DEDC LLC
ENGINEERING | DESIGN | CONSULTING

Delaware
315 S. Chapel Street
Newark, DE 19711
Phone
302.738.7172
Fax
302.738.7175

Pennsylvania
Duane Morris Plaza
30 S. 17th Street
Suite 830
Philadelphia, PA 19103
Phone
267.804.7286
www.dedc-eng.com

PRE-BID MEETING SUMMARY
HERMAN HOLLOWAY CAMPUS
CONTROLS CONSOLIDATION PHASE III
OMB/DFM # MC3501000079
ADDENDUM #2

REVISED BID FORM: Please use the revised Bid Form when submitting bids.

1. **The Herman Holloway Controls Phase III bid due date is April 8th. All bids are due by 1:15 p.m. The virtual bid opening will be at 2:00 p.m. on April 8th. All bids submissions will be done via the new OMB/DFM virtual procedure. No bids will be accepted in person at the Thomas Collins building in Dover. All prospective bidders will receive a separate email explaining the new temporary procedures regarding pre-bid meetings, bid submissions, and bid openings.**

QUESTIONS:

1. Is bidding contractor or State of Delaware responsible for the draining of water systems in order to install new control valves? If contractor is responsible, can you provide guidance on how long the system can remain drained?
   Answer: Yes. Hot water systems may be drained when outside air temperatures exceed 60°F and the system may be down for a maximum of 48 hours.

2. Are there any restrictions on when work can be performed: In each individual building? In specific sections/floors/areas of any building? Any restrictions as to time of day/year that new valves can be installed? Opening of ceilings in occupied areas? Drilling? Unless otherwise clarified, can we assume all work can be performed during normal business hours?
   Answer: The work hours for the Café building shall be from 4:00 PM to 10:00 PM. The work hours for all other buildings in this project shall be from 8:00 am to 4:30 pm. Contractor is to provide a 3-week look ahead schedule at each meeting as well as an overall project schedule before the construction kick-off meeting. These schedules are to be used to accurately identify where work is to be occurring so that employees can be made aware of work occurring in their area and can be temporarily relocated if necessary.

3. Are pipe or valve body sizes available for any of the existing valves that are indicated to be replaced?
   Answer: No. Yes please see drawing M-C23 issued in this addendum.

4. Is any air balancing required? To verify TU air flow values? OA intake air values?
   Answer: No air balancing is required.

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5. Can you clarify that no new ATC dampers, or damper repairs (other than linkage), are to be included in the base bid or any of the alternates.
   Answer: No new dampers are included in this scope of work.

6. Specification Document OMB DFM CONTRACT # MC3501000079 Dated April 2020 indicated an alternate #3 for Phone Building BAS. The plans cover page indicates a drawing M-L11, which was not included in the PDF drawing set. Can you please forward this drawing?
   Answer: Drawing M-L11 has been issued as part of this addendum.

7. Drawing # M-C11 Room #s 201F, 207, 208C, 215, 240A, 240B, 240D, 249, 251, indicate a sensor S in each room. If room sensors, what pieces of equipment do these serve? If not room sensors, please clarify the intention of function of the S sensor.
   Answer: These are existing sensors found during surveys that did not appear to control any equipment and are believed to be abandoned. Contractor to field verify if these sensors are operation and what equipment they control, if any.

8. Drawing # M-C12 Room #s 340, 341, 345, 371, 373, 374, 377, 385, and 389 indicate a sensor S in each room. If room sensors, what pieces of equipment do these serve? If not room sensors, please clarify the intention of function of the S sensor.
   Answer: These are existing sensors found during surveys that did not appear to control any equipment and are believed to be abandoned. Contractor to field verify if these sensors are operation and what equipment they control, if any.

9. Drawing # M-C13 Room #s 35, 41, and conference room indicate a sensor S in each room. If room sensors, what pieces of equipment do these serve? If not room sensors, please clarify the intention of function of the S sensor.
   Answer: These are existing sensors found during surveys that did not appear to control any equipment and are believed to be abandoned. Contractor to field verify if these sensors are operation and what equipment they control, if any.

10. Drawing # M-C14 Room #s 390, Hallway outside 390, 405, 434, 435, 438, 439, 440, 442, 460, and 464 indicate a sensor S in each room. If room sensors, what pieces of equipment do these serve? If not room sensors, please clarify the intention of function of the S sensor.
    Answer: These are existing sensors found during surveys that did not appear to control any equipment and are believed to be abandoned. Contractor to field verify if these sensors are operation and what equipment they control, if any.

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11. Please confirm Duct Coils DH-# as described in equipment detail 3 on drawing M-C22 associated with Terminal Units, are Electric SCR Controlled Reheat Coils (analog output) and not individually staged electric heat elements (digital outputs).
    Answer: Please see revised drawing M-C22. Contractor shall field verify quantity of stages for each electric coil.

12. Drawing # M-C11 Room #206 contains equipment callout HC-2. Please confirm this is the only stand-alone Hot Water Heating Coil in this building.
    Answer: Confirmed.

13. Drawing #M-C14 Room 391 Depicts Multiple Thermostats in the same served space. Please confirm what equipment each thermostat serves.
    Answer: The thermostat labeled "DC-2" serves duct coil #20. The unlabeled thermostat is believed to be abandoned, contractor to field verify if this thermostat is operational and what equipment it controls, if any.

14. Drawing #M-C22 detail 7 indicates a supply air sensor on TU-#. Detail 3 indicates a supply air sensor on the associated DC-#. Can you clarify that only one supply air sensor is required per TU/DC combination?
    Answer: Please see revised drawing M-C22.

15. On Drawing #M-C15 Adjacent to Room#17 Hospital Director, what appears to be TU-27 is labeled as Duct Coil 27. Please confirm this will be Terminal Unit #27.
    Answer: Correct, please see revised drawing M-C15.

16. On Drawing #M-C15 in Corridor 62, there is an annotation for RAC/16. Please confirm this is to be RTU/16 as described on Drawing #M-C23.
    Answer: Correct, please see revised drawing M-C15.

17. On Drawing #M-C15 in Library Room #41, Please confirm DC-38 is supplied by Rooftop Unit 18.
    Answer: Confirmed.

18. In rooms with both BBH and TU/DC, are multiple room sensors to be provided? Or in these cases should just a single room sensor be provided to manage both the TU/DC and BBH? If multiple sensors are required, how should the BAS sequence the BBH vs. the TU/DC for heating?
    Answer: A single room sensor shall be provided to manage both.

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19. On Drawing # M-C23, Rooftop Unit Controls Sequence states dampers are to modulate to applicable code required CFM. The points list on this drawing states dampers are to be open/close DO type actuators. Please confirm that OA & RA dampers are to be controlled by Analog output and will modulating, not 2-position. Are OA airflow sensors required to monitor CFM, to ensure code mandated airflow requirements are met? Or are will specific minimum values be provided? There is DI Status point shown for each damper. If analog control is to be utilized for these dampers, should the status points also be analog? As TU dampers close, what means of pressure relief exists in the system? Should RTU supply fans be outfitted with VFD's?
    Answer: Please see revised M-C22 & M-C23. Rooftop unit dampers shall be modulating. Contractor shall balance OA damper to outside air values identified in schedule.

20. Drawing #M-B11 Annotates CH-1. There are no details indicate for equipment type CH-#. Can you confirm if this is/is not a CUH-# per detail 2 on drawing M-B21? If it is on, can you clarify BAS scope of work for this item?
    Answer: This is not a unit heater nor is there any work associated with this equipment.

21. Drawing #M-B12 indicates two BBH sections in each of Area E's south most rooms. Please confirm one control valve per room (and not one per BBH section)?
    Answer: There is one control valve BBH per section.

22. Equipment Scope of Work Note on Drawing #M-B13 IDO/ODU references equipment diagram on drawing #M-B21 for Split Unit Controls. This diagram is not included. Please provide diagram of controls for existing split units.
    Answer: Please see revised M-B21 for diagram.

23. Specification Document #MC3501000079 Dated April 2020, Section 230951-9, Paragraph C, note 2 states "Provide setpoint adjustment where indicated. The setpoint adjustment shall be a warmer/cooler indication that shall be scalable via the BAS." Please clarify if public space thermostats will require zone override and setpoint adjust. Please confirm if there are any tamper proof, clear plastic covers required for any spaces in the project.
    Answer: Public space thermostats to have zone override and setpoint adjustment, no plastic covers are require.

24. Please confirm Terminal Units, and Electric Duct coils in the Springer Building have existing DDC controls with useable 24V control power.
    Answer: It is the contractor's responsibility to provide the 24V usable power as noted in section 23 09 50 3.06.

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25. Specification Document #MC3501000079 Dated April 2020, Section 230951-9, Paragraph C, note 4 states "provide current temperature indication vis an LCD or LED readout where indicated". Please clarify on drawing sets which room temperature sensors will require LCD display.
    Answer: No room sensors require and LCD display.

26. Are as-builts drawings for the existing BAS in Biggs and Springer available for distribution? We need this to determine what wiring is existing and can be reused vs. new wiring that we must include in the bid.
    Answer: The Biggs and Springer buildings do not have a BAS outside the existing Automated Logic systems. All wiring is to be new.

27. Is documentation available (wiring diagrams, model numbers, etc.) on the new Indoor and Outdoor Split Units in Biggs?
    Answer: We were not able to obtain any documentation provided with the units when they were installed. Documentation can be found on the manufacturer's websites based on model numbers found on the Indoor and Outdoor units.

28. Café H&V unit diagram on M-F21 does not show points for gas heat on/off, room temp, or fan start/stop. Are these points to be included?
    Answer: The intent is to monitor the status of this unit, not control it.

29. Café EF diagram on M-F21 does not include fan start/stop. Please confirm whether this point is required.
    Answer: The intent is to monitor the status of the exhaust fan, not control it.

30. For the Biggs PTAC units, the sequence of operations states that "The Room Controller shall report this space temperature to the PTAC unit". The PTAC unit is not designed to accept a temperature signal from the new BAS controller. Should the BAS controller sequence be modified such that the BAS turns off the PTAC unit if the room temperature goes above/below the BAS setpoints?
    Answer: The sequence shall be modified such that the BAS will monitor the space temperature and enable/disable the PTAC unit based on building occupancy.

31. Equipment Diagram on Drawing #M-B21 lists the Heating Coil as AO (Point List) and DO (Diagram). Please confirm the Heating coils associated with Rooftop Units are Enable/Disable Digital Output points or analog points.
    Answer: Units are enable/disable digital output points.

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32. In areas with block walls, is wiremold allowed as raceways to run new BAS wire?
    Answer: Yes.

33. In areas with spline ceiling, is contactor required to replace tiles broken during tile removal?
    Answer: Yes.

34. Are any access panels required in any areas? Is contractor responsible supply/install?
    Answer: No access panels are included in this scope. Contractor is to locate control panels above accessible ceilings.

35. Can wiring associated with any existing controls be reused? Is there any specific wiring that cannot be reused?
    Answer: Yes, but it is the contractor's responsibility to determine and report defective equipment prior to replacement. It is also the contractor's responsibility to test existing wiring for continuity before use. Currently communication wiring is suspected to be defective and was not specifically identified as existing to remain. See section 23 09 50 3.04.

A. Addendum #2
   1. Addendum #2 (this document) (6 pages)
   2. Specification (14 pages)
      00 41 13 - Bid Form
      23 05 93 - Testing, Adjusting, and Balancing for HVAC
   3. Drawings (9 pages)
      M-B21
      M-C11
      M-C12
      M-C13
      M-C14
      M-C15
      M-C22
      M-C23
      M-L11

Summarized By: DEDC, LLC
Matt Lano
Date: April 3, 2020

BID FORM

For Bids Due: **April 8, 2020 (1:15 p.m.)** **To:** Mr. Patrick McKenna
Construction Projects Manager
State of Delaware
Office of Management and Budget
540 South DuPont Highway, Suite 1
Dover, Delaware 19901

Name of Bidder: _____

Delaware Business License No.: _____ **Taxpayer ID No.:** _____
(A copy of Bidder's Delaware Business License must be attached to this form.)

(Other License Nos.): _____

Phone No.: ( ) _____ - _____ **Fax No.: ( ) _____ - _____**

The undersigned, representing that he has read and understands the Bidding Documents and that this bid is made in accordance therewith, that he has visited the site and has familiarized himself with the local conditions under which the Work is to be performed, and that his bid is based upon the materials, systems and equipment described in the Bidding Documents without exception, hereby proposes and agrees to provide all labor, materials, plant, equipment, supplies, transport and other facilities required to execute the work described by the aforesaid documents for the lump sum itemized below:

$_____
($)

ALTERNATES

Alternate prices conform to applicable project specification section. Refer to specifications for a complete description of the following Alternates. An "ADD" or "DEDUCT" amount is indicated by the crossed out part that does not apply.

ALTERNATE No. 1: Biggs Building: Add the mechanical equipment identified on the drawings to the existing BAS system.

Add: _____
($)

ALTERNATE No. 2: Cafe: Install a new BAS to serve the existing mechanical equipment.

Add: _____
($)

ALTERNATE No. 3: Phone: Install a new BAS to serve the existing mechanical equipment.

Add: _____
($)

ALLOWANCE

A $25,000 twenty-five thousand dollar allowance shall be provided as part of the base bid of this project to cover miscellaneous items found during construction.

BID FORM

I/We acknowledge Addendums numbered _____ and the price(s) submitted include any cost/schedule impact they may have.

This bid shall remain valid and cannot be withdrawn for thirty (30) days from the date of opening of bids (60 days for School Districts and Department of Education), and the undersigned shall abide by the Bid Security forfeiture provisions. Bid Security is attached to this Bid.

The Owner shall have the right to reject any or all bids, and to waive any informality or irregularity in any bid received.

This bid is based upon work being accomplished by the Sub-Contractors named on the list attached to this bid.

Should I/We be awarded this contract, I/We pledge to achieve substantial completion of all the work within _____ calendar days of the Notice to Proceed.

The undersigned represents and warrants that he has complied and shall comply with all requirements of local, state, and national laws; that no legal requirement has been or shall be violated in making or accepting this bid, in awarding the contract to him or in the prosecution of the work required; that the bid is legal and firm; that he has not, directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken action in restraint of free competitive bidding.

Upon receipt of written notice of the acceptance of this Bid, the Bidder shall, within twenty (20) calendar days, execute the agreement in the required form and deliver the Contract Bonds, and Insurance Certificates, required by the Contract Documents.

I am / We are an Individual / a Partnership / a Corporation

By _____ Trading as _____
(Individual's / General Partner's / Corporate Name)

_____
(State of Corporation)

Business Address: _____
_____
_____
_____

Witness: _____ **By:** _____
(Authorized Signature)

(SEAL)

_____
(Title)

Date: _____

ATTACHMENTS

Sub-Contractor List
Non-Collusion Statement
Affidavit(s) of Employee Drug Testing Program
Bid Security
(Others as Required by Project Manuals)

BID FORM

SUBCONTRACTOR LIST

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b of the Delaware Code, the following subcontractor listing must accompany any bid submittal. The bidder must list **in each category** the full name and address (City & State) of the sub-contractor that the bidder will be using to perform the work and provide material for that subcontractor category. Should the bidder's listed subcontractor intend to provide any of their subcontractor category of work through a third-tier contractor, the bidder shall list that third-tier contractor's full name and address (City & State). **If the bidder intends to perform any category of work itself, it must list its full name and address.** For clarification, if the bidder intends to perform the work themselves, the bidder **may not** insert "not applicable", "N/A", "self" or anything other than its own full name and address (City & State). To do so shall cause the bid to be rejected. In addition, the failure to produce a completed subcontractor list with the bid submittal shall cause the bid to be rejected. If you have more than three (3) third-tier contractors to report in any subcontractor category, print out additional page(s) containing the appropriate category, complete the rest of your list of third-tier contractors for that category, notate the addition in parentheses as (CONTINUATION) next to the subcontractor category and an asterisk (*) next to any additional third-tier contractors, and submit it with your bid.

Subcontractor Category		Subcontractor	Address (City & State)	Subcontractors tax-payer ID # or Delaware Business license #
1.	MECHANICAL			
	A.			
	B.			
	C.			
2.	ELECTRICAL			
	A.			
	B.			
	C.			

3.	CONTROLS			
	A.			
	B.			
	C.			

AFFIDAVIT
OF
CONTRACTOR QUALIFICATIONS

We hereby certify that we will abide by the contractor's qualifications outlined in the construction bid specifications for the duration of the contract term.

In accordance with Title 29, Chapter 69, Section 6962(d)(10)b.3 of the Delaware Code, after a contract has been awarded the successful bidder shall not substitute another subcontractor whose name was submitted on the Subcontractor Form except for the reasons in the statute and not without written consent from the awarding agency. Failure to utilize the subcontractors on the list will subject the successful bidder to penalties as outlined in the General Requirements Section 5.2 of the contract.

Contractor Name: _____

Contractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

BID FORM

NON-COLLUSION STATEMENT

This is to certify that the undersigned bidder has neither directly nor indirectly, entered into any agreement, participated in any collusion or otherwise taken any action in restraint of free competitive bidding in connection with this proposal submitted this date to the Office of Management and Budget, Division of Facilities Management.

All the terms and conditions of OMB/DFM# MC3501000079 have been thoroughly examined and are understood.

NAME OF BIDDER: _____

AUTHORIZED REPRESENTATIVE (TYPED): _____

AUTHORIZED REPRESENTATIVE (SIGNATURE): _____

TITLE: _____

ADDRESS OF BIDDER: _____

_____

_____

E-MAIL: _____

PHONE NUMBER: _____

Sworn to and Subscribed before me this _____ day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

AFFIDAVIT
OF
EMPLOYEE DRUG TESTING PROGRAM

4104 Regulations for the Drug Testing of Contractor and Subcontractor Employees Working on Large Public Works Projects requires that Contractors and Subcontractors implement a program of mandatory drug testing for Employees who work on Large Public Works Contracts funded all or in part with public funds.

We hereby certify that we have in place or will implement during the entire term of the contract a Mandatory Drug Testing Program for our employees on the jobsite that complies with this regulation:

Contractor/Subcontractor Name: _____

Contractor/Subcontractor Address: _____

_____

_____

Authorized Representative (typed or printed): _____

Authorized Representative (signature): _____

Title: _____

Sworn to and Subscribed before me this _____day of _____ 20____.

My Commission expires _____. NOTARY PUBLIC _____.

THIS PAGE MUST BE SIGNED AND NOTARIZED FOR YOUR BID TO BE CONSIDERED.

SECTION 23 05 93

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Commissioning activities.

1.02 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Employment of testing agency and payment for services.

B. Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

C. Section 23 08 00 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

B. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to DEDC, LLC.
   2. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Detailed step-by-step procedures for TAB work for each system and issue, including:
         1) Terminal flow calibration (for each terminal type).
         2) Diffuser proportioning.
         3) Branch/submain proportioning.
         4) Total flow calculations.
         5) Rechecking.
         6) Diversity issues.
      f. Expected problems and solutions, etc.
      g. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
      h. Confirmation of understanding of the outside air ventilation criteria under all conditions.
      i. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

j. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for DEDC, LLC and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
6. Include the following on the title page of each report:
a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Engineer.
g. Project Contractor.
h. Report date.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. TAB contractor shall review all of the drawings with special attention to the controls drawings as there is additional instruction on the drawings and sequence of operation as to how balancing shall be performed and what information the controls contractor is required to obtain.

B. TAB contractor shall perform ductwork leak tests prior to installation of ceiling. TAB contractor shall schedule this work thru the mechanical contractor.

C. Perform total system balance in accordance with one of the following:
1. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
2. SMACNA (TAB).

D. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

E. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

F. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Certified by one of the following:
a. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

G. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.

4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to DEDC, LLC to facilitate spot checks during testing.

3.04 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

3.05 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

3.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

3.08 COMMISSIONING

A. See Sections 01 91 13 and 23 08 00 for additional requirements.

B. Perform prerequisites prior to starting commissioning activities.

C. Fill out Prefunctional Checklists for:
   1. Air side systems.
   2. Water side systems.

D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

E. Re-check a random sample equivalent to 10 percent of the final TAB report data as directed by Commissioning Authority.
   1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
   2. Use the same test instruments as used in the original TAB work.
   3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
   4. For purposes of re-check, failure is defined as follows:
      a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
      b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
      c. Temperatures: Deviation of more than one degree F.
      d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
      e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
   5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

F. In the presence of the Commissioning Authority, verify that:
   1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
   2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.

3.09 SCOPE

A. Test, adjust, and balance the following:
   1. Packaged Roof Top Heating/Cooling Units.

3.10 MINIMUM DATA TO BE REPORTED

A. Springer Building Rooftop Units:
   1. Location.
   2. Manufacturer.
   3. Model number.
   4. Serial number.
   5. Arrangement/Class/Discharge.
   6. Supply air flow, specified and actual.
   7. Return air flow, specified and actual.
   8. Outside air flow, specified and actual.
   9. Total static pressure (total external), specified and actual.
   10. Inlet pressure.
   11. Discharge pressure.
   12. Sheave Make/Size/Bore.
   13. Number of Belts/Make/Size.
   14. Fan RPM.

END OF SECTION