

**ADDENDUM #2**

**September 22, 2017**

**UNC Charlotte Sycamore Hall Renovation  
Charlotte, North Carolina  
SCO #16-12735**

This addendum is pursuant to the University of North Carolina General Administration Instructions to Bidders and General Conditions of the Contract in connection with the revision of Bidding Documents which have been previously issues.

Addenda are issued prior to execution of Contract. All instructions contained herein shall be reflected in the Contract Sum and this Addendum will be made a part of the Contract Documents, if, as and when a Construction Contract is awarded.

This Addendum forms a part of the Contract Documents and modifies the original documents dated August 25, 2017, as noted below. Acknowledge receipt of this Addendum in the space provided on the Form of Proposal. Failure to do so will subject the Bidder to disqualification.

**REVISIONS TO THE PROJECT MANUAL:**

1. Revise the project manual by replacing spec sheets/sections/individual pages with the following project manual sheets as follows:
  - a. TABLE OF CONTENTS – Replace page TOC-2 with attached page.
  - b. TABLE OF CONTENTS – Replace page TOC-4 with attached page.
  - c. SECTION 220503 – Replace pages 220503-4 thru 6 with attached pages.
  - d. SECTION 230923 – Replace page 230923-8 with attached page.
  - e. SECTION 232116 – Replace page 232116-2 with attached page.
  - f. SECTION 235216 – Replace page 235216-3 with attached page.
  
2. Revise the project manual by adding spec sheets/sections/individual pages to the project manual sheets as follows:
  - a. SECTION 030130 – "STRENGTHENING OF CONCRETE WITH FRP (FIBER REINFORCED POLYMER) REINFORCEMENT
  - b. SECTION 232113 – HYDRONIC PUMPS
  - c. SECTION 232136 – COOLANT DISTRIBUTION UNIT
  - d. SECTION 233600 – AIR TERMINAL UNITS

**REVISIONS TO DRAWINGS**

1. ABD-003, Addendum #2 Revisions
2. SBD-01, Addendum #1 Revisions
3. SBD-02, Addendum #1 Revisions
4. SBD-03, Addendum #1 Revisions
5. SBD-04, Addendum #1 Revisions
6. SBD-05, Addendum #1 Revisions
7. SBD-06, Addendum #1 Revisions

8. SBD-07, Addendum #1 Revisions
9. BDM-1, Addendum #2 Revisions
10. BDM-2, Addendum #2 Revisions
11. BDM-3, Addendum #3 Revisions

**BIDDER CLARIFICATION REQUESTS**

#	RFI/ Substitution Request	Response
13	<p>Would it be acceptable to temporarily shut down the sidewalk and bike land along Mary Alexander Road between Sycamore Hall and Hickory Hall in order to provide a safer site and improved construction site access? Without doing this, students and other pedestrians using the sidewalk and bike lane will be directly adjacent to construction activities. Preventing access to those paths would be a much safer solution.</p>	<p>It is acceptable to <b>temporarily</b> shut down the sidewalk and provide safety appropriate signage/flaggers along Mary Alexander between Sycamore Hall and Hickory Hall during construction.</p> <p>Space is available along Martin Village Road between Lot 5 and the Cafeteria and Activities Building (CAB) for construction material storage and construction laydown. Note this space is utilized by multiple contractors and will need to be coordinated with UNC Charlotte and fellow contractors that use this area.</p> <p>Recommended location for construction access is along the east of the site with vehicular and construction access along CAB Lane.</p>
14	<p>Please confirm the extent of flooring removal for the building. Is all flooring to be removed in the existing building?</p>	<p>All existing flooring throughout the entire building is to be removed to concrete slab, excluding the existing rubber floors and tread/risers in both egress stairs.</p>
15	<p>Cat 6 cable termination, the spec section states in 27.15.00-7 2.06h all cables shall be terminated 568B. The UNCC Spec States on page 7- cable termination requirements, all category 6UTP cables to be terminated 568A. What is the correct termination procedure? 568A or 568B?</p>	<p>All cables shall be terminated using T568A.</p>
16	<p>AP cable requirement? spec section 27.15.00-2 1.4B calls for only one green cat 6 for the AP locations. UNCC spec calls for 2 cat 6 (page 26 paragraph two) for each wireless access point. What is the correct cable count required?</p>	<p><b>For base bid and alternate Attachment 2</b>, all wireless access points shall require two (2) UNCC Green Category 6 cables at each location. A dual cable wireless outlet configuration, unless otherwise specified, is defined as consisting of two (2) Category 6 cables (UNCC Green) in a two (2) port faceplate with white Category 6 jacks at the access point location. Provide white icon at each end.</p> <p><b>For the Category 6A Alternate Attachment 3</b>, All wireless access points</p>

		<p>shall require two (2) UNCC Green Category 6A cables at each location. A single cable wireless outlet configuration, unless otherwise specified, is defined as consisting of two (2) Category 6A cables (UNCC Green) in a two (2) port faceplate with white Category 6A jacks at the access point location. Provide white icon at each end.</p>
17	<p>What is the cable requirement for the cubicle areas? They are shown on the T101, T102, E101 and E102 drawings.</p>	<p><b>For base bid and alternate Attachment 2,:</b> All standard administrative modular furniture outlets shall require two (2) UNCC Green Category 6 cables at each location. A standard administrative outlet configuration, unless otherwise specified, is defined as consisting of two (2) Category 6 cables (UNCC Green) in a modular plate provided by the furniture manufacturer with two (2) black Category 6 jacks with doors. Provide green icons at each end. Please coordinate with owner.</p> <p><b>For the Category 6A Alternate Attachment 3:</b> All standard administrative modular furniture outlets shall require two (2) UNCC Green Category 6A cables at each location. A standard administrative furniture outlet configuration, unless otherwise specified, is defined as consisting of two (2) Category 6A cables (UNCC Green) utilizing the furniture opening with two (2) black Category 6A jacks. Provide green icons at each end. Provide Siemon Universal Modular Adapter for 6A MX-UMA-01 and fix to opening.</p>
18	<p>T102 General note 5 states a 12" service loop to be left above the workstation stub up at each location. Spec section 27.15.00-11 3.03 a10 calls for a 10" service loop on each end. What is the correct slack length?</p>	<p>T102 General Note 5 is correct. Provide a 12" service loop.</p>

19	T201 Telecom riser states 6AWG to the service GEC. Floor plan note 5 states a 4AWG. Please clarify which size conductor is required.	T201 Floor Plan Note #5 is correct - Contractor shall provide a 4AWG ground conductor to G.E.C.
20	T201 floor plan reference note 8 states a 16" vertical wire manager. 27.11.00-4 2.03 c calls for 10" between racks. 27.11.00-4 2.03 c4 gives a description of a 12" vertical wire manager. What is the correct vertical wire manager size?	<p>T201 Note 8 is correct. Contractor shall provide a 16" vertical wire manager between racks. 27.11.00-4,5 2.03c: Cable Management for floor-mount 2-post Racks: Vertical managers shall be 10" between racks and 6" on each end.</p> <ol style="list-style-type: none"> <li>1. Basis of Design: 6" Vertical Manager Siemon VCM-6</li> <li>2. Basis of Design: 6" Vertical Manager Door Siemon VCM-6D</li> <li>3. Basis of Design: 16" Vertical Manager Siemon VCM-16</li> <li>4. Basis of Design: 16" Vertical Manager Door Siemon VCM-16D</li> </ol>
21	E006 calls for gray paint to be applied to the fire retardant plywood. If painted it should be light in color to maximize the lighting in the room. UNCC spec Pg. 13 states not to paint the plywood. What is the correct procedure?	Provide fire retardant plywood; do not paint.
22	In cases where plumbing drawings and specifications do not match, which should take precedent for material, insulation, etc?	Drawing take precedence in cases where plumbing drawings and specifications do not match for material, insulation, etc.
23	PVC has been listed. Will it be approved for underground sanitary?	Only cast iron is acceptable. Refer to revisions in attached specifications.
24	PVC has been listed. Will it be approved for aboveground sanitary? I see no return air plenum to confirm.	Only cast iron is acceptable. Refer to revisions in attached specifications.
25	Are the existing floors pretension cable?	The existing floors are not pretensioned. Existing floor slab construction is 5-inches thick concrete slab with two-way mild steel reinforcing, as indicated in "Floor Plan Notes #1" on sheet S202.
26	During walk through above ceiling was not exposed for viewing. Are there any structural drawings for the existing building?	Dropbox link was included in Addendum #1 (RFI Response #9) to all existing drawings. During the walk through, the typical ceiling (corridor and bedrooms) was exposed. Only locations with

		concealed ceilings are the suite bathrooms, which are existing drywall and living rooms, which are existing ACT.
27	Is there any structural steel under floors or will all pipe hangers be attached to deck above?	There is no existing structural steel under floors. Pipe hangers will be attached to deck above.
28	How will existing waste, storm, etc. be handled under slab if encountered?	Existing waste and storm piping under slab shall be terminated so there are no dead end runs. Cleanouts may be provided, if required.
29	The untouched building has (5) roof drains. The new plumbing drawings show only (2) 3" roof drains to replace. Are we missing something?	The roof has (2) new 3" roof drains and (2) new overflow scuppers. Existing roof drains and leaders to be removed as indicated in the construction documents. Patch existing roof penetrations as indicated in the construction documents.
30	Please confirm scope of exterior wall demolition. Should we assume demolition of exterior plaster/drywall everywhere and installation of new drywall after MEP rough-in? We saw at the walk-through that some existing drywall/plaster was already removed.	There is limited new electrical work on the inside of the exterior walls. Refer to "Floor Plan Note #7 on sheets AE101 and AE102" and "Demolition Notes on AD001". The drywall that was seen in the walkthrough was from limited demolition for observation during design. Do not assume demolition of exterior drywall everywhere.
31	At locations where existing plaster/drywall is removed from exterior wall, what new wall condition/partition type should be installed?	If existing drywall is removed from exterior wall, replacement of like kind is required. Refer to as-built drawings that were provided through Dropbox link as part of Addendum #1 (RFI Response #9) for information relating to the existing conditions.
32	Drawing AE103 includes the note "New vapor barrier over existing vapor barrier if required by manufacturer's warranty". Is this referring to the new roof manufacturer's requirements? Detail 2C/AE301 shows a vapor barrier under the roof insulation without mention of the manufacturer's warranty.	Contractor to follow approved manufacturer roof warranty requirements to determine whether a new vapor barrier is required.
33	Is air barrier required anywhere outside of potentially under new roof insulation?	There is no fluid-applied air barrier required on the exterior wall. Note the existing, first floor trash room door removed will have brick infill to match existing construction methods.

## **ATTACHMENTS**

1. TABLE OF CONTENTS – Page TOC-2
2. TABLE OF CONTENTS – Page TOC-4.
3. SPECIFICATIONS SECTION 030130 – “STRENGTHENING OF CONCRETE WITH FRP (FIBER REINFORCED POLYMER) REINFORCEMENT (7 PAGES)
4. ABD-003 – FLOOR PLAN NOTES, ADDENDUM #2 REVISIONS, dated 09/22/17
5. SBD-01, ADDENDUM #1 REVISIONS
6. SBD-02, ADDENDUM #1 REVISIONS
7. SBD-03, ADDENDUM #1 REVISIONS
8. SBD-04, ADDENDUM #1 REVISIONS
9. SBD-05, ADDENDUM #1 REVISIONS
10. SBD-06, ADDENDUM #1 REVISIONS
11. SBD-07, ADDENDUM #1 REVISIONS
12. SPECIFICATION SECTION 220503-4 thru 6 (3 PAGES)
13. SPECIFICATION SECTION 230923-8
14. SPECIFICATION SECTION 232216-2
15. SPECIFICATION SECTION 231213-1
16. SPECIFICATION SECTION 232136 232136-1 thru 4 (4 PAGES)
17. SPECIFICATION SECTION 233600 233600-1 thru 5 (5 PAGES)
18. SPECIFICATION SECTION 235216-3
19. BDM-1, Addendum #2 Revisions
20. BDM-2, Addendum #2 Revisions
21. BDM-3, Addendum #3 Revisions

END OF ADDENDUM #2

019113 GENERAL COMMISSIONING REQUIREMENTS 19113-1 thru 12

**DIVISION 02 – EXISTING CONDITIONS**

020100 SUBSURFACE INVESTIGATION 021000-1  
*REPORT OF SUBSURFACE EXPLORATION* 28 pages  
020200 NESHAP ASBESTOS SURVEY REPORT 020200-1  
*NESHAP ASBESTOS SURVEY REPORT dated Nov. 9, 2016* 35 pages  
020213 REPORT FOR THE REMOVAL OF ACM 020213-1  
020213a REMOVAL OF ACM 020213a-1 thru 20  
024113 SELECTIVE SITE DEMOLITION 024113-1 thru 5  
024119 SELECTIVE DEMOLITION 024119-1 thru 8

**DIVISION 03 – CONCRETE**

030130 STRENGTHENING OF CONCRETE WITH FRP (FIBER REINFORCED POLYMER)  
REINFORCEMENT 030130-1 thru 7  
031000 CONCRETE FORMWORK 031000-1 thru 8  
032000 CONCRETE REINFORCEMENT 032000-1 thru 6  
033000 CAST IN PLACE CONCRETE 033000-1 thru 16  
033500 CONCRETE FINISHES 033500-1 thru 8  
033700 CONCRETE CURING 033700-1 thru 4

**DIVISION 04 - MASONRY**

042000 UNIT MASONRY 042000-1 thru 16  
047200 CAST STONE MASONRY 047200-1 thru 7

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051200 STRUCTURAL STEEL 051200-1 thru 10  
053123 STEEL ROOF DECKING 053123-1 thru 5  
054000 COLD-FORMED METAL FRAMING 054000-1 thru 3  
055000 METAL FABRICATIONS 055000-1 thru 8  
055213 PIPE AND TUBE RAILINGS 055213-1 thru 9

**DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES**

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072100 BUILDING INSULATION 072100-1 thru 4  
072726 FLUID-APPLIED MEMBRANE AIR BARRIERS 072726-1 thru 7  
074213.13 FORMED METAL WALL PANELS 074213.13-1 thru 6  
075419 POLYVINYL-CHLORIDE (PVC) ROOFING 075419-1 thru 9  
076200 SHEET METAL FLASHING AND TRIM 076200-1 thru 7  
078100 APPLIED FIREPROOFING 078100-1 thru 8  
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220719 PLUMBING PIPING INSULATION 220719-1 thru 23

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### **DIVISION 23 – HEATING, VENTILATION AND AIR CONDITIONING**

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### **DIVISION 26 - ELECTRICAL**

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## DIVISION 3 – CONCRETE

### **SECTION 030130 – STRENGTHENING OF CONCRETE WITH FRP (FIBER REINFORCED POLYMER) REINFORCEMENT**

#### **PART 1 – GENERAL**

##### 1.1 RELATED DOCUMENTS

- A. The Conditions of the Contract for Construction and the General Requirements of Division 1 of these Specifications apply to the Work in this Section.

##### 1.2 WORK INCLUDED

- A. The Work of this Section shall include furnishing all labor, materials, equipment, and supervision to prepare the surface of the structural concrete members and to install the FRP Reinforcement as indicated on the Drawings.

##### 1.3 RELATED SECTIONS

- A. Concrete Formwork (Section 031000)
- B. Concrete Reinforcement (Section 032000)
- C. Cast-in-Place Concrete (Section 033000)
- D. Concrete Finishes (Section 033500)
- E. Concrete Curing (Section 033700)

##### 1.4 REFERENCE STANDARDS

- A. Comply with the following reference standards, except where more stringent requirements are indicated on the Drawings or specified herein:
  - 1. American Concrete Institute (ACI):
    - a. ACI 440R-07, “Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures”
    - b. ACI 440 R-96, “State-of-the-Art Report on Fiber Reinforced Plastic (FRP) Reinforcement for Concrete Structures”
    - c. ACI 503 R, “Pull-off test to determine FRP adhesion to concrete substrate”
  - 2. International Concrete Repair Institute (ICRI):
    - a. ICRI Guideline No. 03742, “Guide for the Selection of Strengthening Systems for Concrete Structures”
    - b. ICRI Guideline No. 03739, “Guide to Using In-Situ Tensile Pull-Off Tests to Evaluate Bond of Concrete Surface Materials”
  - 3. Sika CarboDur Composite Strengthening Systems – Engineering Guidelines for Design and Application.
  - 4. American Society of Testing and Materials (ASTM) as cited herein.

## 1.5 QUALITY CONTROL

- A. Quality Control procedures performed by the manufacturer shall include, but not be limited to the following:
  - 1. Manufacturer shall have a nationally recognized program of contractor training, certification and technical support.
  - 2. The Manufacturer shall have minimum ten years' experience in FRP Reinforcement confirmed by actual field tests of minimum 100 successful installations.
  - 3. The Manufacturer shall be able to supply testing data to demonstrate system properties and durability of the actual FRP Reinforcement to be used.
  
- B. Quality Control procedures performed by the contractor shall include, but not be limited to the following:
  - 1. The contractor shall be trained by the manufacturer and shall have completed a program of instruction in the use of FRP Reinforcement.
  - 2. The contractor shall have a minimum of two years' experience in FRP Reinforcement confirmed by actual field tests of at least five successful installations.
  - 3. The contractor shall inspect all materials prior to application to assure that they meet specifications and have arrived to the job-site undamaged.
  - 4. The FRP Reinforcement shall be completely inspected by the contractor during and immediately following application of the composite materials. Conformance with the design drawings, proper alignment of fibers and quality workmanship shall be assured. Entrapped air shall be released or rolled out before the epoxy sets. Defects shall be noted in the Daily Construction Log.
  - 5. After FRP Reinforcement has cured, the contractor shall inspect the all work to check for voids and or debonding. Repairs shall be made as per Par. 3.7 Repair of Defects, and noted in the Daily Construction Log.

## 1.6 SUBMITTALS

- A. Submit for record Material Safety Data Sheets (MSDS) of each product, used on site.
- B. Submit product data indicating product standards, physical and chemical characteristics, environmental durability, technical specifications, limitations, installation instructions, and general recommendations regarding each material.
- C. Submit for record, a qualification statement by the contractor listing their completed FRP Reinforcement projects, including size, location, owner, engineer/architect and contact numbers.
- D. Submit for record a complete description of the FRP Reinforcing system materials, surface preparation, application procedures, application rates, and cure times.
- E. Submit for record copies of purchase order and packaging slips showing quantities and dates of primer and resin purchased.
- F. Submit for review and approval shop drawings including, the following:
  - 1. Limits of FRP Reinforcing.
  - 2. Details of epoxy injection crack repair and epoxy resin patching.

3. Complete system details including, but not limited to, FRP Reinforcement, primer, resin, and protective coating.
- G. Submit for record test results of the Pull-off test to determine FRP adhesion to concrete substrate.
  - H. Submit for record Daily Construction Logs kept by the contractor. These logs shall include the following information: Weather and temperature at application times; Amount of product used and square footage/linear footage of substrate covered; Batch numbers of all products used; Names of all crew members; Any bond-strength tests, noting location, quantity and who performed these tests.
  - I. Submit an approved ICC Evaluation Report in the name of the proposed FRP system to be used on this project.
  - J. Submit independent test report verifying the environmental durability of the proposed system to be used on this project. Such reports shall include as a minimum:
    1. 10,000 hour resistance to salt water
    2. 10,000 hour resistance to high temperature (38°C) and high humidity (100%)
    3. 10,000 hour resistance to alkali solution (pH 9.5)
    4. 3,000 hour resistance to dry heat (60°C)
    5. Resistance to 20 freeze/thaw cycles
    6. Resistance to UV/condensation at 100 cycles
    7. Resistance to diesel fuel (4 hour exposure)

#### 1.7 JOBSITE CONDITIONS

- A. Do not apply FRP Reinforcement materials if raining, snowing, or dew condensation is expected or existing concrete surface is wet or if the ambient or surface temperature is below 40° F (4°C).
- B. The ambient temperature and temperature of the epoxy components shall be between 50°F (10°C) and 80°F (27°C) at the time of mixing. See appropriate technical data sheets for more specific instructions.
- C. Precautions should be taken to avoid damage to any surface near the work zone due to mixing and handling of the specified material.
- D. The contractor is solely responsible for fume control and shall take necessary precautions against injury to Installer personnel or adjacent building occupants during application of primer and resin, etc. Contractor personnel shall use protective equipment and area shall be well vented to the outside. As a minimum, Installer must take the following precautions.
  1. Contractor to locate and protect building air intake during application.
  2. Contractor to follow all state, federal, and local safety regulations.
  3. Contractor to follow all manufacturers' safety requirements as indicated on appropriate MSDS sheets.

#### 1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver primer, saturant and protective coating in original, unopened containers with the

Manufacturer's name, labels, product identification, and batch numbers.

- B. FRP Reinforcement shall be stored in a cool dry area away from direct sunlight, flame, moisture, or other hazards.
- C. Store primer, saturant and protective coating under conditions as recommended by the manufacturer in a cool dry place out of direct sunlight. Products that have exceeded their shelf life shall not be used.
- D. The contractor is required to confirm that all materials used in accordance with this Section conform to local, state, and federal environmental and worker's safety laws and regulations.
- E. During operations, the contractor shall maintain barricades.
- F. The contractor shall properly dispose of empty containers in accordance with local regulations.
- G. Submittals: Shop Drawings for blocking as required.

**PART 2 – PRODUCTS**

2.1 FRP REINFORCEMENT FABRIC AND/OR LAMINATE

- A. FRP Pre-cured strip shall be high strength, high modulus, unidirectional carbon fiber reinforced polymer (CFRP).
  - 1. FRP pre-cured strip shall be of the type, size, layer and location as indicated on the Drawings.
  - 2. FRP pre-cured strip shall meet the following minimum requirements:

Property	Requirement	ASTM Test Method
Laminate Tensile Strength, In primary fiber direction	406,000 psi (2,800 MPa)	D3039
Laminate Tensile Modulus, In primary fiber direction	23.2x10 <sup>6</sup> psi (160,000 MPa)	D3039
Laminate Elongation at break	1.69 %	D3039
Laminate Thickness	0.047 inch (1.2 mm)	
Fiber Volume, minimum	68%	D2563

- 3. Approved products are:
  - a. Sika CarboDur, Sika Corp., Lyndhurst, NJ.
  - b. Alternate products must be submitted **and** approved by the Engineer a minimum of two weeks prior to the bid date.

2.2 EPOXY REPAIR MORTAR

- A. Repair mortar shall be 100% solids, non-sag paste epoxy.

- B. Approved products are:
  - 1. Sikadur 30, Sika Corp., Lyndhurst, NJ
  - 2. Sikadur 31, Sika Corp., Lyndhurst, NJ.
  - 3. Alternate products must be submitted **and** approved by the Engineer a minimum of two weeks prior to the bid date.

## **PART 3 – EXECUTION**

### **3.1 GENERAL**

- A. Inspect surfaces to receive the work and report immediately in writing to the Engineer as required in the General Conditions and deficiencies in the surface that render it unsuitable for proper execution of this work.
- B. Protect vehicles, concrete, and other items surrounding work area from dust or damage due to Work of this Section.

### **3.2 SURFACE PREPARATION**

- A. All concrete surfaces shall be dry and free of surface moisture and frost, and tested by the Contractor to evaluate moisture transmission in accordance with ASTM D4263, "Indicating Moisture in Concrete by the Plastic Sheet Method."
- B. All concrete surfaces shall be sound. Remove deteriorated concrete, dust, laitance, grease, paint, curing compounds, waxes, impregnations, foreign particles, and other bond inhibiting materials from the surface by blast cleaning or equivalent mechanical means.
- C. All concrete surfaces shall be air blasted and vacuumed clean to a dust free condition.
- D. Concrete surface irregularities less than one inch shall be ground and smoothed and/or filled with an approved repair mortar (e.g., Sikadur 30) with the addition of one part oven dried sand to make an epoxy mortar. Surface irregularities shall be limited to less than 0.04 inches (1 mm). Surface irregularities greater than one inch shall be repaired using an approved cementitious repair mortar (e.g. SikaTop 123).
- E. External concrete corners shall be rounded to at least a 1/2 inch radius when perpendicular to fiber orientation and internal corners shall be smoothed by troweling epoxy mortar into the corners.
- F. The adhesive strength of the concrete shall be verified after preparation by random pull-off testing (ACI 503R) at the direction of the Engineer. Minimum tensile strength is 200 psi with concrete substrate failure, or as approved by the Engineer.

### **3.3 MIXING PRIMER AND SATURANT**

- A. Mix components in accordance with Manufacturer's recommendations.
- B. Diluting is not permitted. Pre-condition materials as indicated on technical data sheet.

- C. Mix only that quantity which can be used within its pot life.
- D. Do not batch delivered units into smaller quantities. Mix only full units.

### 3.4 PRIMER APPLICATION

- A. Apply primer in accordance with manufacturer's recommendations.
- B. Primer may be applied with a brush or roller. Apply second coat as necessary after first coat has penetrated into concrete.
- C. Surface depressions shall be filled with epoxy filler per manufacturers' instructions.
- D. Primer must be covered with fiber within 24 hours of application, depending on temperature conditions. If 24-hour window is exceeded, the primed surfaces must be solvent wiped with a fast flashing solvent (e.g. MEK) or roughened with sandpaper to break the amine blush. Correction of work will be at no additional expense to owner, and no allowance will be made for extension of time.

### 3.5 FRP REINFORCEMENT APPLICATION

- A. Pre-Cured Strip Application:
  - 1. Apply FRP pre-cured strip in accordance with manufacturer's recommendations.
  - 2. Care shall be taken not to damage the fibers in handling and unpacking the strips.
  - 3. Strips may be either delivered to project site in factory pre-cut lengths, or cut on site. Care must be taken not to fray or otherwise damage the fibers when field cutting. Follow manufacturer's recommendations for field cutting of strips.
  - 4. Strips shall be cleaned with a fast flashing solvent (e.g. MEK) to remove any bond inhibiting materials. A clean white cotton rag shall be used for this purpose. Continue cleaning the strip in this manner until no black residue shows on the rag. Cleaning shall be performed the same day the strips are to be used

### 3.6 CURING

- A. Protect finished installation of FRP Reinforcement from rain, sand, dust, etc. using protective sheeting or other barriers. Do not allow protective sheeting to come in contact with finished application.
- B. Curing of finished application shall be a minimum of 24 hours and in order to achieve full strength curing shall be extended for a period of two weeks at an average ambient temperature of 68°F.

### 3.7 REPAIR OF DEFECTS

- A. Upon completion of the curing process, the installed system shall be checked for areas where saturant has not penetrated or where saturant has not completely cured. Such areas shall be epoxy injected to re-establish bond subject to the approval of the Project Engineer.
- B. Repair procedures shall be performed in accordance with guidelines established by ACI 440.2R-

08 (paragraph 7.2.3) and approved by the Project Engineer. All repairs shall be subject to the same application, curing and quality control specifications as the original work:

1. Small delaminations and voids less than 2 in<sup>2</sup> each are permissible as long as the delaminated area is less than 5% of the total laminate area and there are no more than 10 such delaminations per 10 ft<sup>2</sup>.
2. Medium sized delaminations and voids greater than 2 in<sup>2</sup> but less than 25 in<sup>2</sup> may be repaired by epoxy resin injection or ply replacement, depending on the size and number of delaminations and their location. The repair procedure should be determined by the Project Engineer.
3. Larger size delaminations and voids greater than 25 in<sup>2</sup> should be repaired by selectively cutting away the affected sheet and applying an overlapping sheet patch of equivalent plies. The overlap should extend a minimum of 6 inches in all directions.

### 3.8 PROTECTIVE COATING

- A. Apply protective coating in accordance with Manufacturer's recommendations.

### 3.9 CLEANING

- A. Uncured saturants may be cleaned from tools with an approved solvent and properly.
- B. Cured saturants shall be removed by mechanical means and properly disposed.

**END OF SECTION 030130**

# FLOOR PLAN NOTES

1. PLAN DIMENSIONS SHOWN ARE TO FACE OF FRAMING MEMBERS, FACE OF MASONRY, FACE OF EXISTING WALL, AND TO CENTER OF COLUMNS.

2. EXISTING COLUMNS TO BE FURRED OUT WITH 2- 1/2" METAL STUDS AND 5/8" GYPSUM WALLBOARD, UNLESS OTHERWISE NOTED. ALIGN BACK OF STUD TRACK WITH FACE OF COLUMN. CONTRACTOR TO ADJUST LOCATION OF FURRING SUCH THAT WALLS WITHIN THE SAME PHYSICAL PLANE ARE STRAIGHT, PLUMB AND FLUSH WITH ONE ANOTHER. CONTRACTOR TO ADJUST STUD LOCATIONS TO ACHIEVE CONSISTENCY IN WALL PLANE FOLLOWING REVIEW WITH ARCHITECT AND AT NO COST TO OWNER. ~~CONTRACTOR TO CONDUCT A 3-DIMENSIONAL SURVEY OF EXISTING STRUCTURAL ELEMENTS FOLLOWING DEMOLITION AND PRIOR TO THE COMMENCEMENT OF NEW WORK FOR REVIEW AND APPROVAL BY ARCHITECT.~~

ADDENDUM #2  
REVISIONS

PURPOSE OF DRAWING: ADDENDUM #2 REVISIONS

**Morris·Berg**  
ARCHITECTS  
1401 WEST MOREHEAD STREET, SUITE 120, CHARLOTTE, NC 28208  
(704) 332-3800 FAX (704) 332-1420

**SYCAMORE HALL  
RENOVATION**  
9201 UNIVERSITY CITY  
BOULEVARD, CHARLOTTE, NC  
28223

BULLETIN DRAWING TITLE: <b>AE101 &amp; AE102 FLOOR PLAN NOTES</b>	PROJECT NUMBER <b>1610</b> DRAWING NUMBER <b>ABD-003</b> DATE: 09/22/17
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1

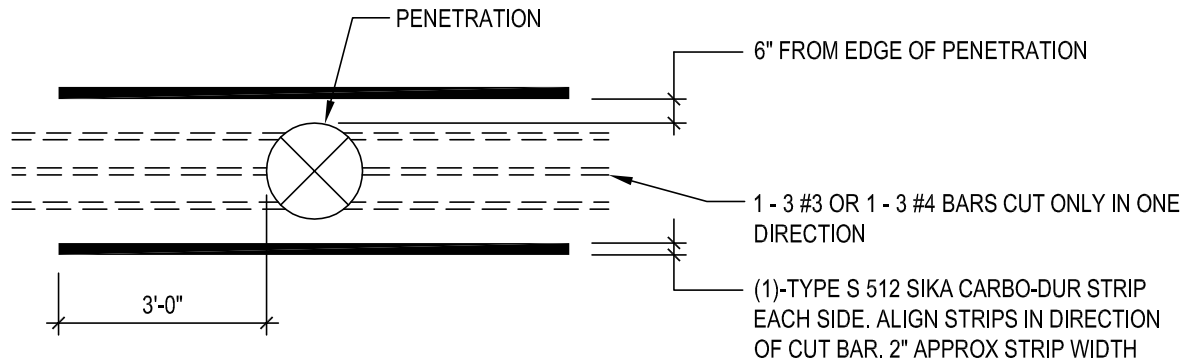
**FLOOR PLAN NOTES:**

1. EXISTING FLOOR SLAB CONSTRUCTION IS 5-INCHES THICK CONCRETE SLAB WITH TWO-WAY MILD STEEL REINFORCING, TOP AND BOTTOM (U.O.N.). SEE EXISTING DRAWINGS FOR DETAILS.
2. FOR SLAB PENETRATIONS AND OPENINGS SEE TYPICAL REINFORCING DETAILS ON SHEET S801.
3. FOR EXISTING AND NEW OPENINGS REQUIRED THROUGH EXISTING FLOOR SLAB REFER TO ARCHITECTURAL, MECHANICAL, ELECTRICAL AND PLUMBING DRAWINGS.
4. NEW ~~AND EXISTING~~ SLAB PENETRATIONS ARE SHOWN FOR ESTIMATING AND COORDINATION PURPOSES. LOCATIONS AND SPACING ARE APPROXIMATE. SEE ELECTRICAL, MECHANICAL, FIRE PROTECTION AND PLUMBING DRAWINGS FOR LOCATIONS, QUANTITIES AND SIZES. LOCATE ALL EXISTING OPENINGS AND COORDINATE NEW OPENINGS WITH ALL TRADES AND WITH EXISTING SLAB REINFORCING BEFORE MAKING ANY NEW PENETRATIONS.

**PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS**

**UNC CHARLOTTE  
SYCAMORE HALL  
RENOVATION**

BULLETIN DRAWING TITLE: _____ _____ _____	PROJECT NUMBER SCO ID#16-12735 DRAWING NUMBER <b>SBD-01</b> RE: S201 & S202 _____
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NOTE:

1. SEE TYPICAL DETAILS 7A, 7 AND 8 ON S801 FOR OTHER REQUIREMENTS
2. REFER TO SPECIFICATIONS FOR OTHER REQUIREMENTS

1

REFLECTED CEILING VIEW

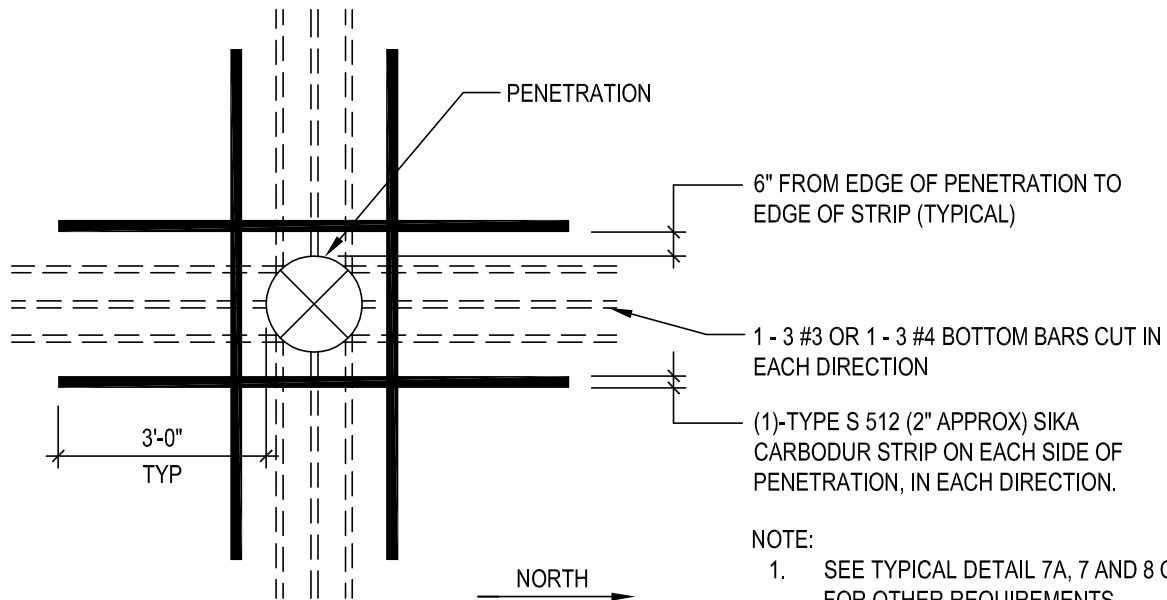
**TYPICAL DETAIL**  
**UP TO 12" DIA PENETRATION - BOTTOM BARS CUT**

1  
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NTS

**PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS**

BULLETIN DRAWING TITLE:	PROJECT NUMBER SCO ID#16-12735
_____	DRAWING NUMBER <b>SBD-02</b>
_____	RE: S801
_____	_____
_____	_____



REFLECTED CEILING VIEW

NOTE:

1. SEE TYPICAL DETAIL 7A, 7 AND 8 ON S801 FOR OTHER REQUIREMENTS
2. PLACE STRIP IN DIRECTION OF CUT BARS CLOSEST TO SLAB SURFACE FIRST
3. ALIGN STRIPS PERPENDICULAR TO PLAN NORTH / WEST
4. REFER TO SPECIFICATIONS FOR OTHER REQUIREMENTS

1

**TYPICAL DETAIL**

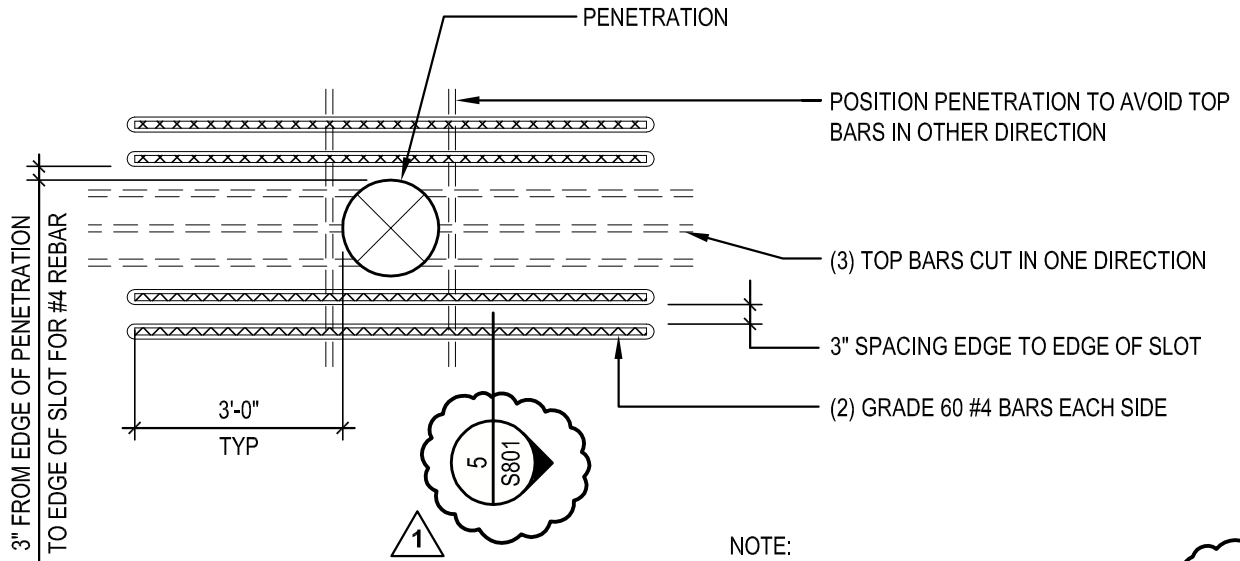
**UP TO 12" DIA PENETRATION - BOTTOM BARS CUT**

2  
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NTS

**PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS**

BULLETIN DRAWING TITLE:	PROJECT NUMBER <b>SCO ID#16-12735</b>
_____	DRAWING NUMBER <b>SBD-03</b>
_____	RE: <b>S801</b>
_____	_____



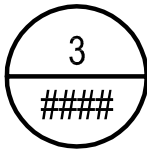
NOTE:

1. SEE TYPICAL DETAILS 7A, 7 AND 8 ON S801 FOR OTHER REQUIREMENTS
2. REFER TO SPECIFICATIONS FOR OTHER REQUIREMENTS

PLAN VIEW

TYPICAL DETAIL

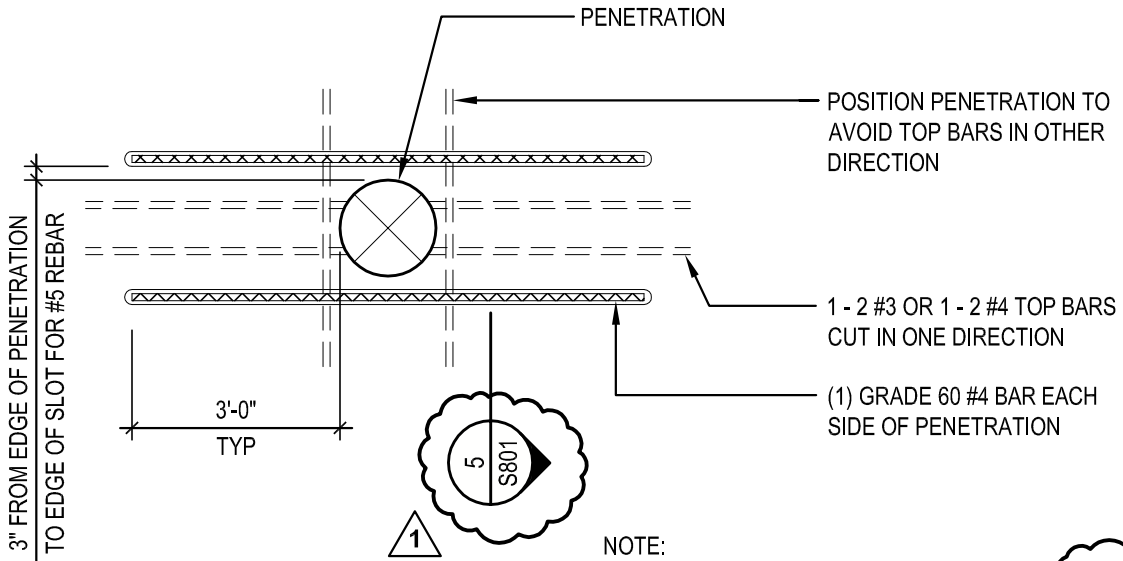
12" DIA PENETRATION - (3) TOP BARS CUT



NTS

**PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS**

BULLETIN DRAWING TITLE:	PROJECT NUMBER <b>SCO ID#16-12735</b>
	DRAWING NUMBER <b>SBD-04</b>
	RE: <b>S801</b>



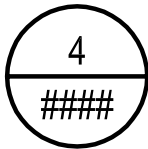
NOTE:

1. SEE TYPICAL DETAILS 7A, 7 AND 8 ON S801 FOR OTHER REQUIREMENTS
2. REFER TO SPECIFICATIONS FOR OTHER REQUIREMENTS

PLAN VIEW

**TYPICAL DETAIL**

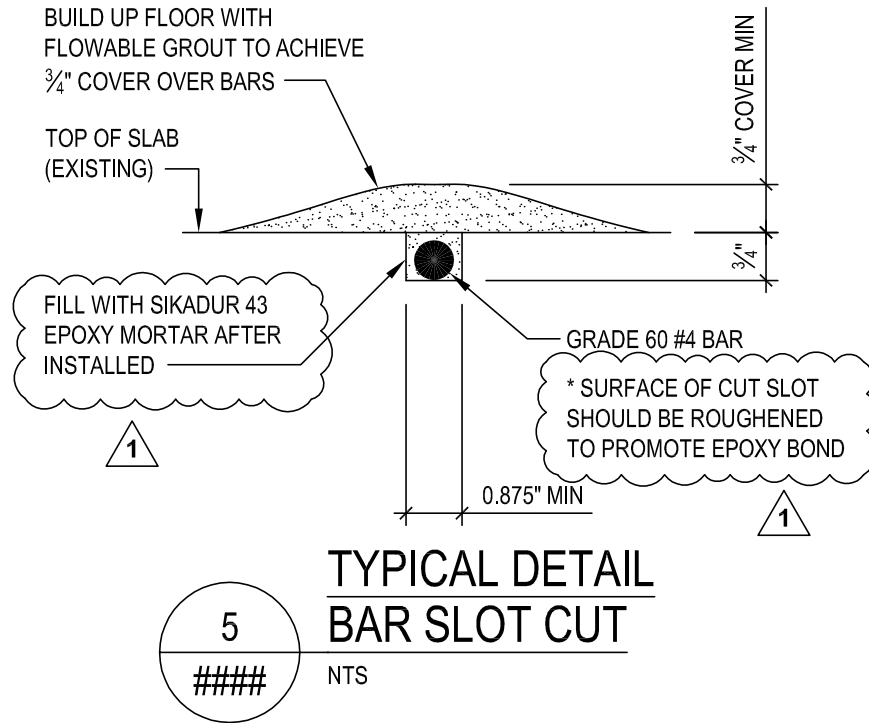
**6" DIA OR LESS PENETRATION - TOP BARS CUT**



NTS

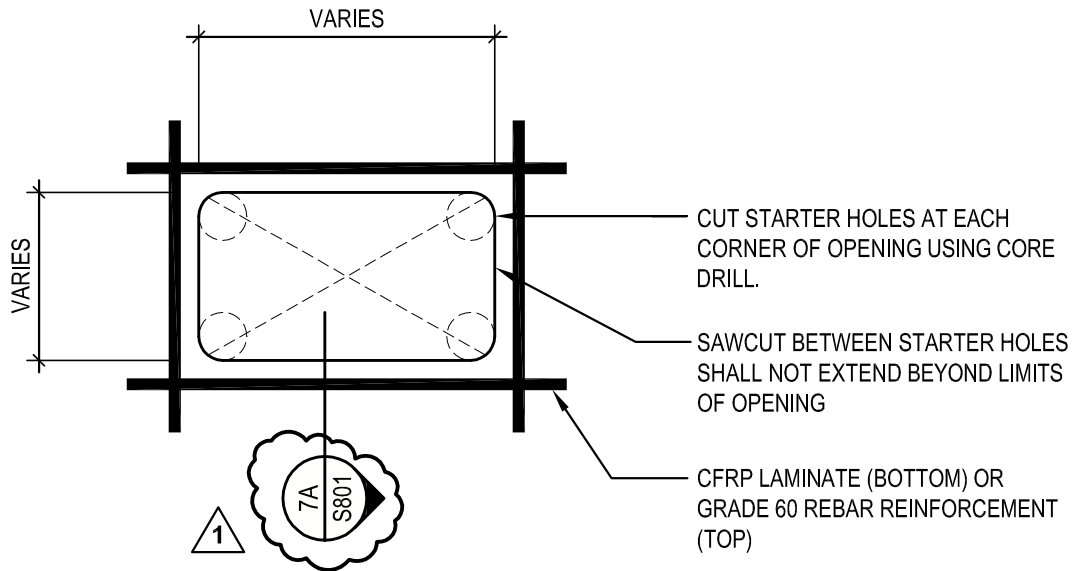
**PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS**

BULLETIN DRAWING TITLE:	PROJECT NUMBER <b>SCO ID#16-12735</b>
	DRAWING NUMBER <b>SBD-05</b>
	RE: <b>S801</b>



PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS

BULLETIN DRAWING TITLE:	PROJECT NUMBER SCO ID#16-12735
_____	DRAWING NUMBER <b>SBD-06</b>
_____	RE: S801
_____	_____
_____	_____



**NOTES:**

1. GROUPS OF SMALLER PENETRATIONS WHICH DO NOT MEET THE DIAMETER RESTRICTIONS OF THE TYPICAL PENETRATION DETAILS SHOULD BE FIELD LOCATED AND SENT TO STRUCTURAL ENGINEER FOR SPECIFIC STRENGTHENING DETAIL.
2. PENETRATION LOCATIONS SHOULD BE POSITIONED TO AVOID CUTTING TOP BARS IN MORE THAN ONE DIRECTION.
3. MULTIPLE PENETRATIONS SHOULD BE SPACED AS CLOSE AS POSSIBLE, IF THE PENETRATIONS ARE SMALL ENOUGH TO CUT THE SAME NUMBER OF BARS AS A TYPICAL PENETRATION DETAIL ALLOWS.
4. CONTRACTOR IS RESPONSIBLE FOR SLAB REPAIR WHERE OVERCUT EXTENDS PAST ADDED REINFORCEMENT.
5. MULTIPLE CLOSELY SPACED PENETRATIONS THAT EXCEED THE ALLOWABLE TYPICAL DETAIL PENETRATION DIAMETERS SHALL BE POSITIONED, AS STATED ABOVE, AND SUBMITTED TO STRUCTURAL ENGINEER FOR REINFORCEMENT DETAIL.
6. PENETRATIONS GREATER THAN 2" IN DIAMETER (TOTAL CUT DIAMETER) SHOULD NOT BE POSITIONED WITHIN A 3'-0" DIAMETER OF AN EXISTING COLUMN.

7

**TYPICAL DETAIL**  
**PLAN-SLAB OPENING**  


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##### NTS

**PURPOSE OF DRAWING: ADDENDUM #1 REVISIONS**

BULLETIN DRAWING TITLE: <hr/> <hr/> <hr/> <hr/>	PROJECT NUMBER <b>SCO ID#16-12735</b> DRAWING NUMBER <div style="text-align: center; font-size: 24pt; font-weight: bold;">SBD-07</div> RE: S801
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## PART 2 PRODUCTS

### 2.1 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

Pipe 3 inch and larger:

- A. Ductile Iron Pipe: AWWA C151.
  - 1. Fittings: AWWA C110, ductile or gray iron, standard thickness.
  - 2. Joints: AWWA C111, rubber gasket with rods.

Pipe 2½ inch and smaller:

- B. Copper Tubing: ASTM B88, Type K hard drawn or annealed.
  - 1. Fittings: ASME B16.18, cast copper, or ASME B16.22, wrought copper.
  - 2. Joints:
    - a. 1” and smaller: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
    - b. 1-1/4” and larger: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.

### 2.2 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L hard drawn.
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints:
    - a. 1-1/2” and smaller: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
    - b. 2” and larger: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degrees F.
    - c. 1-1/2” and smaller: Copper, Push-To-Connect Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper with stainless steel teeth and EPDM synthetic rubber o-ring seal in each end (UL classified in accordance with NSF-61 for hot (+180°F) and cold (+86°F) potable water service) with push-to-connect ends instead of solder-joint ends.
- B. Copper Tubing: ASTM B88, Type L hard drawn, rolled grooved ends.
  - 1. Fittings: ASME B16.18 cast copper alloy, or ASME B16.22 wrought copper and bronze, or ASTM B584 bronze sand castings,] grooved ends.
  - 2. Joints: Grooved mechanical couplings meeting ASTM F1476.
    - a. Housing Clamps: ASTM A395/A395M and ASTM A536 ductile iron, cast with offsetting, angle-pattern bolt pads to provide rigidity, copper-



colored enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion. "Installation-Ready" design for direct stab installation onto roll grooved copper tube without field disassembly. Victaulic Style 607 QuickVic™.

- b. Gasket: Elastomer composition, Grade "EHP" EPDM synthetic rubber gasket (UL/ULC classified in accordance with ANSI/NSF-61 for domestic water service) for operating temperature range from -30 degrees F to ~~230~~ 250 degrees F.
- c. Accessories: Stainless steel bolts, nuts, and washers.

## 2.3 SANITARY WASTE PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Soil Pipe: ASTM A74, service weight bell and spigot ends.
  - 1. Fittings: Cast iron, ASTM A74.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.

## 2.4 SANITARY WASTE AND VENT PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

## 2.5 STORM WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74, service weight bell and spigot ends.
  - 1. Fittings: Cast iron, ASTM A74.
  - 2. Joints: ASTM C564, rubber gasket joint devices or lead and oakum.

## 2.6 STORM WATER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hub-less, service weight.
  - 1. Fittings: Cast iron, CISPI 301.
  - 2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

## 2.7 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type DWV.
  - 1. Fittings: ASME B16.18, cast brass, or ASME B16.22 solder wrought copper.

2. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
3. Fittings: ASME B16.18 cast copper alloy, or ASME B16.22 wrought copper and bronze, or ASTM B584 bronze sand castings with copper tube dimensioned grooved ends (flaring of tube and fitting ends to IPS dimensions is not permitted).
4. Joints: Grooved mechanical couplings meeting ASTM F1476.
  - a. Housing Clamps: ASTM ASTM A536 ductile iron, cast with offsetting, angle-pattern bolt pads to provide rigidity, copper-colored enamel coated, compatible with copper tubing sizes, to engage and lock designed to permit some angular deflection, contraction, and expansion. "Installation-Ready" design for direct stab installation without field disassembly. Victaulic Style 607H QuickVic™.
  - b. Gasket: Grade "EHP" EPDM gasket for water service with operating temperature range from -30 degrees F to 250 degrees F or Grade "T" Nitrile gasket for oil service with operating temperature range from -20 degrees F to 180 degrees F.
  - c. Accessories: Stainless steel bolts, nuts, and washers.

## 2.8 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
  1. Ferrous Piping: Class 150, malleable iron, threaded.
  2. Copper Piping: Class 150, bronze unions with soldered joints.
  3. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
  1. Ferrous Piping: Class 150, forged steel, slip-on flanges.
  2. Copper Piping: Class 150, slip-on bronze flanges.
  3. Gaskets: 1/16 inch thick preformed neoprene gaskets.
- C. Flange Adapter for Pipe 2 inches and Larger:
  1. Ferrous Piping: Class 125, 150 & 300, ductile iron, flat faced. Victaulic Style 741, 743 & W741.
  2. Copper Piping: 300 psi, ductile iron coated with copper-colored enamel, flat faced. Victaulic Style 641.

within 2 hours of the time that the problem is reported. This coverage shall be extended to include normal business hours, after business hours, weekends and holidays.

E. **Warranty Access**

1. Pending owner pre-approval, the Owner shall grant to the FMCS contractor, reasonable access to the FMCS during the warranty period. The owner shall allow the contractor to access the FMCS from a remote location for the purpose of diagnostics and troubleshooting, via the Internet, during the warranty period.

**1.11 ACCEPTABLE SYSTEM CONTRACTORS**

- A. The FMCS Contractor shall provide JACE hardware, software and DDC components. The successful FMCS Contractor shall not have password access to the Enterprise Server (Web Supervisor) and shall be restricted to JACE access.
- B. The FMCS Contractor shall have a technical support group accessible that is staffed with qualified personnel, capable of providing instruction and technical support service for networked control systems.
- C. FMCS Systems Contractors of the hardware and software components must be approved by UNCC prior to winning projects.
- D. UNCC List of Acceptable Contractors;
  - 1) **Platinum Building Automation** (using Honeywell Lonworks Controllers).
  - 2) **Schneider Electric Controls** (using Invensys I/A series Lonworks or approved BACnet).
  - 3) **United Automation Corporation** (using Honeywell Lonworks Controllers).
  - 4) **Mechanical Systems and Services** (using Honeywell Lonworks Controllers).
  - 5) **Johnson Controls** (using open protocol BACnet controllers and an approved Tridium systems integrator).
  - 6) **Engineered Control Solutions** (using Honeywell ILC BACnet)

**PART 2 - PRODUCTS**

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**2.1 GENERAL**

- A. The Facility Management Control System (FMCS) shall be comprised of a network of interoperable, stand-alone digital controllers, a computer system, graphical user interface software, network devices and other devices as specified herein.
- B. The installed system shall provide secure passwords access to all features, functions and data contained in the overall FMCS.

**2.2 OPEN, INTEROPERABLE, INTEGRATED ARCHITECTURES**

- A. The intent of this specification is to provide a peer-to-peer networked, stand-alone, distributed control system with the capability to integrate the most current ANSI/ASHRAE Standard BACnet, LonWorks technology, MODBUS, existing OPC if applicable, and other existing open and proprietary communication protocols if applicable in one open, interoperable system.
- B. The supplied computer software shall employ component-based technology (OOT) for representation of all data and control devices within the system. In addition, adherence to industry standards including the most current ANSI / ASHRAE™ Standard, BACnet and LonMark to assure interoperability between

## 1.4 QUALITY ASSURANCE

- A. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.
- B. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

## PART 2 - PRODUCTS

### 2.1 HYDRONIC SPECIALTY VALVES

- A. Bronze, Calibrated-Orifice, Balancing Valves:
  - 1. Body: Bronze, ball or plug type with calibrated orifice or venturi.
  - 2. Ball: Brass or stainless steel.
  - 3. Plug: Resin.
  - 4. Seat: PTFE.
  - 5. End Connections: Threaded or socket.
  - 6. Pressure Gage Connections: Integral seals for portable differential pressure meter.
  - 7. Handle Style: Lever, with memory stop to retain set position.
  - 8. CWP Rating: Minimum 125 psig.
  - 9. Maximum Operating Temperature: 250 deg F.
- B. Automatic Flow-Control Valves:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. [Flow Design Inc.](#)
    - b. [Griswold Controls.](#)
    - c. [PRO Hydronic Specialties](#)
    - d. [Nexus Valve.](#)
  - 2. Design:
    - a. 2" and under:
      - 1) Shall be a brass body type.
      - 2) Shall have threaded or sweat connections
      - 3) Minimum of one union and tailpiece incorporated into the design.
      - 4) Shall include a full-port ball type isolation valve.
    - b. 2-1/2" and up:
      - 1) Shall be ductile iron wafer style.
      - 2) Shall include ANSI Class 150 flanges on both ends.
      - 3) Shall include a lug style butterfly isolation valve.
    - c. The GPM for the automatic flow limiter valve shall be preset at the factory and shall be within  $\pm 5\%$  of the specified GPM.
    - d. The Automatic Flow Limiting Cartridge shall be permanently marked by a letter that corresponds to the specific GPM.
    - e. Each valve shall have two P/T ports "H" and "L" for flow verification.

## SECTION 232123 - HYDRONIC PUMPS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Close-coupled, in-line centrifugal pumps.
2. Separately coupled, horizontally mounted, in-line centrifugal pumps.
3. Automatic condensate pump units.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of pump.

B. Shop Drawings: For each pump.

1. Show pump layout and connections.
2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
3. Include diagrams for power, signal, and control wiring.

#### 1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

### PART 2 - PRODUCTS

#### 2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Armstrong Pumps, Inc.
2. ITT Corporation.
3. Patterson Pump Company; a Gorman-Rupp company.
4. TACO Comfort Solutions, Inc.
5. Wilo (Approved for PHWP-1 only)

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.

C. Pump Construction:

## SECTION 232136 – COOLANT DISTRIBUTION UNIT

### PART 1 - GENERAL

#### 1.1 SUMMARY

This specification describes a Coolant Distribution Unit (CDU) used for distributing cool fluid to a range of cooling systems including but not limited to active chilled beams. The CDU shall be supplied in a Top Feed configuration and shall be rated for outdoor use. The CDU functions by circulating a clean fluid (see coolant specification), at a temperature above room dew point, to a specified computer cooling system in a closed loop therefore removing heat indirectly from the computer system and avoiding possible condensation. The heated water from the chilled beam system is then pumped by the CDU through its' integral heat exchanger where it is transferred to a decoupled, cold water building cooling system and effectively removed. The CDU shall include a stainless steel brazed plate heat exchanger, redundant circulation pumps with redundant variable frequency drive (VFD) control, motorized 2-way control valve high powered programmable logic controller (PLC), dew point monitoring and control system, leak detection system, expansion tank, A/B Power connections, remote monitoring capability (customer specified), a high quality sheet metal enclosure with baked epoxy powder finish will include front and rear access doors, removable side panels and heavy duty castors with locking mechanism and lifting feet. All piping shall be of specified diameter and made of type L copper, stainless steel or a combination of both. Specified external dimensions shall be strictly followed to ensure correct grid layout inside the data center. The CDU shall be complete in all respects, including all components, wiring and controls. The CDU shall only require connection to building utilities and cooling system furnished by others to be fully operational. The complete assembly shall be tested & approved by ETL, in accordance with UL 1995 and CSA C22.2 236-06 safety standards, and shall have the ETL label affixed, suitable for USA. The CDU shall meet these specified performance requirements without deviation.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each unit
- B. Shop Drawings: For each unit.
  - 1. Show unit layout and connections.
  - 2. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.
  - 3. Include diagrams for power, signal, and control wiring.

### PART 2 - PRODUCTS

#### 2.1 COOLANT DISTRIBUTION UNIT

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Motivair.
  - 2. Systecon.
  - 3. Envirosep.

B. Components & Construction

1. Powder coated metal enclosure
2. Stainless Steel Heat Exchanger
3. Circulation Pumps
4. Variable Frequency Drives
5. Programmable Logic Controller (PLC) in NEMA 3R Outdoor Rated Enclosure

C. POWDER-COATED CABINET ENCLOSURE: The CDU shall be enclosed in a high strength aluminum frame capable of supporting all the required components and suitable for specified duty. The enclosure shall include removable side access panels with front and rear access doors. Perforations shall be included at key locations for ventilation. All doors and panels shall be finished in a black, baked epoxy powder. The enclosure shall include castors rated for heavy duty operation with locking wheels and adjustable feet.

D. HEAT EXCHANGER (HX): The CDU shall include a 316L stainless steel copper brazed plate heat exchanger (HX) rated for the specified thermal duty. The heat exchanger shall be UL listed and tested to specified operating pressure. The HX shall be wrapped in 1 inch closed cell thermal insulation to prevent condensation. In the event of service requirements, the HX shall be able to be removed with the use of unions or clamps. A welded or soldered connection shall not be allowed.

E. CIRCULATION PUMPS: The CDU shall include two (2) redundant secondary circulation pumps used to circulate a cool fluid to the designated computer cooling system. Each pump shall include a high efficiency TEFC motor rated for the specified, customer supplier, power system. Each pump shall be rated for the specified flow and pressure without deviation unless specifically noted by the owner. Each pump will be connected to the main CDU control panel and will include all necessary wiring, overloads and contactors for operation. Pump operation, weekly rotation and automatic change over in the event of a lead pump failure shall be controlled by the CDU PLC. Pumps shall be located inside the CDU for easy maintenance and service access.

F. VARIABLE FREQUENCY DRIVES: Each pump shall be equipped with its own Variable Frequency Drive (VFD) suited for matched duty to the pump motor. Each VFD shall be controlled by the CDU PLC and shall include an integrated Active Power Filter used to reduce EMI on building power lines. The VFDs will be mounted inside the main CDU control panel and ventilated accordingly to ensure reliable operation. VFD features will include at minimum, adjustable ramp up and ramp down times, a full array of motor safety features, automatic restart feature and a 24x7 global support hotline. The VFD shall meet all current safety and efficiency codes for the North American, European markets.

G. PROGRAMABLE LOGIC CONTROLLER (PLC): The CDU operation shall be controlled and monitored by a plug-in, fully integrated, Programmable Logic Controller. The PLC shall control all functions of the CDU and shall monitor all operating parameters including secondary coolant water inlet and outlet temperature, primary chilled water inlet and outlet temperature, room dew point and 2-way valve position. The PLC shall include a 4-line LCD display. An adjustable alarm shall be provided for all critical CDU functions. The alarm points shall be wired to a common alarm relay, and a panel mounted LED. In the event of any alarm condition, the PLC shall display a code for the alarm condition. The alarm conditions shall be:

High secondary outlet water temperature	Low secondary outlet water temperature
Temperature sensor in open or closed circuit	Input voltage out of range
High chilled water temperature	Low chilled water temperature
Memory failure	VFD Failure
High room dew point	Pump Failure
High/Low Coolant Pressure	High/Low Voltage
Phase Imbalance	

The entire PLC control shall be mounted inside the main CDU electrical cabinet. The PLC shall be suitable for connection to a central control system for remote control & alarm access. Remote communication shall be via an interface (optional) board for Modbus, Bacnet IP, Bacnet MSTP or Ethernet.

## PART 3 - EXECUTION

### 3.1 UNIT INSTALLATION

- A. Install units to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.
- B. Independently support unit and piping so weight of piping is not supported by units and weight of unit is not supported by piping.
- C. Equipment Mounting:
  - 1. Install units on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

### 3.2 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Where installing piping adjacent to CDU, allow space for service and maintenance.
- C. Connect piping to CDU. Install valves that are same size as piping connected to CDU.
- D. Install shutoff valves on discharge side of CDU.
- E. Install shutoff valve on suction side of CDU.
- F. Install flexible connectors on suction and discharge sides of CDU between unit casing and valves.
- G. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.
- H. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- I. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.3 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.
- C. Complete installation and startup checks according to manufacturer's written instructions and perform the following:



1. Verify that CDU has been leak tested.
  2. Verify that pumps are installed and functional.
  3. Verify that thermometers and gages are installed.
  4. Operate unit for run-in period.
  5. Check bearing lubrication and oil levels.
  6. Verify proper motor rotation.
  7. Verify static deflection of vibration isolators, including deflection during unit startup and shutdown.
  8. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
- D. Visually inspect chiller for damage before starting. Repair or replace damaged components, including insulation. Do not start CDU until damage that is detrimental to operation has been corrected.
- E. Prepare a written startup report that records results of tests and inspections.

#### 3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain CDU.
1. Instructor shall be factory trained and certified.
  2. Provide not less than eight hours of training.
  3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
  4. Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
  5. Obtain Owner sign-off that training is complete.
  6. Owner training shall be held at Project site.

END OF SECTION 232136

## SECTION 233600 - AIR TERMINAL UNITS

### 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:
  - 1. Shutoff, single-duct air terminal units.
  - 2. Casing liner.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of air terminal unit.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for air terminal units.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For air terminal units.
  - 1. Include plans, elevations, sections, and mounting details.
  - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 3. Include diagrams for power, signal, and control wiring.
  - 4. Hangers and supports, including methods for duct and building attachment and vibration isolation.
- C. Delegated-Design Submittal:
  - 1. Materials, fabrication, assembly, and spacing of hangers and supports.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
  - 1. Ceiling suspension assembly members.
  - 2. Size and location of initial access modules for acoustic tile.

3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
- B. Field quality-control reports.

## 1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
    - a. Instructions for resetting minimum and maximum air volumes.
    - b. Instructions for adjusting software set points.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 - Heating, Ventilating, and Air Conditioning."

### 2.2 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

- A. **Basis-of-Design Product:** Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. [METALAIRE, Inc.](#)
  2. [Price Industries.](#)
  3. [Titus.](#)
  4. [Trane.](#)
- B. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
- C. Casing: 0.034-inch- thick galvanized steel, single wall.
1. Casing Liner: Comply with requirements in "Casing Liner" Article for flexible elastomeric duct liner.
  2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
  3. Air Outlet: S-slip and drive connections, size matching inlet size.

4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
  5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- D. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from zero to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.
- E. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3-inch wg inlet static pressure.
  2. Damper Position: Normally closed.
- F. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch, and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
- G. Control devices shall be compatible with temperature controls system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
1. Electric Damper Actuator: 24 V, powered open, spring return.
  2. Terminal Unit Controller: Pressure-independent, variable-air-volume (VAV) controller with electronic airflow transducer with multipoint velocity sensor at air inlet, factory calibrated to minimum and maximum air volumes, and having the following features:
    - a. Occupied and unoccupied operating mode.
    - b. Remote reset of airflow or temperature set points.
    - c. Adjusting and monitoring with portable terminal.
    - d. Communication with temperature-control system specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

## 2.3 CASING LINER

- A. Casing Liner: Flexible elastomeric duct liner fabricated of preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.
1. Minimum Thickness: 1/2 inch.
  2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
  3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

## 2.4 SOURCE QUALITY CONTROL

- A. Factory Tests: Test assembled air terminal units according to AHRI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and AHRI certification seal.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
  1. Where practical, install concrete inserts before placing concrete.
  2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
  3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches thick.
  4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches thick.
  5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hangers Exposed to View: Threaded rod and angle or channel supports.
- D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

### 3.2 TERMINAL UNIT INSTALLATION

- A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
- B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
- C. Install wall-mounted thermostats.

### 3.3 CONNECTIONS

- A. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
- B. Hot-Water Piping: Comply with requirements in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties," and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.
- C. Comply with requirements in Section 233113 "Metal Ducts" for connecting ducts to air terminal units.

- D. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 "Air Duct Accessories."

### 3.4 IDENTIFICATION

- A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

### 3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
  - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Air terminal unit will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

### 3.6 STARTUP SERVICE

- A. Perform startup service.
  - 1. Complete installation and startup checks according to manufacturer's written instructions.
  - 2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
  - 3. Verify that controls and control enclosure are accessible.
  - 4. Verify that control connections are complete.
  - 5. Verify that nameplate and identification tag are visible.
  - 6. Verify that controls respond to inputs as specified.

### 3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 233600

3. The equipment furnished contains inter-changeable parts with the specified equipment so that all major equipment parts can be obtained from the specified manufacturer.

## PART 2 - PRODUCT

### 2.01 MANUFACTURERS

- A. Furnish and install factory “packaged” low pressure hot water boiler(s) as manufactured by Harsco Industrial /Patterson-Kelley or as approved and accepted by the Engineer. Each factory “packaged” boiler shall be complete with all components and accessories necessary for a complete and operable boiler as hereinafter specified. Each unit shall be furnished factory assembled with required wiring and piping as a self-contained unit. Each unit shall be readily transported and ready for installation. Approved Equals: Lochinvar, Laars

### 2.02 COMPONENTS

#### A. HEAT EXCHANGER

1. Each hot water boiler shall consist of a cast aluminum heat exchanger complete with trim, valve trains, burner, and boiler control system. The boiler manufacturer shall fully coordinate the boiler as to the interaction of its elements with the burner and the boiler control system in order to provide the required capacities, efficiencies, and performance as specified.
2. The boiler heat exchanger shall be cast from an aluminum alloy that is suitable to resist the corrosive gases produced from flue gas condensation. The casting shall be a counter-flow design for maximum heat transfer with the multiple flow paths arranged in a reverse return configuration to assure balanced flow through each channel. Each section shall be an independent vessel connected together on the water side by a common manifold without the inclusion of pin-nipples and/or water-side gaskets or may be of a Mono-Block design in lieu of sectional design. Heat exchangers that consist of a primary and secondary heat exchanger are not acceptable.
3. Each boiler shall be capable of operating with a minimum outlet water temperature of 68°F.

#### B. MAIN GAS TRAIN

1. Each boiler shall be provided with an integral main gas valve train. The main gas valve train(s) shall be factory assembled, piped, and wired. Each gas valve train shall include at least the following:
  - a) One (1) manual shutoff valve.

# COOLING DISTRIBUTION UNIT SCHEDULE

TAG	CDU-1	
LOCATION	OUTDOOR MECH YARD	
MANUFACTURER & MODEL	MOTIVAIR MCDU-75-6-60	
<b>HEAT EXCHANGER</b>		
TYPE	BRAZED PLATE	
PLATE MATERIAL	STAINLESS STEEL COPPER	
CONNECTION HOT & COLD SIDE	2-1/2"	
	HOT SIDE	COLD SIDE
FLUID TYPE	100% WATER	100% WATER
FLOW RATE (GPM)	72	24
INLET TEMPERATURE (DEGREE F)	62	44
OUTLET TEMPERATURE (DEGREE F)	58	56
PRESSURE DROP (FT)	31.8	28.9
<b>HOT SIDE PUMPS</b>		
TYPE	CLOSE COUPLED CIRCULATION	
QUANTITY	2	
OPERATING TEMP (DEGREE F)	22	
FLOW RATE (GPM)	120	
DUTY HEAD (FT)	110	
MINIMUM MOTOR (HP)	-	
SPEED (RPM)	1800	
EFFICIENCY (%)	-	
MOTOR TYPE	TEFC	
<b>COMPLETE SKID ELECTRICAL (SINGLE POINT POWER)</b>		
VOLTAGE	460/60/3	
MCA (AMPS)	13.8	
MOP (AMPS)	25	
<b>COMPLETE PACKAGE DIMENSIONS</b>		
LENGTH (IN)	39	
WIDTH (IN)	31	
HEIGHT (IN)	72	
SHIPPING WEIGHT (LBS)	1,170	
OPERATING WEIGHT (LBS)	1,300	
<b>NOTES:</b>		
1. PROVIDE NEMA 3R ENCLOSURE.		
2. COMPLETE CONTROLS PACKAGE FACTORY ENGINEERED, INSTALLED AND COMMISSIONED PER SEQUENCE OF OPERATION. SYSTEM CONTROLLER SHALL HAVE TOUCH SCREEN DISPLAY. BAS TO ONLY INTEGRATE INPUTS AND OUTPUTS. PROVIDE BACNET COMMUNICATION.		
3. PUMPS TO OPERATE LEAD/LAG AND HAVE INDEPENDENT VFDS FOR REDUNDANCY.		
4. ALL PIPING TO BE INSULATED FOR CONDENSATION PREVENTION.		
5. EXPANSION TANK, PRESSURE RELIEF VALVE, AND AIR VENT		
6. APPROVED EQUAL MANUFACTURERS: SYSTECON, ENVIROSEP		

**PURPOSE OF DRAWING:** TO REVISE CDU SCHEDULE NOTES. ENCLOSURE SHALL BE NEMA 3R.

<small>BULLETIN DRAWING TITLE:</small>	<small>PROJECT NUMBER</small> <b>1610</b>
<b>SCHEDULE</b>	<small>DRAWING NUMBER</small> <b>BDM-1</b>
	<small>DATE:</small> <b>09/21/17</b>



## VAV TERMINAL UNIT SCHEDULE

UNIT DESIGNATION	VAV-01	VAV-02	VAV-03	VAV-04	VAV-05	VAV-06
MANUFACTURER	PRICE	PRICE	PRICE	PRICE	PRICE	PRICE
MODEL NUMBER	SDV	SDV	SDV	SDV	SDV	SDV
AREA SERVED	105 - BREAK	108 - CONFERENCE	215 - CONFERENCE	317 - CONFERENCE	401D - COLLAB.	411 - CONFERENCE
MAX. TERMINAL UNIT AIRFLOW (CFM)	290	215	200	200	200	200
MAX. TERMINAL UNIT HEATING AIRFLOW (CFM) (NOTE 6)	205	151	140	140	140	140
MIN. TERMINAL UNIT AIRFLOW (CFM)	85	65	60	60	60	60
COIL LEAVING AIR DRY-BULB TEMPERATURE (DEGF)	90	90	90	90	90	90
COIL ENTERING AIR DRY-BULB TEMPERATURE (DEGF)	55	55	55	55	55	55
COIL HEATING CAPACITY AT MINIMUM AIRFLOW (MBH)	7.82	5.74	5.34	5.34	5.34	5.34
COIL ROWS	1.0	1.0	1.0	1.0	1.0	1.0
COIL ENTERING WATER TEMPERATURE	130	130	130	130	130	130
COIL LEAVING WATER TEMPERATURE	110	110	110	110	110	110
WATER FLOW (GPM)	1.5	1.1	1.0	1.0	1.0	1.0
TERMINAL UNIT INLET DIAMETER (IN.)	6	5	10"	10"	10"	10"
TERMINAL CONTROL TYPE	DDC	DDC	DDC	DDC	DDC	DDC

**NOTES:**

1. PROVIDE FACTORY MOUNTED PRESSURE INDEPENDENT CONTROLS.
2. PROVIDE FACTORY MOUNTED 24V ACTUATOR POWERED BY BAS.
3. DUCT RUNOUT DIAMETER TO BE EQUIVALENT TO AIR VALVE INLET DIAMETER.
4. MAX. TERMINAL UNIT PRESSURE DROP NOT TO EXCEED 0.8" W.C. WITH HEATING COIL.
5. MAX. COIL FACE VELOCITY NOT TO EXCEED 800 FPM AT MAX AIRFLOW CONDITIONS.
6. TERMINAL UNIT AIRFLOW IS ONLY ALLOWED ABOVE 30% IN HEATING MODE WHEN CHILLED WATER VALVE IS CLOSED.

**ALTERNATES ACCEPTABLE: TRANE, TITUS, METALAIR**

**PURPOSE OF DRAWING: TO UPDATE VAV SCHEDULE APPROVED EQUALS**

BULLETIN DRAWING TITLE:	PROJECT NUMBER
	<b>1610</b>
	DRAWING NUMBER
	<b>BDM-2</b>
	DATE: 09/21/17

REMARKS:

1. PROVIDE COANDA PLATES FOR EXPOSED MOUNTING.
2. PROVIDE TYPE VFC PRESSURE INDEPENDENT VOLUME FLOW CONTROLLER W/ VARIABLE ADJUSTMENT ACTUATOR. 24V POWER. TIE INTO BAS.
3. PROVIDE TYPE VFL VOLUME FLOW LIMITER IN DUCT PRIOR TO FINAL CONNECTION TO CHILLED BEAM.

**PURPOSE OF DRAWING:** TO REVISE CHILLED BEAM SCHEDULE NOTES.

BULLETIN DRAWING TITLE:	PROJECT NUMBER
<u>SCHEDULE NOTES</u>	1610
	DRAWING NUMBER
	<b>BDM-3</b>
	DATE: 09/21/17