond and Performance Bond, it is understood that the Bid Guarantee or Bid Bond will be returned to the undersigned by the Owner.
UNIT PRICES

NOTE: Unit Prices shall include the furnishing of all labor, materials, supplies and services and shall include all items of cost, overhead and profit for the Contractor and any Subcontractor involved, and shall be used uniformly without modifications for either additions or deductions. The Unit Prices as established shall be used to determine the equitable adjustment of the Contract Price in connection with changes, deletions or extra work performed under the Contract and the "Rules of Measurement" set forth in the General Conditions shall govern.

All Bidders are required to complete and submit the following information with their bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNIT</th>
<th>COST PER UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laborer</td>
<td>HR</td>
<td></td>
</tr>
<tr>
<td>Electrician</td>
<td>HR</td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td>HR</td>
<td></td>
</tr>
</tbody>
</table>
PRIMARY LIST OF PROPOSED SUBCONTRACTORS

All Subcontractors are subject to the approval of the Capital Construction Procurement Section and Capital Project Management Division, University of Kentucky, Lexington, KY.

If certain branches of the Work are to be done by the Prime Contractor, so state.

The apparent low bidder will be required to complete and submit to the University the following information by twelve (12) noon of the first working day following the bid opening. The information requested in this submittal is required to assist the University in determining contractor responsibility to complete the project being bid.

The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.

Provide the address, phone number and contact information for the following Subcontractor/suppliers:

<table>
<thead>
<tr>
<th>DIVISION OF WORK</th>
<th>NAME AND ADDRESS OF SUBCONTRACTOR</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
LIST OF MATERIALS AND EQUIPMENT

Each item listed under the different phases of construction must be clearly identified so that the Owner will definitely know what the Bidder proposes to furnish.

The use of a manufacturer's or dealer's name only, or stating "as per Plans and Specifications," will not be considered as sufficient identification.

Where more than one "Make" or "Brand" is listed for any one item, the Owner has the right to select the one to be used.

*The apparent low bidder will be required to complete and submit to the University the following information by twelve (12) noon of the first working day following the bid opening. The information requested in this submittal is required to assist the University in determining contractor responsibility to complete the project being bid.*

*The apparent low bidder is requested to attend a post bid meeting which will be scheduled at a later date.*

<table>
<thead>
<tr>
<th>ITEM DESCRIPTION</th>
<th>MANUFACTURER/SUPPLIER</th>
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IDENTIFICATION OF MINORITY SUBCONTRACTORS AND MATERIAL SUPPLIERS

Participation of Minority and Women owned Contractors and businesses.

The University of Kentucky encourages and supports the participation of minority and women owned businesses.

1. Minority and Women Subcontractors

   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

2. Minority and Women Material Suppliers

   ___________________________________________________________

   ___________________________________________________________

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   ___________________________________________________________

   ___________________________________________________________

   ___________________________________________________________

SUPERINTENDENT

In accordance with Article 17 of the General Conditions a full-time superintendent will be required on this project. Below, please list the superintendent your firm will employ on this project. The successful Bidder will be required to furnish a resume of the superintendents’ qualifications and or past projects.

__________________________________________
List the Superintendent’s Name
TRADE CONTRACT – 26V – Electrical

This section defines in summary, without limitations by the descriptions, significant items of the scope of work to be performed by the Subcontractor and any special provision related to the Subcontractor’s execution of the Work and the Project. The details of the scope of work are further defined in Drawings, Specifications, and other provisions contained in the Project Documents.

Unit 26V Chiller 6 Electrical

This work shall include all items indicated in Section A: General Scope of Work, as such items apply to this work unless specifically noted otherwise herein.

This work primarily includes, but is not limited to the following specification sections as well as related work specified or shown elsewhere in the Contract Documents:

- Division 1 – General Requirements
- Division 2 - Existing Conditions
- 024119 - Selective Demolition (as it pertains to this scope of work)
- Division 26 – Electrical
  - 260000 - General Electrical Requirements
  - 260513.16 – Medium-Voltage Single and Multi Conductor Cables
  - 260519 – Low Voltage Electrical Power Conductors and Cables
  - 260526 – Grounding and Bonding for Electrical Systems
  - 260529 – Hangers and Supports for Electrical Systems
  - 260533 – Raceway and Boxes for Electrical Systems
  - 260533 – Electrical Systems Identification
  - 260593 – Electrical Systems Firestopping
  - 260812 – Power Distribution Acceptance Tests
  - 260813 – Power Distribution Acceptance Test Tables
  - 262726 – Wiring Devices
  - 262813 – Fuses
  - 262816 – Enclosed Switches and Circuit Breakers
  - 262913 – Enclosed Controllers
  - 265100 – Lighting Systems

Electrical as specified in contract documents

***Note: This Subcontractor is responsible for the requirements of the complete Contract Documents as they pertain to this Unit of Work.

1. Scope of Work – It is the intent for this project that this Subcontractor performs all work scoped herein and as specified in the Project Manual and Contract Drawings. This Subcontractor will generally perform all electrical and communication work which includes but is not limited to:
   a) Electrical service runs for Chiller and as required by Contract Documents
   b) Pull boxes
   c) Electrical and communication demolition
   d) Control wiring
   e) VFDs
   f) Light installation, movement, etc.
   g) Mechanical systems wiring
   h) Coordination and installation of Owner supplied equipment
   i) Equipment Wiring
   j) Control Wiring
k) Transformer reception testing and installation  
l) Ductbank modification  
m) Transformer feeder upgrades  

2. Full-time Project Manager - Subcontractor shall provide full time project manager or competent person onsite at all time work is being performed.  

3. PlanGrid License – This Subcontractor has included the necessary license(s) to PlanGrid for their office and field staff for field reference and notifications. Please note that drawings posted on PlanGrid do not supersede the Contract Documents and should only be used for reference and notifications. All submittals, RFIs, and installation work should conform to the Contract Documents.  

4. Engineering – This Subcontractor shall be responsible for complete engineering and design of the electrical system to the extent needed for permitting. Furnish and install all seismic bracing required by local code for this scope of work. Provide complete engineering for seismic systems. Furnish and install vibration isolation for electrical equipment and piping per contract documents for this scope of work. Provide complete engineering for isolation systems.  

5. Selective Demolition – This Subcontractor will perform all electrical, communication, fire alarm, tele-video, etc. selective demolition as called for on the construction documents. This will include all haul off, disposal, storage, and salvage as may be required for this scope of work.  

6. Sleeves – Furnish and set electrical sleeves in concrete, masonry and drywall walls. Furnish wall sleeves for installation into walls other Subcontractors as applicable. Provide shop drawings to installing contractor identifying height and locations of wall sleeves.  

7. Material Ordering – Materials will not be ordered on the basis of submittal verification alone. This Subcontractor will cross reference approved material submittals with as built condition of material to be installed. Where this is not feasible Construction Manager must be notified before releasing material for order etc.  

8. Roof Penetrations – This Subcontractor is responsible for all roof penetrations required for this trade’s work. This includes cutting, patching, curb placement and procurement, repair and return to finished condition of roof. All waterproofing sealing caulking etc. shall be the responsibility of this Subcontractor.  

9. Outages – all outages must be coordinated through the University of Kentucky and the Construction Manager. The Subcontractor is required to provide a two week minimum notice to Whiting-Turner for all shutdown requests.  

10. Controls – This Subcontractor will anticipate and account for control wiring for the totality of the project shown on the contract documents whether displayed on the contract documents or not.  

11. Waterproofing – This Subcontractor will waterproof all electrical penetrations, pre-cast electrical and communication manholes.  

12. Provide cutting and patching, saw-cutting and core drilling for any penetrations required for this scope of work. No core drilling will take place without the Structural Engineer's written approval.  

13. Transformers – This Subcontractor has accounted for reception of owner provided installation, testing, certification and full turn key installation. This will include but not be limited to support pad modifications, duct bank feeder modifications, upgrades to feeders and conductors. All excavation required for this scope will be provided by this Subcontractor.  

14. Provide drawings showing all required in-wall blocking. Blocking to be provided by others.
15. **Access Doors** - Furnish all access doors required for access to electrical system. Access doors to be installed by others.

16. **Fire Stopping** - Provide fire stopping at all electrical penetrations in floors, ceilings, and walls.

17. Subcontractor shall seal all penetrations where **electrical wire or conduit** penetrates interior or exterior partitions. Ensure that all penetrations through exterior walls to receive waterproofing have been properly sealed according to the requirements of the Contract Documents and manufacturer’s recommendations before waterproofing is installed.

18. **Protection** - This Subcontractor shall be responsible for identification and protection of all work that will remain exposed after installation. Costs to repair or replace inadequately protected work that becomes damaged shall be borne by this Subcontractor.

19. Provide flashing, counterflashing and sealants required for penetrations through roof related to this scope of work. Include all supports, curbs, angles, clips, all thread, bolts and connections to support and mount new work.

20. Provide modifications to gear as called for in the construction documents, including but not limited to testing, conduit and cable, relays, CT’s, fuses, and work related to HMI and PLC’s. Coordinate outages with owner and Whiting-Turner. Work that requires a shutdown of the emergency power system shall be carried as off hours.

21. Furnish and install labels and signage which meet contract documents along with the governing code for electrical systems.

22. Furnish and install supplemental steel for electrical equipment per contract documents for this scope of work. Prime paint all steel supports installed for this scope of work.

23. Furnish and install labels and signage which meet contract documents along with the governing code for electrical systems. Identification (labels, tags, schedules, engravings, etc.) for all items including conduits and raceways provided by this unit of work. Temporary labels and schedules are required for any panels and switchgear that are activated. Update labels as work is installed.

24. **Protection** - This Subcontractor shall be responsible for identification and protection of all work that will remain exposed after installation. Costs to repair or replace inadequately protected work that becomes damaged shall be borne by this Subcontractor.

25. Provide coordination study, arc flash study and provide labels for all equipment included in this bid package.

26. Coordinate all power requirements with Mechanical and Plumbing drawings. Identify all discrepancies at submittal time.

27. Coordinate with Controls Contractor for interface between electrical equipment and Building Automation System. Coordinate Fire Alarm & Security System interface with Building Automation System. Provide breakers for Building Automation System. Provide power and wiring to all motorized dampers, including fire, smoke and fire/smoke dampers.

28. Install VFD’s and starters furnished by others for equipment provided. Provide disconnects shown on contract documents, disconnects not shown on documents will be furnished by others and installed by this Subcontractor. Provide all fuses for disconnects provided by others.

29. Wire all equipment provided by others. This includes wiring between components packaged separately (e.g. gas pressure alarms, skid mounted equipment split for shipment, etc.).

30. Provide sealing of devices, boxes and conduits installed under this scope.
31. Provide electrical connections to all equipment new or existing as required by project manual and contract documents.

32. Provide grounding system for utility bridge and tower. Provide lightning protection system as required and associated UL listing/certification.

33. Notify ALL construction personnel on site of any electrical energizing, de-energizing and tie-in work. Notify Whiting-Turner and the Owner's Representative 48 hours two weeks prior to performing this work.

34. Provide permanent lighting as required by project manual and contract documents. Include light fixtures shown on all drawings, not just electrical.

35. Provide site lighting. This Subcontractor will additionally be responsible for all finished site lighting.

36. Subcontractor shall be responsible for cleaning and certification of the electrical system as required by contract documents and codes. Provide cleaning of inside of panels and gear before turnover.

37. Testing – This Subcontractor shall be responsible for all testing of systems installed under this scope of work. Provide factory testing and third party testing as required. Coordinate all testing and inspections with Authority Having Jurisdiction and Whiting-Turner. Provide multiple testing of installations as required to meet the project schedule.

38. Commissioning: Provide commissioning support including but not limited to the following:
   a) Completion of commissioning documentation
   b) Attendance in commissioning meetings when directed by Whiting-Turner
   c) Onsite support during functional testing
   d) Onsite support to resolve any commissioning issues with installed work

39. Site Conditions – All existing site conditions are to be verified prior to start of construction. Any variances in conditions must be documented prior to construction. If Whiting-Turner is not notified in writing, it shall be the responsibility of this Subcontractor to make any corrections or remediation necessary at no additional cost. In addition, this Subcontractor shall protect all existing conditions and surroundings as so not to damage during construction. This includes any damage that could result from surface water. If any existing items, which are to be left undisturbed, are damaged by this Subcontractor it shall be its responsibility to repair.

40. Traffic Control – This Subcontractor will provide a flagman with stop signs and appropriate training to assist and manage traffic flow, for haul trucks to make a safe and secure exit out of the Construction site. This Subcontractor is fully aware that the construction site is within a high traffic campus corridor with continuing operations throughout the construction process. To that end, this Subcontractor will work hand in hand with the Construction Manager to ensure deliveries, manpower, and general construction traffic are conducted in such a manner as to provide a safe and undisturbed environment for the pedestrian and vehicular traffic, which includes but is not limited to: cleanup of all vehicle debris, mud, materials, adjusting haul routes and hours, adjusting exit routes, parking in designated areas, deferring to campus traffic, posting flagmen, etc.

41. Schedule / Weather – This Subcontractor shall make all provisions for an accelerated construction schedule. Contract extensions will not be considered for abnormal weather conditions. As a Team we must anticipate and do everything reasonable and prudent to get over, through and/or around the obstacles that beset every construction project.

END OF SPECIFIC SCOPE
<table>
<thead>
<tr>
<th>NO.</th>
<th>QUESTION</th>
<th>RESPONDER</th>
<th>COMMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>On page 22 Article 32 the specs talk of dust partitions. To what extent are they to be built. I assume they are for the concrete cutting. Do the dust partitions need to have a negative pressure? Please explain.</td>
<td>WT</td>
<td>Dust control will conform to OSHA Crystalline silicate requirements and as generally appropriate for dust mitigation in construction. Negative Air is not required.</td>
</tr>
<tr>
<td>2</td>
<td>The specifications call for painting the exterior piping but not the interior piping. Does the piping in this bid need to be painted and if so, please send us the specification for the colors?</td>
<td>AEI</td>
<td>All piping to be painted – refer to added Div 09 spec. -AEI Chicago- REVISED RESPONSE 4.6.18</td>
</tr>
<tr>
<td>3</td>
<td>Once we are complete, do we need to paint or finish the floor? If so, what is the spec?</td>
<td>Champlin</td>
<td>New concrete curbs in CUP are to be painted yellow. Concrete floors are to be finished to match existing concrete floors. See Spec Section 099123</td>
</tr>
<tr>
<td>4</td>
<td>Your unit prices are not specific. Please be more specific.</td>
<td>WT</td>
<td>Make best judgement as a subject matter expert to provide as accurate as possible unit price as requested. If unable input N/A.</td>
</tr>
<tr>
<td>5</td>
<td>Special conditions Article 42 call for $50,000,000.00 umbrella liability insurance. Is this correct?</td>
<td>WT</td>
<td>Subcontractors bidding this work will be required to obtain insurance per Exhibit A of the Subcontract agreement provided in bid documents</td>
</tr>
<tr>
<td>6</td>
<td>Does bid package 26V provide any electrical? Specifically the power connections for the Sewage Ejectors and the VFD’s.</td>
<td>WT</td>
<td>26V is the electrical scope in this bid package. All electrical work is to be considered within this work scope.</td>
</tr>
<tr>
<td>7</td>
<td>Do we need to provide a Port-O-Let or can we use the facilities in the CUP building?</td>
<td>WT</td>
<td>Port – o – lets are to be provided per the scope. UK facilities are not to be utilized by Subcontractors performing work under this agreement.</td>
</tr>
<tr>
<td>8</td>
<td>In the 26V as well as the 23V specs it mentions wiring for the VFD’s. Who performs this work?</td>
<td>WT</td>
<td>Wiring of VFDs will be performed by 26V excepting where 23V has controls wiring to be performed under their work scope.</td>
</tr>
<tr>
<td>9</td>
<td>Per spec section 221314-6 3.3, what is the concrete sump coating for?</td>
<td>AEI</td>
<td>Not needed. -AEI Chicago</td>
</tr>
<tr>
<td>10</td>
<td>Per spec section 232116-4 1.6-c-b, butt welds shall be tested by means of radiography. Is this required?</td>
<td>AEI</td>
<td>Yes, this requirement is standard for all projects including the base scope Spline project. -AEI Chicago</td>
</tr>
<tr>
<td>11</td>
<td>Is the 20” CTS and CTR piping A53B ERW or A106 seamless?</td>
<td>AEI</td>
<td>Per spec 232116.2.2.B, 20” CTS/R shall be ASTM A53, Grade B, Type E or S, Schedule Standard, black steel -AEI Chicago</td>
</tr>
<tr>
<td>12</td>
<td>On sheet H200.8, there is a note between columns 4 and 5 at the top of the page that states to reroute the existing sprinkler line. Can you give us more information on this note?</td>
<td>WT</td>
<td>You will need to be more specific. Where conflict arises with sprinkler line the sprinkler lines must be rerouted by 23V.</td>
</tr>
<tr>
<td>13</td>
<td>For clarification, the plans show that there is an existing 16” butterfly valve at the CHW connection in the new piping that penetrates the basement floor but there is no valve there in the building? Please clarify if a valve needs to be installed here or if it is in the previous package.</td>
<td>WT</td>
<td>Valve needs to be installed</td>
</tr>
<tr>
<td><strong>Biddlers Questions</strong></td>
<td><strong>Page 2 of 3</strong></td>
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<tr>
<td>14. There is also a note on sheet H200.8 on the right side above column line G that states to relocate sprinkler lines, sanitary waste lines, tower water and conduits. Please be more specific on this note.</td>
<td>WT</td>
<td>Bidding Subcontractors need to be prepared to move any conflicting lines within the CUP Building.</td>
<td></td>
</tr>
<tr>
<td>15. On sheet H201.8, piping system CWR both the chiller detail and the piping diagram show one 16” butterfly valve between the chiller and PC-6 but the HVAC chilled water diagram on H702.8 shows 2 – 16” butterfly valves. Which is correct?</td>
<td>AEI</td>
<td>The butterfly valve on level 1 on sheet H201.8 is a new 16” valve. The butterfly valve in the basement on H200.8 is an existing valve (installed in Spline project) that will have a new pipe connection. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>16. Is the chilled water piping standard wall or true SCH 40?</td>
<td>AEI</td>
<td>CHW Piping is standard wall. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>17. Who will supply the refrigerant for the chiller? Bid package 23V or the owner?</td>
<td>AEI/UK</td>
<td>Per the pre-purchased Chiller submittal, the initial charge of refrigerant and oil will be supplied by the manufacturer, shipped in containers and cylinders for field installation or factory charged in the chiller. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>18. What is the budget for this project?</td>
<td>WT</td>
<td>We anticipate total value for this trade package to fall between 1.6 – 2.2 Million</td>
<td></td>
</tr>
<tr>
<td>19. The pipe hanger detail 5/H400.7 is for 8” and smaller. What hanger is specified for the piping above 8”?</td>
<td>AEI</td>
<td>AEI will include pipe hanger detail for above 8” pipe in forthcoming addendum. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>20. Per spec section 23-2118-3, you have rated the butterfly valves as 150 psi dead end pressure. In the past, U/K’s specification has been 250 psi dead end pressure. Which is correct?</td>
<td>AEI</td>
<td>150 psi dead end pressure is correct. This was changed during VE efforts for the Spline project and carried over into BP8. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>21. In addenda #1, TOC-1 says 02 4119 selective demo is to be added. I did not see this spec section in the addenda? Please provide.</td>
<td>AEI</td>
<td>Section 024119 Added to project manual.</td>
<td></td>
</tr>
<tr>
<td>22. On sheet H201.8 note #6 states to remove existing condensate drain and 2 air vent pipes to make space for CTS pipe down thru the floor and to re install. Where is this note and what work is there for us to</td>
<td>AEI</td>
<td>H201.8 note #6 does not apply and shall be removed. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>23. H300.8 on the CW bypass, what type of valve is between the two 1-1/2” gate valves and is this to be a control valve?</td>
<td>AEI</td>
<td>This is a ball control valve. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>24. Is a stress analysis report required for this project?</td>
<td>AEI</td>
<td>No, stress analysis for boiler blowdown is not required. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>25. Spec section 23 2118-7, check valves are specified for 3” and 4”. What is the spec for the 6” check valve?</td>
<td>AEI</td>
<td>Check valves for 6” shall follow spec for 3” and 4”. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>26. Sheet H702.8 – 4” and 6” soft water piping has a symbol for a 6” gate valve but no spec. Can we use a butterfly valve?</td>
<td>AEI</td>
<td>Yes, a 6” butterfly valve is acceptable. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>27. Is it correct that the 10” vent for the blow down tank is type K copper tubing?</td>
<td>AEI</td>
<td>Per 232116.2.6.A, use pipe and pipe fittings as indicated for the system to which relief valve or vent is connected. Tank is steel, so vent should be steel. -AEI Chicago.</td>
<td></td>
</tr>
<tr>
<td>28. Are we using Whiting-Tuner Umbrella Excess Liability Insurance ($5,000,000 aggregate) or UK Special Conditions article #42 ($50,000,000 aggregate) forbidding costs.</td>
<td>WT</td>
<td>Whiting- Turner Insurance requirements will be utilized. See Exhibit A to the Subcontract Agreement Provided</td>
<td></td>
</tr>
<tr>
<td>29. Special Conditions article #25 UTILITIES will</td>
<td>WT</td>
<td>These costs will not apply to Spline</td>
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</tr>
<tr>
<td>BIDDER'S QUESTIONS</td>
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<tr>
<td>30. <strong>Bid schedule shows final completion 2/7/19 is this correct.</strong></td>
<td><strong>WT</strong></td>
<td>This is correct. All Schedule conflicts will be adjudicated using the primavera schedule in these bid documents. Other references are descriptive only and not meant to be contractually binding.</td>
<td></td>
</tr>
<tr>
<td>31. <strong>Unit prices can you specify a pipe size.</strong></td>
<td><strong>WT</strong></td>
<td>Make best reasonable judgement in applying a number to unit pricing. If you feel this is not possible enter N/A</td>
<td></td>
</tr>
<tr>
<td>32. <strong>Is the roof bonded if not what type material do we use?</strong></td>
<td><strong>WT</strong></td>
<td>Roof is a Hypalon type system. Subcontractors will flash back with EPDM type material such that this flashing will hold for minimum of 1 year.</td>
<td></td>
</tr>
<tr>
<td>33. <strong>Is there any temporary piping to install.</strong></td>
<td><strong>WT</strong></td>
<td>Only if called for in the contract documents</td>
<td></td>
</tr>
<tr>
<td>34. <strong>All concrete is to be bid pack 23V.</strong></td>
<td><strong>WT</strong></td>
<td>Excepting concrete work associated with transformer, all concrete to be performed by 23V</td>
<td></td>
</tr>
<tr>
<td>35. <strong>Section 2000000 item (F) Painting refers to division #09 there is no division #09 in the specifications.</strong></td>
<td><strong>AEI</strong></td>
<td>Refer to added section 09 spec -AEI Chicago- REVISED RESPONSE 4.6.18</td>
<td></td>
</tr>
<tr>
<td>36. <strong>Section 232116 Pipe and Fittings Item 3.14 (B) is the hydro-jet equipment necessary for flushing the interior pipe system.</strong></td>
<td><strong>WT</strong></td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>37. <strong>Drawing H200.8 note #8 rerouting sprinkler, sanitary, tower water and electrical to install new pump can we get a drawing showing sizes and routing for these Utilities.</strong></td>
<td><strong>AEI</strong></td>
<td>No drawings for these utilities are available. Contractor to field verify. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>38. <strong>In regards to the project above, I am inquiring to see if a pre-bid sign-in sheet is available</strong></td>
<td><strong>UK</strong></td>
<td>Minutes and Sign in Sheets will not be posted from pre-bid meeting.</td>
<td></td>
</tr>
<tr>
<td>39. <strong>I was reviewing Addendum #1 for the Spline Utilities: Chiller 6 project. It appears that the wrong control spec is being used. I marked up a few items on one of the sheets that lead me to believe the Medical Center’s Spec was used instead of the UK’s Delta Room Spec. Could you please confirm that this project is to be tied into the Delta room, similar to the previous Cup Chiller projects?</strong></td>
<td><strong>AEI</strong></td>
<td>Project is to be tied into the Delta Room, not the medical center. -AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>40. <strong>Per detail 2/H401.8, what is the bottom and side thickness of the concrete for the trench drain?</strong></td>
<td><strong>AEI</strong></td>
<td>See Section 2/S200.8 for trench drain reinforced concrete- Bill Ryan 4.6.18</td>
<td></td>
</tr>
<tr>
<td>41. <strong>Is there a top/grate to the trench drain on detail 2/H401.8?</strong></td>
<td><strong>AEI</strong></td>
<td>See plumbing schedule on P900.8 for basis of design make and model of TD-1</td>
<td></td>
</tr>
<tr>
<td>42. <strong>Is it correct that you are specifying no hub cast iron for the sewage ejector #2 pump discharge piping?</strong></td>
<td><strong>AEI</strong></td>
<td>Correct- AEI Chicago</td>
<td></td>
</tr>
<tr>
<td>43. <strong>On sheet P200.8 note #2, reference the drain for the condenser water retention tank. Is the piping material carbon steel and can we use a butterfly valve instead of a flanged ball valve?</strong></td>
<td><strong>AEI</strong></td>
<td>See details 2 &amp; 3 on H200.8- AEI Chicago</td>
<td></td>
</tr>
</tbody>
</table>
Bid Package #8 Construction Area

- Dumpster
- Porta-John

Fence with 20’ gated entrance and set poles
23V Provided.

- KU Substation
- Generator Building
- Central Utility Plant
- Parking Garage