Commissioning Report

CENTER FOR VETERANS IN HIGHER EDUCATION

UNIVERSITY OF ILLINOIS
URBANA – CHAMPAIGN

BUILDING 1494 **PROJECT NO U-13036**

Facilities & Services Engineering Services,

Quality Assurance Division

LEED
LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

For New Construction & Major Renovations

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EXECUTIVE OVERVIEW COMMISSIONING VERIFICATION

The University of Illinois is committed to commissioning the mechanical and electrical systems required for the reliable, safe, and secure operation of the facility. Additionally, other components and systems in respective Divisions (sub-grade, foundation, structure, roofing, window assemblies, elevators etc.), have been inspected as per normal and customary University procedures. This process verifies these systems are complete and functioning properly as per the Design intent upon project completion and that the University staff has appropriate system documentation and training as was also required per the Bid Documents.

The Universal ongoing Commissioning Services Scope of Work agreement between the FSQA Inspection Commissioning Group and the University is provided under Appendix S.

Supporting documentation for the Systems identified for required Commissioning have been included with the Final O&M Manuals as the collective set of binders forming the Systems Manual for this project. *The Systems are: HVAC and related controls, Lighting and control, Domestic Hot Water System, Electrical distribution and Emergency Power generation, and Renewable Energy in the Project.*

Project Progress as well as RFPs, Issues and Deficiencies were tracked and logged within the University Project Tracking (electronic) system "PRZM". A summary snapshot of the Issues Log was provided as an example under Appendice N. There are no remaining critical functional issues affecting or impeding contractual obligations for this project. The remaining open Issues items are contractor-acknowledged commitments with dates for completion.

The Design Review process completed jointly by the Commissioning Staff, the F&S Engineering Design Review Staff as well as the University Housing Staff is further discussed later in this report as having reviewed the Design Documents for the intent of meeting the Project's intent (Program Statement / OPR) and subsequent Basis of Design BOD.

The Submittal Review process was subsequently completed independently coincident by the Commissioning Staff, the F&S Engineering Design Review Staff as well as the University Housing (Owner) Staff in parallel with the AE Design Team. The F&S Commissioning Staff provided their review and comments for all divisions of work not just for MEP areas.

David Eisenmann, the Commissioning Lead Inspector for this Project also confirmed receipt of a Draft Set of O&M final Documentation from the Contractors. Red Line "as-builts" were reviewed with and are now being used by the AE to create Record Drawings as part of their (AE) contract.

Included in the Commissioning Scope of work is a follow up 10th month walkthrough scheduled for June 20th 2016 with the Occupant/Owner verifying status of warranty claims and overall building and systems performance.

COMMISSIONING AUTHORITY

Mr. David Eisenmann was the designated Commissioning Authority. He has been active with the University's Facilities and Services Quality Assurance Group, Inspection and Commissioning Services group providing Commissioning and Inspections and QA since joining the group in September 2005. The University continues to average in excess of (2) major new-construction projects (buildings) annually during his same tenure. The University has received USGBC LEED certification on ten previous major projects ranging from Silver to Platinum to date. Major Projects equate to buildings typically larger than 50,000 sq. ft. Mr. Eisenmann does not report to or have any accountability to the University Construction / Construction Management Division or the University Planning Division. Mr. Eisenmann also is independent of the AE Design group and independent of all Contractors.

Mr. Eisenmann, as well as five Inspectors and two other Lead Inspectors report to Mr. Fred Hahn, the Associate Director for F&S Quality Assurance Division of the University. Mr. David Eisenmann is the Lead Inspector for this Project and also became LEED Accredited in 2007. David was the LEAD inspector and CxA for The Business Instructional Facility and The Electrical Computer Engineering Project. Both of those projects were LEED certified.

Jointly, this group executes the Inspection and Commissioning Services for the University and may also call upon F&S Technical Trades to assist with testing services. This Project is the eleventh LEED

Project seeking certification. See Appendix S for the Commissioning Agreement with the University.

COMMISSIONING PROCESS

The University of Illinois Urbana-Champaign enacted this process initially in 1999 primarily following the basis of ASHRAE Guide 0.

Design Phase:

Commissioning activities began during the design phase of the project and will continue through the warranty period.

As with this Project, the Commissioning Team's Services Agreement commences work on each Capital Construction Project on Campus with Planning and Design including reviewing the OPR and BOD. This Project and each Project exceeding $5 million shall also follow and pursue USGBC LEED certification at least Silver or higher. All Design Phase AE submittals are reviewed by the Cx Team in parallel with the F&S Engineering group; neither are on the AE Design contracted team.

Construction Phase:

Equipment Submittals, cut-sheets and shop drawings were reviewed, in parallel, by the Project AE and the Commissioning Team. The latter phases in the overall commissioning process consisted of the Commissioning Team systematically documenting specified components and as-designed systems verifying they have been installed, started up properly and then functionally tested to additionally verify proper operation.

Training and Occupancy:

In addition, training sessions of owner-personnel have been verified. See Appendix P examples. Also final project Operation & Maintenance (O&M) documents have been reviewed for completeness.

The U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) program has identified Fundamental Commissioning as a prerequisite (compulsory) process to be included in every LEED certified project. As part of the commissioning process, the University of Illinois will be seeking US Green Building Certification under LEED v 3.0 for this project that will require Fundamental Building Systems Commissioning.

This Summary covers the overall outcome of the Commissioning process for the Project, any history of deficiencies, outstanding issues, seasonal testing as may be scheduled at later date(s), functional performance of systems and verification by the CxA of the design meeting the OPR, Basis of Design as well as required documentation, training and overall compliance by the contractors Each of these areas will be addressed with brief a summary, any analysis and recommendation.

OPR - REVIEW

The OPR is a follow-up overview to the University's Project Scope, relative to the building architecture and systems selected for commissioning. It was utilized to establish a baseline of performance expectations to which the actual installed performance is compared.

This OPR reflected the underlying assumptions and requirements that became represented in the construction documents. The OPR was initially co-developed by the Planning Division and Fred Hahn Associate Director for FSQA Div. and confirmed by the AE at the owner's request, and may be found in Appendix B.

The Commissioning Authority is not responsible for design concept, design criteria or compliance with codes. The Commissioning Authority does not verify the designers' calculations or proof schematics or layouts in detail. The Commissioning Authority uses his or her knowledge to provide input into the areas checked. For example, the Commissioning Authority does not verify appropriate pipe or duct

sizing, but may provide comments on unusually tight or restrictive duct layouts and bends or a poor location of a static pressure sensor.

In addition to the OPR citing directly related Codes and University Standards for energy efficiency environmental quality, the University-Required Program Statement (precedent and foundation of the OPR) clearly sets the requirements for Environmental and Sustainable Goals.

OCCUPANCY REQUIREMENTS
The New facility will be mixed occupancy use, students, instructors, classrooms and offices. Environmental conditions will be consistent with ASHRAE Standards cited below.

PERFORMANCE REQUIREMENTS

Mechanical Design Codes & Standards

- University of Illinois at Urbana – Champaign Standards
- All local codes and ordinances
- Latest issue of American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbooks on "Fundamentals" and "Systems"
- Applicable ASHRAE Standards including Standards 62 and 90.1
- Underwriters Laboratories (UL)
- Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- American Society for Testing and Materials (ASTM)
- American National Standards Institute (ANSI)
- Air Conditioning and Refrigeration Institute (ARI)
- American Society of Mechanical Engineers (ASME)
- Occupational Safety and Health Administration (OSHA)
  National Fire Protection Association (NFPA)
- National Electrical Manufacturer's Association (NEMA).

Electrical Design Codes & Standards

- University of Illinois at Urbana – Champaign Facilities Standards
- All local codes and ordinances
- National Electrical Code
- American National Standards Institute
- American Society for Testing and Material
- Electrical Testing Laboratories
- Illuminating Engineering Society
- Institute of Electrical and Electronics Engineers
- Occupational Safety and Health Administration
- National Electrical Manufactures Association
- National Fire Protection Association
- Underwriters Laboratories
- Americans with Disabilities Act

Owner's Project Requirements Version History:

The following is a summary of the changes made to the Owner's Project Requirement document throughout Pre-Design, Design, Construction, and Occupancy and Operations.

Rev. No.	Date	Description
	10/17/2011	Conceptualization
	01/05/2012	Schematic Design

BASIS OF DESIGN - REVIEW

The BOD for this project was developed by the Engineer of Record and may be found in Appendix C.

Groundwork for the BOD started early in the Programming phase comparing various HVAC concepts suitable for this Project.

The CxA, with the assistance of the FM, GC, OR/PM and A/E, discussed the Basis of Design Summary for those building systems selected for commissioning during the Design Phase and documenting commissioning related comments and Engineer responses. While not specifically identifying each Design Review Comment as having come from or on behalf of the BOD, the formal contracted process by the F&S QA reviewers is to evaluate the Design and thus the BOD, for OPR - Scope and University Standards' compliance. Knowing revisions are often not completed in time for the next milestone, the formal review process for this Campus requires multiple reviews for "back-checking" not just one review midway or near the end of Design.

The BOD covered the following areas: Architecture, Site, Structural, Plumbing, Domestic Water, Sanitary, Storm Water, Fire Protection, Utilities, HVAC and Controls, Testing and Balancing, Electrical, Lighting and Lighting Control, Communications, Alarm and Emergency Generator.
Overall, the design was reviewed and comments provided by the F&S Commissioning team and the F&S Engineering group at each milestone SD, 50%CD, 95%CD, Bid Set and Addenda. Responses are required from the AE Design Team for each phase Pre-construction through Bid Set. Comments for Bid Set and any Addenda focus specifically to what was not yet evident or missed by the Design team commensurate of prior reviews.

Center for Wounded Veterans in Higher Education - 50% (Green)	7/22/2013 3:51 PM
Center for Wounded Veterans in Higher Education - 50% (GuyGrant)	6/21/2013 8:55 AM
Center for Wounded Veterans in Higher Education - 50% (Koric)	5/24/2013 3:39 PM
Center for Wounded Veterans in Higher Education - 50% (McClure)	6/6/2013 6:32 PM
Center for Wounded Veterans in Higher Education - 50% (Summers)	6/10/2013 4:01 PM
Center for Wounded Veterans in Higher Education - 50% (Youakim)	6/4/2013 3:51 PM
Center for Wounded Veterans review Comments 50%	6/11/2013 8:57 AM
Center for Wounded Veterans review Comments 50%_additional comments	6/24/2013 11:51 AM
Copy of Center for Wounded Veterans In Higher Ed 50%61713(codecompliance)(C Grant)	6/24/2013 11:41 AM
Copy of Center for Wounded Veterans in Higher Education - 50%(Edmonson)	6/14/2013 4:09 PM
DoR Comments 05-31-2013 v2	6/6/2013 3:39 PM

Center for Wounded Veterans in Higher Education - 95% (Green)	8/20/2013 4:18 PM
Center for Wounded Veterans in Higher Education - 95% (McClure)	8/15/2013 6:00 PM
Center for Wounded Veterans in Higher Education - 95% (SKoric)	9/6/2013 10:43 AM
Center for Wounded Veterans in Higher Education - 95% (Youakim)	8/14/2013 12:03 PM
Center for Wounded Veterans review Comments 95%	8/16/2013 9:09 AM
CWVHE 95% CD AV review comments	8/14/2013 11:49 AM
DoR Comments 08-15-2013 v1	8/15/2013 10:57 AM
U13036 CWVHE - 95% CD PM worksheet	8/9/2013 3:19 PM

101	H 6.4	Add standard UIUC chilled water building control sequence.	
102	H 6.5	Add Mixed temperature sensor / transmitter (AI point) in mixing air chamber.	
103	H 6.5	Add installation detail for Air Flow monitor station and show it on V-sheets and clarify how many straight section of ductwork needs to be provided. This product works well only if installed correctly & calibrated per manufacturers recommendations. Coordinate V- sheets and TC divisions of work.	
104	H 6.5	Add standard UIUC control panel detail.	
105	General Comment	Show control devices in plan view, which should include control panels location, VFD location, DPT (differential pressure transmitter) location, etc.	
106	H 6.6	Are there any occupancy sensors or space CO2 sensors associated with VAV box zone controls? If there are then I.O. points should be shown on detail 5 and detail 6. Demand control ventilation CO2 and occupancy sensors are preferred way of UIUC control scheme, of course depending on space usage.	
107	H 6.6	Detail 5 - Add a control sequence for VAV Box with reheat and parameter heat.	
108	H 6.6	Detail 5 - Add a note to this detail that “Radiation valve and reheat valve shall be provided with a separate signals. They cannot share IO point in terminal air box controller.	
109	H 6.6	Detail 5 - Add a control sequence for VAV Box with reheat.	
	H 6.5	Add a General Note to drawing that:" All relays shall be gold contact."	
	H 6.5	Add a General Note to drawing that:" Optical Isolation (Isoverters) shall be used for all analog input points and analog output points to VFD's or any other controller / analyzer powered from a separate circuit."	

	H 6.5	Add a General Note to drawing that:" All VFD's shall be provided with four hard wired points and Data Connection shall be connected and integrated to primary BAS system by TC contractor."	
Specification Comments			
110	23 09 02-8	Page 8 - 2,2 / 2) Add clarification to title for Modulating low pressure steam valve. It should read Size 2" and larger, Flanged Eccentric Plug valve, and Leakage Class VI.	
111	23 09 93-5	Economizer Control- If OA temperature is less than 52 deg. F, Modulate the mixed air dampers to maintain Mixed Air temperature at 55 deg. F.	

1	C4.0, HS1.0	It may be most appropriate to run trap discharge line from Christopher Hall into Center for Wounded Veterans in order to eliminate condensate pump in vault, maybe condensate pump in vault to south as well. This line could be run in the same conduit as the pumped condensate line between the building and the vault. We will research further.
2	HS2.0	Detail 6: Air vent assembly should be standard corporation cock threaded into ductile iron pipe with male angle ball valve threaded into it. Corporation cock should be in open position. Ball valve should have key operator. Purpose of corporation cock is that it has special threads for ductile on one side and FPT on the other.
3	HS2.1	Detail 5: Steam main bypass detail should not be needed given that steam main in vault is end of main.
4	HS2.2	Detail 1: Increase CHW lines to 4" for durability if not for capacity. We used to run nothing smaller than 6" anywhere.
5	HS2.2	Our Steam Distribution Shop is confirming configuration of piping and valves in vault.
6	H1.1	Will west door at bottom of stairs be used by public? If so it should have a cabinet unit heater. If it is sized generously there will be no need for additional heaters in stairwell on floors above
7	H1.3	If adequate cabinet unit heater is installed on first floor level no additional heat will be needed in the stairwell.

8	H2.0	The U of I Utilities Group has finally decided that the PRV station and relief valve will not be required for this project. It took a long time to get to this decision. Relief valve can be deleted as long as all components within the building steam system are rated for 125 PSIG. Give consideration to humidifier (if any) and domestic water heater (if not adequately rated). Small devices that are not adequately rated will require a dedicated PRV and relief piped into condensate pump receiver vent.
9	H2.0	The CHW lines through the building wall up to and including the valves should be the responsibility of the outdoor contractor. This allows him to test against the valves before the building contractor has completed his work.
10	H6.2, H6.3	Fill connection should be connected to main upstream of air-dirt separator. It can't be connected as a standard air separator given that the automatic vent is essentially integral.
11	H6.2, H7.0	If there will be no PRV indicate such.
12		I haven't checked the sequence but the circ. pump should be on below 40F and off above 40F.
13	H6.6	I haven't checked the sequence but the VAV box and perimeter heat should be brought on together.
14	H9.0	What is an "inverted cabinet" unit heater We prefer that cabinet unit heaters be floor mounted.
15	H9.1	Main Control Valve Schedule: Only shut (isolation) valves should be line size. Control valves should almost always be at least one line size smaller. They should be selected based upon Cv.
16	H9.1	Main Control Valve Schedule: Positioners are not typically required on HVAC valve actuators.
17	H9.1	Main Control Valve Schedule: Our current spec calls for the building CHW return valve to be resilient seated type but either one will work. There are pros and cons.
18	H9.1	Main Control Valve Schedule: Eccentric plug valves are industrial.
19	V	A factory AHU arrangement drawing is still needed. One that provides plan and profile views with all internal components shown to scale and includes all access doors.
20	V	It is often more convenient to use an inline mixed flow return fan in lieu of a standard floor mounted housed centrifugal. Not sure about this project.

BACK CHECK 50% EXAMPLE USING 95% CDS:

Yes each of these has been verified.

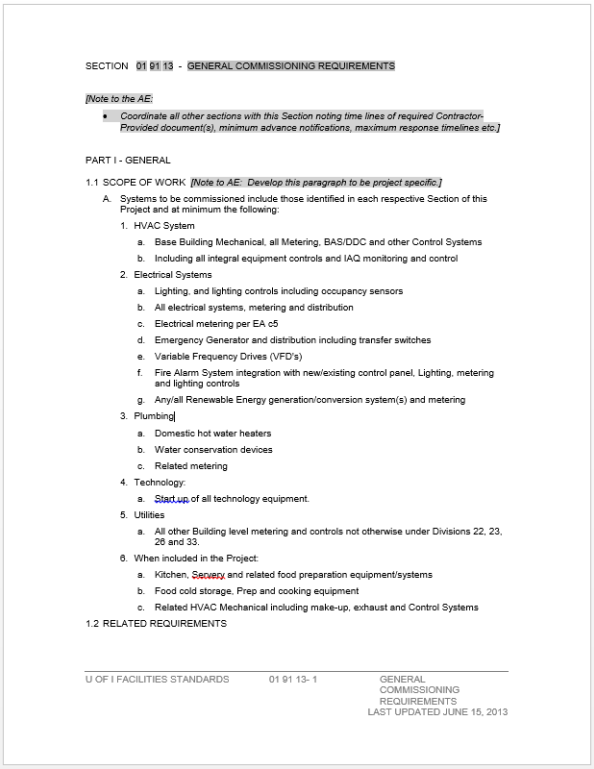
The BOD complied with the University requirements. The Design also integrated VAV terminal boxes. Design Review Comments reminded the Engineer to meet the more stringent .4% occurrence of local design weather data.

Roles, responsibilities, additional detailed requirements and procedures were provided in the project specifications under “General Commissioning Requirements”, section 01 9113. These contract documents describe the process in more detail and also provide general instruction covering Construction Checklists, Test Procedures, forms, and other requirements used to guide the commissioning activities.

The General Commissioning Specification was authored by the CxA. The GC provided quality control and scheduling to the Project with only minor interpretation differences on timing of Documentation to the CxA.

References were also developed for the technical specification sections to integrate the commissioning process with the project technical requirements. The process was perceived adequately integrated with the normal construction process, (pre-functional checks, start-up activities, functional tests etc.).

The following inset illustrates the first pages of 01 9113.



SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

[Note to the AE:

- *Coordinate all other sections with this Section noting time lines of required Contractor-Provided document(s), minimum advance notifications, maximum response timelines etc.]*

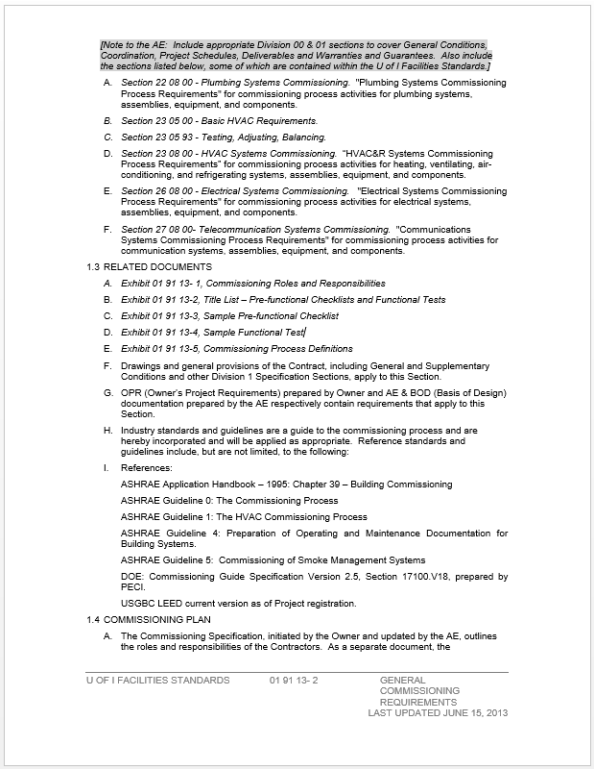
PART I - GENERAL

1.1 SCOPE OF WORK *[Note to AE: Develop this paragraph to be project specific.]*

A. Systems to be commissioned include those identified in each respective Section of this Project and at minimum the following:
   1. HVAC System
      a. Base Building Mechanical, all Metering, BAS/DDC and other Control Systems
      b. Including all integral equipment controls and IAQ monitoring and control
   2. Electrical Systems
      a. Lighting, and lighting controls including occupancy sensors
      b. All electrical systems, metering and distribution
      c. Electrical metering per EA c5
      d. Emergency Generator and distribution including transfer switches
      e. Variable Frequency Drives (VFD's)
      f. Fire Alarm System integration with new/existing control panel, Lighting, metering and lighting controls
      g. Any/all Renewable Energy generation/conversion system(s) and metering
   3. Plumbing
      a. Domestic hot water heaters
      b. Water conservation devices
      c. Related metering
   4. Technology:
      a. Start up of all technology equipment.
   5. Utilities
      a. All other Building level metering and controls not otherwise under Divisions 22, 23, 26 and 33.
   6. When included in the Project:
      a. Kitchen, Servery and related food preparation equipment/systems
      b. Food cold storage, Prep and cooking equipment
      c. Related HVAC Mechanical including make-up, exhaust and Control Systems

1.2 RELATED REQUIREMENTS

U OF I FACILITIES STANDARDS 01 91 13- 1 GENERAL COMMISSIONING REQUIREMENTS LAST UPDATED JUNE 15, 2013



[Note to the AE: Include appropriate Division 00 & 01 sections to cover General Conditions, Coordination, Project Schedules, Deliverables and Warranties and Guarantees. Also include the sections listed below, some of which are contained within the U of I Facilities Standards.]

A. *Section 22 08 00 - Plumbing Systems Commissioning.* "Plumbing Systems Commissioning Process Requirements" for commissioning process activities for plumbing systems, assemblies, equipment, and components.
B. *Section 23 05 00 - Basic HVAC Requirements.*
C. *Section 23 05 93 - Testing, Adjusting, Balancing.*
D. *Section 23 08 00 - HVAC Systems Commissioning.* "HVAC&R Systems Commissioning Process Requirements" for commissioning process activities for heating, ventilating, air-conditioning, and refrigerating systems, assemblies, equipment, and components.
E. *Section 26 08 00 - Electrical Systems Commissioning.* "Electrical Systems Commissioning Process Requirements" for commissioning process activities for electrical systems, assemblies, equipment, and components.
F. *Section 27 08 00- Telecommunication Systems Commissioning.* "Communications Systems Commissioning Process Requirements" for commissioning process activities for communication systems, assemblies, equipment, and components.

1.3 RELATED DOCUMENTS

A. *Exhibit 01 91 13- 1, Commissioning Roles and Responsibilities*
B. *Exhibit 01 91 13-2, Title List – Pre-functional Checklists and Functional Tests*
C. *Exhibit 01 91 13-3, Sample Pre-functional Checklist*
D. *Exhibit 01 91 13-4, Sample Functional Test*
E. *Exhibit 01 91 13-5, Commissioning Process Definitions*
F. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
G. OPR (Owner’s Project Requirements) prepared by Owner and AE & BOD (Basis of Design) documentation prepared by the AE respectively contain requirements that apply to this Section.
H. Industry standards and guidelines are a guide to the commissioning process and are hereby incorporated and will be applied as appropriate. Reference standards and guidelines include, but are not limited, to the following:
I. References:

   ASHRAE Application Handbook – 1995: Chapter 39 – Building Commissioning

   ASHRAE Guideline 0: The Commissioning Process

   ASHRAE Guideline 1: The HVAC Commissioning Process

   ASHRAE Guideline 4: Preparation of Operating and Maintenance Documentation for Building Systems.

   ASHRAE Guideline 5: Commissioning of Smoke Management Systems

   DOE: Commissioning Guide Specification Version 2.5, Section 17100.V18, prepared by PECI.

   USGBC LEED current version as of Project registration.

1.4 COMMISSIONING PLAN

A. The Commissioning Specification, initiated by the Owner and updated by the AE, outlines the roles and responsibilities of the Contractors. As a separate document, the

U OF I FACILITIES STANDARDS 01 91 13- 2 GENERAL COMMISSIONING REQUIREMENTS LAST UPDATED JUNE 15, 2013

INCORPORATING CHANGES DURING DESIGN

Changes were incorporated by the Design Team as recommended by the Owner and the FS Design Review and Commissioning Groups.

Commissioning comments on the Design Phases reside in Appendix K.

COMMISSIONING PLAN – DEVELOPMENT / IMPLEMENTATION

Both the Cx Plan and the general Commissioning Specification explained roles and responsibilities of all associated participants; the CxA scope of work, listing of systems to be inspected and commissioned with expected documentation from the respective participants. The two documents as well as the Equipment Progress Log were also used to track and verify receipt of Contractor deliverables from Submittals, I-O&Ms, Pre-functional Checklists, Startups, Contractor tests, Functional Performance Tests (CxA witnessed sequences and operations filling out the FPTs.) The Project Architect also maintained a Submittal (approval) Log.

The final version of the Project's Cx Plan was authored by the Commissioning Authority (CxA), and supplemented by the aggregate information and updates provided by the A/E, University Project Manager (PM), and Contractors throughout the construction process as deemed appropriate to eventually form this overall Project Commissioning Record culminated at the end of the project. Throughout the commissioning process, the CxA revised the specific commissioning procedures and forms as deemed necessary to suit project field conditions and actual approved manufacturer's equipment, to incorporate test data, procedural results, and scheduling for the commissioning tasks.

GENERAL LIST OF SYSTEMS INSPECTED / COMMISSIONED

1. Utilities: (Electrical, Chill Water, Heating Hot Water, Domestic Water, Communications, Alarm, Interior/Exterior Lighting)
2. Building HVAC Systems: (Heating, DOA Ventilating, Air Conditioning, FCU's)
3. Outdoor Air Economizer serving HVAC Systems
4. Building Automation System (managing, controlling, trending, graphics)

COMMISSIONING SCOPING MEETING

The "Kick off" meeting coordinated through the GC occurred on 01/09/2013. The respective representatives of the GC, CA, PM, A/E and the Mechanical, Electrical, Controls, and TAB subs were in attendance. Each building system to be commissioned was addressed, including commissioning requirements, anticipated start-up schedules and completion. All parties agreed on the scope of work, tasks, schedules, deliverables, and responsibilities and lines of reporting and communication for implementation of the Commissioning Plan during the scoping meeting.
The CxA-finalized Commissioning Plan used the information gathered from the scoping meeting. The initial commissioning schedule was developed along with a detailed timeline by the GC. The timeline was adjusted as construction progressed.

COMMISSIONING SCOPE OF WORK

In accordance with the Universal F&S Agreement to provide Commissioning Services on all major Capital Projects on the Campus for the University (in existence since 1999), the FSQA Inspection and Commissioning Group primarily follows ASHRAE Guide 0 with additional scope commencing with multiple reviews during Design; reviews (all) submittals; inspection of all construction; witnessing/verifying installations, startups, functional sequences and general performance in accordance with the BOD for utilities and MEP as well as specialty items i.e. elevators etc..
Commissioning activities in the Construction Phase proceeded from lower to higher levels of complexity. For each discrete subsystem or system, testing at the lower level was completed prior to starting the next higher level of tests. In general, the order of testing from lowest to highest was as follows:

1. Witness Static "Contractor" tests (such as duct leakage tests)
2. Verify Completion of Construction (MEP) Pre-functional Checklists
3. Witness Start-ups
4. Verify documentation of Control point-to-point checks

5. Verify Balancing Documentation
6. Witness and verify documented Functional Performance Procedures
7. Verify Training
8. Confirm / recommend Acceptance (Substantial Completion)
9. Acknowledge ready for Occupancy (Substantial Completion Concurrence)
10. Verification during construction; this project achieved the following objectives according to the Contract Documents:
    - Ensure that applicable equipment and systems were installed properly and received adequate operational checkout by installing contractors.
    - Verify and document proper functional operational performance of equipment and systems.
    - Ensure that O&M documentation is complete or acknowledged date to be updated with updates.
    - Verify and document that systems and assemblies perform according to the BOD & OPR.
    - Verify that adequate and accurate system and assembly Record Documentation is provided / or acknowledged date to be provided to the owner.
    - Verify that operation and maintenance personnel and occupants are properly trained.
    - Utilize quality-based sampling techniques to detect systemic problems.

SUBMITTALS - CONSTRUCTION PHASE

The general contractor provided the CxA with major equipment hardcopy IO&M submittals for review/approval prior to installation. This equipment documentation typically included typical installation and start-up procedures, performance data and temperature control drawings where relevant. The subcontractors, GC, A/E and the Commissioning Authority discussed RFIs and change orders for potential impact to the OPR and/or operating parameter changes; added control strategies; sequences of operation, that was thought to affect commissioned systems. Commissioning submittal comments are also shown in Appendix L.

Verification of Installation during Construction

Site Observation

The FSQA Commissioning Inspection Group made periodic site visits to witness equipment and system installations, spot checking completed Construction Checklists submitted by the contractors.

The CxA / Lead Inspector / commissioning group attended selected planning and nearly all job-site meetings in order to remain informed on construction progress and to update parties involved in commissioning.

This process started at the beginning of the Construction Phase and continued through the current occupancy and operations (Warranty) period with actual verification of operational sequences and overall performance.

The Center for Veterans in Higher Education is now operating with no known active problems or complaints as of this Report.

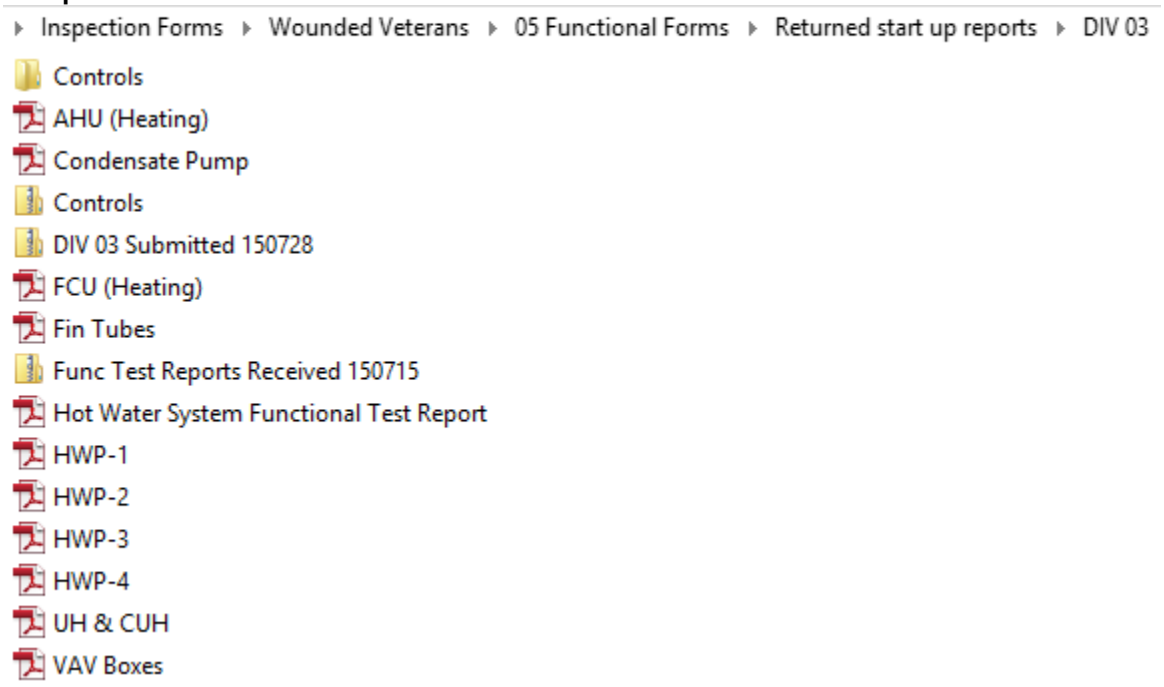
Verification during the construction of this project achieved the following specific objectives according to the Contract Documents:

- That applicable equipment and systems were installed properly and received adequate operational checkout by the installing contractors.
- HVAC, electrical, plumbing and domestic water system each completed Contractor Checklists (Functional Checklist), Manufacturer's startups (as specified) with Mfr. Supervision on VFD drives (as specified), emergency generation, and sequential functional testing with operational BAS graphics have been reviewed by the Cx group
- See Listing of completed Startup Checklists and Functional Test Procedures in Appendix M.
- Overall, minor quality issues relating to finishes, remote electronic (electrical sub-metering) access, calibrations / re-adjustment of approximately 20 Vertical Fan-Coil room units.

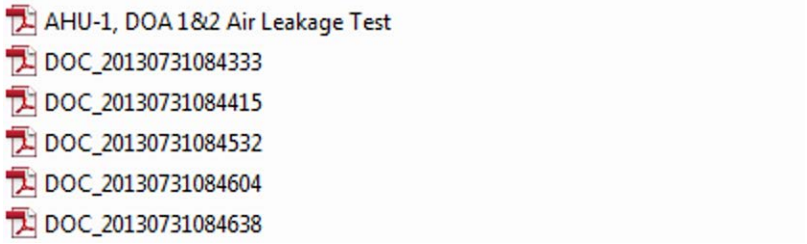
PRE-FUNCTIONAL CHECKLISTS, TESTS AND STARTUP

Construction Checklists (CC) [Pre-Functional Procedures] The CCs are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, many Construction Checklist items entail simple testing of the function of a component, a piece of equipment or system which will be combined with the manufacturer's start-up checklist.
The contractor is required to provide a full checkout for each major piece of MEP equipment. In general, the contractors are to complete CCs for all equipment and systems prior to formal performance testing of equipment or subsystems of the given system.
These checklists were verified by the Commissioning team as having been completed by the installers. Example Contractor Tests and Startup Procedures may be found in Appendix I. The Lead Inspector has verified Startup procedures were properly followed and related documentation has been included within each hardbound O&M Manual.

Completed Checklists:



Examples of Contractor Tests and Start-up Verifications



REQUIREMENTS LEADING TO FUNCTIONAL TESTING

The following sequential priorities were followed that would also not conflict with LEED goals:

- Equipment is not (and was not) "temporarily" started (for heating or cooling), until installation checklist items and all manufacturers' pre-start procedures are (were) completed. Additionally moisture, dust and other environmental and building integrity issues have been fully addressed / controlled.
- System verification testing was not begun until Construction Checklists (Pre-Functional Checklists) and approved plans for Start-up and initial TAB and subsequent Startup(s) were accepted by the CxA for the HVAC system.
- The controls system and equipment it controls were not functionally tested until all points had been calibrated and Construction Checklists were completed. (Note that the TC Contractor later re-verified the VAV Terminal Boxes using their automated VAV "Commissioning Tool" Software.). Minor questions pending resolution did not prevent system checkout and commissioning from proceeding.
- Equipment operation was not allowed until the envelope was completely enclosed and ceilings were complete, and the IAQ Plan was fully met.
- TAB was not performed until the controls system had been started, calibrated, sufficiently functionally tested, and approved by the A/E.

FUNCTIONAL TEST PROCEDURES (DEVELOPED by CxA)

Overview

Functional testing is the dynamic testing of components and systems (rather than just components) ideally under full operation. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through the control system's sequences of operation and components are verified to be responding as the sequences state. The CxA develops Test Procedures in a sequentially written format for Contractor testing and documenting of the actual performance witnessed by the CxA.

Functional testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA will follow the specifications and use judgment where needed to determine which method is most appropriate. According to the specifications, not all pieces of identical equipment necessarily receive in-depth testing.

PREREQUISITES FOR FUNCTIONAL PERFORMANCE TESTING

The following as-applicable prerequisite checklist items are required to be listed on respective associated test form(s) and be completed prior to being checked off by the Commissioning Authority (CxA) prior to functional testing.

Checklist for GC/CxA prior to Functional Testing

Post Startup Pre-Requisites for Functional Performance Testing	CM Verified	CxA Verified
All related equipment has been started up and start-up reports have been submitted and approved by the A/E and Construction Checklists have completed by contractor.	☒	☒
All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set-points and schedules with debugging, loop tuning and sensor calibrations completed.	☒	☒
Piping system flushing complete and required report approved.	☒	☒
Water treatment system complete and operational.	☒	☒
Test and balance (TAB) complete and approved for the Hydronic and air systems.	☒	☒
All A/E punch-list items for this equipment corrected or at least confirmed for resolve.	☒	☒
Safeties and operating ranges reviewed by Operations.	☒	☒
Test requirements and sequences of operation included.	☒	☒
Sufficient clearance around equipment for servicing.	☒	☒
Record of all values for pre-test set-points changed to accommodate testing has been made and a check box provided to verify return to original values (control parameters, limits, delays, lockouts, schedules, etc.).	☒	☒
Other miscellaneous checks of the CC checklist and start-up reports completed successfully.	☒	☒

EXECUTION OF FUNCTIONAL TESTING PROCEDURES

Overview and Process

For any given system, prior to performing functional testing, the CxA will wait until the respective CC has been submitted with the necessary signatures, confirming that the system is ready for functional testing.

Each Contractor shall conduct a thorough and systematic performance test of each individual element, subsystem, and total system, in the presence of the Architect/Engineer and Owner. Test(s) shall demonstrate that all systems and components operate, in all reasonable respects and comply with the requirements of the contract documents. Notably test all control, alarm, and specialty systems integral to or necessary for the proper functioning of the building.

- The control system is tested before it is used to verify performance of other components or systems.

- The air balancing and water balancing is completed and systems “debugged” before functional testing of air-related or water-related equipment or systems.
- Testing commences from components to subsystems to systems and finally to interlocks and connections between systems.

The contractor performs the testing and the CxA oversees and witnesses the functional testing of all equipment and systems according to the OPR and the Specifications. The CxA ensures the FT is documented. This Project required the Contractors to make ready for witnessing by pretesting, documenting their FT procedures and handing them to the CxA for review before agreeing to schedule the final witness testing.

The completed Functional Test Procedures reside in Appendix I.

Change orders for this Project have not hampered or substantially altered the intent of the Project or the Commissioning process.

The University Facilities and Services Inspectors were involved throughout the construction Process observing installation, Contractor (pressure) tests, startups, and witnessing of operational / Functional testing.

The Controls Contractor submitted their point to point checkout / verification sheets and their graphic based control logic sheets. The CxA has requested additional Controls Contractor verification proving calibration has been completed for all devices. This was provided by the CC.

The TAB reports were submitted. The Air Report was submitted 08/10/15 and the Water Report was submitted 08/06/15. Final TAB Reports were provided with Final O&M Manuals.

Verify and document proper functional operational performance of equipment and systems.

- Sensors were calibrated and Offsets were incorporated to stabilize operation / humidity conditions. Appendix O illustrates calibrations and graphics verifications.
- The major Utilities metering were calibrated by F&S IT Building Automation Service Group Engineers.
- The FS QA Cx team witnessed the Temperature Control Contractor point-to-point checkouts and some calibrations (adjustments when appropriate for re-calibrations).
- Lighting and Lighting-Control were verified to be properly operating and witnessed by the CxA.
- Other “Non-LEED” systems such as Elevators, architecture structure, windows, doors, hardware, meeting rooms, other mechanical / electrical services (emergency generator & ATS) function properly.

O&M MANUAL REQUIREMENTS

The requirements for the Manuals were incorporated into the project specifications as noted earlier.

As of this Report, the Lead Inspector verifies the Owner has received acceptable O&M Manuals. Refer to Appendix Q for Table of Contents.

SYSTEM COMMISSIONING SUMMARY

With respect to their Division of responsibility, each Contractor was required to conduct and record a functional test of each individual (major) element, subsystem, and total system, then repeat the same procedure matching this data in the presence of the Architect/Engineer, CxA and Owner (at the Owner’s option to attend).

Completed Testing demonstrated respective systems and components operated in all reasonable respects and comply with the intent of the contract documents.
Testing (including control, alarm, and specialty systems) integral to or necessary for the proper functioning of the building, included but was not limited to:

- All Electrical Systems including lighting; (Note that Electrical Systems involved testing early on and are associated with the Pre-Functional Phase or Contractor Testing.)
- Building Automation Systems Control
- HVAC, including economizer, and AHU-01.
- Plumbing & Domestic Water
- *(Non-LEED Testing performed by F&S QA)*

  Fire Alarm System
  Elevators (Also State approval)
  Subgrade utilities (pressure tests)
  Building Architecture, in-wall and above ceiling inspections, pipe and duct pressure tests.

Refer to Appendix M for a List of completed major mechanical and electrical FT Procedures.
In accordance with the Specifications, the CxA would require the Contractor to correct or adjust deficiencies in operation noted during testing and required resolution prior any retest.
Commissioning related deficiencies primarily occurred with temperature control (a few “cold” rooms and a couple rooms were cross-labeled.

The following additional concerns were resolved or in the process of being resolved by the Engineer, Contractors and Manufacturers.

- The BAS DDC Inspecting Supervisor verified sampling was performed in accordance with Specifications.

- AHU-1 had an issue with the outdoor air damper being installed as a two position damper, instead of a modulating damper. This has been replaced.

Verify and document that systems and assemblies perform according to the OPR.

To summarize, all systems control as per the Specifications, operate and function in accordance with the Project’s scope and requirements. We continue to notice on recent and current projects: the actual Building operating schedule is longer than that modeled and that Setbacks have not been finalized. Otherwise:

- Lighting and related control function as designed.
- The air conditioning has been functioning.
- Ventilation has been monitored along with utilities being used.
- Heating (re-heating) has been functioning since early Summer.
- Deferred testing of the seasonal heating mode will be conducted in November 2015. Testing of AHU-01 to verify sequences are optimized utilizing economizer appropriately and maintaining set points within accepted tolerances.

Verify that adequate and accurate system and assembly documentation is provided to the owner. See also Verification of Installation & performance of Systems Checklist.

- We have received electronic (PDF) Draft set of O&M Manuals which include one-line diagrams and the Pre-Functional and Functional Forms for the Project.
- As-Builts were periodically reviewed during the Construction Phase. The Architect has received the final As-Built drawings to complete the Project Record Drawings.
- The Architect is under contract to provide Record Drawings as their final obligation.

Utilize quality-based sampling techniques to detect systemic problems.

The BAS DDC Inspecting Supervisor verifies sampling was performed in accordance with Specifications.

Periodic monitoring using the BAS Graphics in addition to onsite inspections were used to identify potential issues.

All issues and requested changes have been addressed. Those that have not either been corrected or scheduled for resolution will remain on the Punch List until resolved or accepted by the Owner as is.

TRAINING REQUIREMENTS

Verify that operation and maintenance personnel and occupants are properly trained.
Training requirements were established during the Design Phase and were incorporated into the project specifications for each system that required training. In cooperation with the other Contractors and the Architect/Engineer, the Contractor Responsible for the equipment/system provided formal training in operation and maintenance as it related to the building, including each separate element, controls and interfaces. O&M manuals were to serve as the basis for Owner training. Contractors maintained formal record of dates, names of attendees, duration of each training session, and materials covered. Owner's Representative and Architect/Engineer were expected to sign the Record. The Architect/Engineer provided discussion of design concepts.
See also the Verification of installation & performance of Systems Cx Checklists.
The Lead Inspector verifies Sign-in Sheets have been received and will be included with the O&M Manuals.

- Training / attendance verifications have been provided.
- The Lead Inspector verifies all training has been scheduled and/or provided – attendance documented and accordingly included with the O&M Manuals. Refer to Appendix P for example.

COMMISSIONING ISSUES LOG

The Issues Log may also be known as deficiency or non-conformance reports. Note that as Issues are resolved the subsequent published Log may only include outstanding items. During this project we noted numerous issues that needed to be addressed during commissioning of the MEP systems. We are down to zero open items as of the writing of this report.

Commissioning Issues are submitted as soon as they are discovered during the Construction and Occupancy and Operations Phases and logged in the University's online to tracking system "PRZM". All PRZM open issues must be satisfied by the Contractor in order to be closed by the PM for Contractors to be paid.

The Issues Log then summarizes the issues and provides issue status at-a-glance for those outstanding items. Refer to Appendix N for example and current status.

RESOLVING COMMISSIONING ISSUES AND RETESTING

The Inspectors and CxA recorded deficiencies identified during the verification testing on an issues list and reported to the owner. The deficiency report includes some detail of the components or systems found to be non-compliant with the parameters of the test plans.
Corrections of minor deficiencies identified may be made during the test(s) at the discretion of the CxA with the concurrence of the owner. In such cases the deficiency and resolution will be documented accordingly. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.
For identified deficiencies:

If there is no dispute on the deficiency and the responsibility to correct it:

The contractor corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CxA reschedules the test and the test is repeated.

If there is a dispute about a deficiency or who is responsible:

The deficiency is documented on the issues form and a copy given to the GC/OR. Resolutions are made at the lowest management level possible. Final interpretive authority is with the GC/OR and the A/E. The CxA documents the resolution process.

Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

An Issues Log has been compiled between the GC and the Lead Inspector. It was summarized and was continually updated. Completed issues may either "roll off" or hidden such as row hiding in an Excel spreadsheet. Refer to Appendix N for an excerpt of the Issues Log.

DEFERRED TESTING

Unforeseen / Deferred Tests: If any test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon approval of the owner. These tests are conducted in the same manner as the seasonal tests as soon as possible.
Seasonal Testing: Seasonal variation in operations or control strategies may require additional testing during the opposite season to verify performance of the HVAC system and controls. During the warranty period, seasonal testing and other deferred testing is completed as required to fully test all sequences of operation. F&S QA and the Owner coordinate these activities. Tests are executed and documented, with deficiencies corrected by the appropriate contractors. Any final adjustments to the O&M manuals and as-builts due to the testing are subsequently completed as the case may be by the Contractor or later by the Owner.
Construction contracts require participation of the Contractors throughout the Warranty period as discoveries arise. In this case occupancy did not occur until August-September. Accordingly, Contractors will still be expected to participate / resolve any latent deficiencies.

FINAL ACCEPTANCE

Architect/Engineer make the final inspection with the General Contractor to ensure completion of all contract requirements. The Lead inspector and CxA verifies that any outstanding items are complete, before the contractors can receive their final payments.

FINAL COMMISSIONING REPORT (update of this Cx Report)

After completion of all commissioning activities, the Commissioning Authority will update this report becoming the Final Report documenting the overall results of the commissioning process.
The CxA recommends acceptance of the completed commissioning process and related documentation as provided to the owner.
See Appendix O showing example graphics confirming stable operation.

CONTINUAL VERIFICATION DURING WARRANTY PHASE

Verification during and post construction of this project is intended to achieve the following specific objectives according to the Contract Documents:

- Ensure that applicable equipment and systems are installed properly and receive adequate operational checkout by installing contractors.
- Verify and document proper performance of equipment and systems.
- Ensure that O&M documentation is complete.
- Verify and document that systems and assemblies perform according to the OPR.
- Verify that adequate and accurate system and assembly documentation is provided to the owner.
- Verify that operation and maintenance personnel and occupants are properly trained.
- Utilize quality-based sampling techniques to detect systemic problems.
- Verify proper coordination among systems and assemblies.

The CxA verifies the above objectives have been achieved and where applicable additional

documentation has been provided.

WARRANTY PERIOD & 10 MONTH REVIEW

During the warranty period, seasonal testing and other deferred Contractor testing required are to be completed according to the specifications. Tests are executed and deficiencies corrected by the appropriate subs and witnessed by the CxA group. Any final adjustments to the O&M manuals and as-builts due to the testing are made at that time by the contractors. In accordance with the University standard F&S Services agreement, approximately 10 months into the warranty period, a one day review session is to be held on site to review systems operation with O&M staff prior to expiration of the warranty. Appendix R in the Manual, 10th Month Warranty Review Walkthrough (scheduled for 6/20/16) is designated to include the results of this session.

LESSONS LEARNED REVIEW

After completion of all commissioning activities and before the end of the warranty period, a 'lessons' learned review is to be held on site with the Commissioning Team in attendance. The purpose of the review session is to obtain honest, objective, and constructive feedback on the effectiveness of the commissioning process used and changes that will improve the delivered project.
The outcome is summarized, acknowledging

- The TC and TAB contractors are improving their documentation via following the specifications.
- Documentation outside of traditional O&M Manuals designated for a Systems Manual continue to be sporadic.
- We still have issues with the contractors saying they are ready for commissioning. We get to the project and have to reschedule the commissioning, because of items not being completely ready for us.

CONTACT INFORMATION

Refer to Appendix E – Contacts for Construction Team.
Refer to Appendix F – Contacts for Design Team.
Refer to Appendix G – Contacts for the Project Team.
Refer to Appendix H – Contacts for the Commissioning Team.

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APPENDIX A – COMMISSIONING PROJECTED SCHEDULE

	Start
Bid and Award	Dec/2013
Submittals	Feb/2014
Commissioning Kick-off Meeting	Jan/2014
Construction	Jan/2014
Startups	April/2015
TAB	Aug/2015
IAQ Test or Flush-out (Requires stable Trends)	Aug/2015
Functional Test Forms Distributed	Feb/2015
Inspections through Final Witness Functional Performance Testing	July/2015 – Aug/2015
Substantial Completion	Aug/2015
Warranty Phase (base 1 calendar year)	Aug/2015 - Aug/2016
10 Month Walkthrough	June/2016

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APPENDIX B – OWNER'S PROJECT REQUIREMENTS

Program Statement for
Owner's Project Requirements

For

Project Number: U11098
Project Name: Center for Veterans in Higher Education

Date: January 2012

Prepared By: Ted Christy, Planner
F&S Planning Division
University of Illinois at Urbana Champaign

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V. **Project Schedule**

VI. **Financial Analysis**
- A. Funding Commitments
- B. Budget Summary

VII. **Utilities**
- A. Utility Program Statement (UPS)
- B. Telecommunication Program Statement (TUPS)
- C. AV Program Statement (AVPS)

VIII. **Site Criteria**
- A. IDNR requirements
- B. Site Selection
  1. Architectural Review Committee
  2. Construction Staging
- C. Site Layout
  1. Physical characteristics
     a) Soils investigation
     b) Visual survey and investigation
     c) Hazardous Materials Assessment
     d) Surface contours
     e) Property Description
     f) Utilities Survey
     g) Easements / Right-of-ways
     h) Storm Water
  2. Orientation/views/prevailing conditions
  3. Site functions and relationships
     a) Circulation of vehicles, pedestrians, and service needs
     b) Public Transportation
     c) Parking
     d) Accessibility

IX. **Project Requirements**

X. **Appendix**
- A. PSC Approval
- B. Project Approval/PDS
- C. Budget Increase
- D. Campus Approval – CCRC Meeting Minutes
- E. LEED 2009 for New Construction and Major Renovations scorecard – See Conceptualization Phase Submittal
- F. Schedule
- G. Environmental Checklist
- H. Asbestos Management Program
- I. Utility Program Statement (UPS)
- J. Telecommunication Program Statement (TUPS)

K. Audio Visual Program Statement (AVPS)
L. IDNR correspondence
M. Site Plan / Floor Plan – See Conceptualization Phase Submittal
N. Project Directory
O. Conceptualization Phase Submittal
P. Conceptualization Phase Meeting Notes
Q. Site Selection Report (on file)

This Program Statement was prepared using all available information as of the above date and approved by:

1/12/12

Engineering Services (initial), Date — Associate Director of Planning (initial), Date

TLC 1/6/12 — 1/12/12

Director of Planning, Facilities & Services, Date

2/2/12

Dean of Applied Health Sciences, Date

30 Jan 12

Director of Construction, Facilities & Services, Date

2/3/12

Executive Director of Facilities & Services, Date

APPENDIX C – BASIS OF DESIGN

ILLINOIS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

CENTER FOR VETERANS IN HIGHER EDUCATION

CONCEPTUALIZATION PHASE SUBMITTAL

PROJECT NO. U11098

LCM ARCHITECTS

LCM ARCHITECTS | 819 SOUTH WABASH AVENUE | CHICAGO, ILLINOIS 60605

DECEMBER 16, 2011

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APPENDIX D – PRE-FUNCTIONAL CHECKLISTS & FUNCTIONAL TEST PROCEDURES

Construction Phase Start-Up Sheets & Functional Test Forms

Inspection Forms ▸ Wounded Veterans ▸ 05 Functional Forms

- 05A FT-SEQ of OP attchmnts
- glycol makeup package- help
- Not used in this project
- project drawings pdf
- Returned start up reports
- T&B Reports
- _CWV_Fan Coil Units Functional Performance Test
- _CWV_Radiator Functional Performance Test
- _CWV_Unit Heaters_Cabinet Unit Heaters Functional Test
- _CWV_VAV BOXES (Air Terminal units)
- BINDER Table of Contents - Functional Form list
- COVER SHEET BINDER 1494 Cntr Wounded Vets
- FT1_CWV_Fan Coil Units Functional Performance Test
- FT2_CWV_Radiator Functional Performance Test
- FT3_ATS Functional Test - Checklist
- FT3_ATS Functional Test - Checklist
- FT4_Condensate Return Station & Pump FT_
- FT4_Condensate Return Station & Pump FT_
- FT5_Electrical Panels_PC & FT
- FT5_Electrical Panels_PC & FT
- FT6_LOW VOLTAGE DRY TRANSFORMER-Checklist
- FT6_LOW VOLTAGE DRY TRANSFORMER-Checklist
- FT7_ELECTRICAL UNIT SUBSTATION-Checklist
- FT7_ELECTRICAL UNIT SUBSTATION-Checklist
- FT8_Exhaust_fan_EF-1_test_procedure_
- FT8_Exhaust_fan_EF-1_test_procedure_
- FT8_Exhaust_fan_EF-2_test_procedure_with SEQ attachment
- FT8_Exhaust_fan_EF-2_test_procedure_with SEQ attachment
- FT8_Exhaust_fan_EF-3_test_procedure_
- FT8_Exhaust_fan_EF-3_test_procedure_
- FT9_CWV_AHUs (requires attachments)
- FT9_CWV_AHUs (requires attachments)
- FT10_CWV_Unit Heaters_Cabinet Unit Heaters Functional Test
- FT11_Hot Water System - HEATING
- FT11_Hot Water System - HEATING
- FT12_Hot Water System - DOMESTIC
- FT12_Hot Water System - DOMESTIC
- FT13_CWV_VAV BOXES (Air Terminal units)
- FT14_VFD Functional Test_
- FT14_VFD Functional Test_
- FT15_Sump Pump (for each)
- FT15_Sump Pump (for each)
- FT16_UTILITY METERING
- FT16_UTILITY METERING
- U-0369-01_P_en_macro

Center for Veterans in Higher Education

APPENDIX E – CONSTRUCTION TEAM

Contractor Information Logs By Division

Center for Wounded Veterans in Higher Education - Construction
(#U13036)

Division of Work	Contractor	Phone	Fax	Status
Division 01 - General Work	Broeren Russo Construction Inc.	(217) 352-4232	(217) 352-0307	Completed
Division 02 - Plumbing Work	A & R Mechanical Contractors	(217) 367-4227	(217) 367-4164	Completed
Division 03 - Heating, Piping, Refrigeration, and Temperature Control Work	A & R Mechanical Contractors	(217) 367-4227	(217) 367-4164	Completed
Division 04 - Ventilation and Air Distribution Work	A & R Mechanical Contractors	(217) 367-4227	(217) 367-4164	Completed
Division 05 - Electrical Work	Commercial Electric, Inc.	(217) 235-0616	(217) 235-0141	Completed
Division 06 - Sprinkler Work	Superior Fire Protection	(217) 877-5336	(217) 877-0372	Completed

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APPENDIX F – DESIGN TEAM

CENTER FOR VETERANS IN HIGHER EDUCATION U11098

PROJECT TEAM

REVISED 01/05/12

Name	Title/Role	Office	Address	Phone Number	E-mail Address
Ted Christy	Architect/Project Planner	115C Physical Plant Service Building	1501 S. Oak St. MC-800	265.6515	tchristy@illinois.edu
Margaret Myers	Project Assistant	155 Physical Plant Service Building	1501 S. Oak St. MC-800	244.5544	mjmyrs@illinois.edu
Joyce Koeberlein	Project Assistant	155 Physical Plant Service Building	1501 S. Oak St. MC-800	244.0340	joyce2@illinois.edu
Bill Goodman	Assistant Dean for Administration & Technology	108 Huff Hall	1206 S. Fourth St. MC-586	333.2131	wggoodma@illinois.edu
Fred Hahn	Associate Director of Engineering Services	130 Physical Plant Service Building	1501 S. Oak St. MC-800	244.8989	fjhahn@illinois.edu
Craig Grant	Associate Director of Campus Code Com&Fire	115L Physical Plant Service Building	1501 S. Oak St. MC-800	244.7215	cpgrant@illinois.edu
Mario Marruffo	Capital Construction Project Manager	115T Physical Plant Service Building	1501 S. Oak St. MC-800	333.8212	marruffo@illinois.edu
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John Catlin	LCM Architects Partner		819 S. Wabash Ave, Suite 509 Chicago, IL 60605	312.913.1717 ext 230	jcatlin@lcmarchitects.com
Armando Tobias	LCM Architects Senior Project Manager		819 S. Wabash Ave, Suite 509 Chicago, IL 60605	312.913.1717 ext 240	atobias@lcmarchitects.com
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Gene Mojekwu	Matrix Engineering Corp. Structural Engineer		33 W. Jackson Blvd. 4th Floor Chicago, IL 60604	312.427.1200	
David Guth	Affiliated Engineers, Ltd. Project Engineer		300 S. Wacker Drive, Suite 510 Chicago, IL 60606	312.212.6400	
Eric Haglund	Affiliated Engineers, Ltd. Mechanical Engineer		300 S. Wacker Drive, Suite 510 Chicago, IL 60606	312.212.6400	
Jonathan Kulpit	Primera Engineers Plumbing & Fire Protection Engineer		100 S. Wacker Drive, Suite 700 Chicago, IL 60606	312.606.0910	
Ted Wolf	Wolff Landscape Architects, Inc. Landscape Architect		307 N. Michigan Ave. Suite 601 Chicago, Illinois 60601	312.663.5494	
Robert Svoboda	Construction Cost Systems, Inc. Architectural/Structural Cost Estimator		1815 S. Meyers Road Suite 200 Oakbrook Terrace, IL 60181	800.443.8607	
Jim McGlynn	Engineering PLUS Project Manager		9018 Heritage Parkway Suite 1000 Woodridge, IL 60517	630.786.4200	
Charlie Saville	Sieben Energy Associates, LLC. Sustainability, LEED Consultant		333 N. Michigan Ave Suite 2100 Chicago, IL 60601	312.899.1000	

APPENDIX G – PROJECT TEAM

Team Members

Center for Wounded Veterans in Higher Education - Construction
(#U13036)

Name	Title	Office	Phone	Email
Alaina Davis	University Staff	University of Illinois at Urbana-Champaign	(217) 244-5486	adavis3@illinois.edu
Amy Bergman	Contract Administrator	Broeren Russo Construction Inc.	(217) 352-4232	abergman@broeren-russo.com
Armando Tobias	Architect	LCM Architects	(312) 913-1717	atobias@lcmarchitects.com
Brent Moore	NA	Broeren Russo Construction Inc.	(217) 352-4232	bmoore@broeren-russo.com
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Cindy Pruitt	Administrative Aide	University of Illinois at Urbana-Champaign	217-333-0340	cpruitt@illinois.edu
Daren Funk	Accounting Associate	University of Illinois at Urbana-Champaign	(217) 333-0340	dfunk@illinois.edu
David Guth	Project Manager	AEI	(217) 363-3894	dguth@aeieng.com
Dominic Ruholl	Contractor	Commercial Electric, Inc.	(217) 235-0616	dominic@cei1969.com
Donna Luedke	Senior Project Coordinator	AEI	(217) 363-3894	dluedke@aeieng.com
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Grant Nohren	Project Financial Reporting Coordinator	University of Illinois at Urbana-Champaign	(217) 244-1145	nohren@uillinois.edu
Heidi VanWinkle	Contracts Administrator	A & R Mechanical Contractors	(217) 367-4227	hvanwinkle@ar-mech.com
Helen Coleman	Director, Construction Management	University of Illinois at Urbana-Champaign	(217) 244-8817	hjcolema@illinois.edu
Hilda Garcia	Accountant	University of Illinois at Urbana-Champaign	(217) 244-9752	hgarcia@illinois.edu
Jeff Thompson	Senior Project Manager	Matrix Engineering Corporation	(312) 427-1200	jeff@matrixchicago.com
Jonathan Jakobsson	Construction Superintendent / Lead Inspector	University of Illinois at Urbana-Champaign	(217)265-6849	jakobssn@illinois.edu
Judi Deal	Bookkeeper	Superior Fire Protection	(217) 877-5336	judi@superiorfire.biz
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CENTER FOR VETERANS IN HIGHER EDUCATION

APPENDIX H - FACILITIES & SERVICES COMMISSIONING & INSPECTION GROUP

Name	Title	Phone	Email
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Jonathan Jakobsson	Lead Inspector/Construction Superintendent	(217) 265-6849	jakobssn@illinois.edu
Randy Bachert	Mechanical Construction Superintendent	(217)714-9489	rlbacher@illinois.edu
Al Halberstadt	Electrical Construction Superintendent	(217) 244-6183	hlbrstdt@illinois.edu
Randy Grace	Mechanical Construction Superintendent	(217) 244-5079	rgrace@illinois.edu
Fred Hahn	Associate Director	(217) 244-8989	fjhahn@illinois.edu
Dave Lancaster	Electrical Construction Superintendent	(217) 300-2347	dlancast@illinois.edu
Bryan Elliott	Mechanical construction Superintendent	(217) 300-0028	belliot1@illinois.edu
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APPENDIX I – PRE-FUNCTIONAL CHECKLISTS & FUNCTIONAL TEST PROCEDURE

AHU-01 example:

YASKAWA

HVAC Startup Report

HVAC.1000

Please obtain a Purchase Order Number from the Customer when they contract you to perform warranty startup on Yaskawa drives. Fax to (847) 887-7771 or e-mail to startup@yaskawa.com
This form must be completed in FULL by the certified startup technician for a one year warranty extension.
ATTN: Technical Support Help Desk

Start-up provided by:	Jason Lang		Customer Name:	Wesco	
Start-up Technician:	John R Willis Inc		Customer's PO #:		
Job Site Name:	Wounded Vet		Contact Person's Name:		
Address:	University of Illinois		Contact's Company Name:		
City:	Urbana-Champaign		Contact's Phone #:		
State:	IL	Zip Code:	Contact's E-mail address:		
Drive Series:	Z1000		Customer's Tag # (ex: AHU 1, etc..)	AHU-1 RF	
Drive Model #:	CIMR-ZU4A0021FAA		Cabinet / Bypass Model #:	ZUICVB021FRST	
Drive Serial #:	1W14Z5754640011		Cabinet / Bypass Serial #:	4W1515744140001	

Motor Manufacturer:	Marathon	Motor Model # :	215TTDC6026
Motor Horsepower:	10	Motor Voltage:	460
Motor Amperage:	12.8	Motor Insulation Class:	F

Line side option present (reactor, RFI filter, etc):	input reactor
Load side option present (reactor, dV/dT filter, etc):	none

Drive input line voltage (VAC):	L1 to L2:	480	L2 to L3:	479	L3 to L1:	480
Drive input line voltage (VAC):	L1 to Gnd:	277	L2 to Gnd:	277	L3 to Gnd:	277
Drive output line voltage (VAC):	T1 to T2:	506	T2 to T3:	508	T3 to T1:	506
Drive input current	L1	8.3	L2	8.8	L3	8.6
Drive output current	T1	10.64	T2	10.65	T3	10.65

What is the drive's Software Number in monitor U1-25?:	1018
Serial Communication Method used (Apogee, Metasys, BACnet, etc):	**BACNET**
Describe the type of application (Cooling Tower, Fan, Pump, Extruder, etc):	**Fan**

TRAVEL & WORK TIME

Date	Travel Hours	Work Hours
6/1/2015		

Field notes:

Status of this drive startup: ( ) Partially Completed (X) Fully Completed

HVAC.1000.HVAC Startup Report 3-21-2013 Rev 2

Project: Center for Wounded Veterans in Higher Education; U13036

Attach this Section to the AHU Functional Test Procedure

Table of Contents: Sequences of Operation

3.13 AIR HANDLING UNIT (AHU-1) - CONTROL SEQUENCE

A. General:

1. System is designed as pre-heating and cooling, single duct, variable volume reheat system.

[select] Pass
[revision note]

2. System is designed for minimum and maximum outside air with an economizer control and CO2 overrides.

[select] Pass
[revision note]

3. System fans consist of package air handling unit supply fan and associated return fan provided separately and external from the unit.

[select] Pass
[revision note]

B. Unit Operating Mode:

1. System shall operate with 3 operating modes; full occupied cycle, partial occupied cycle, and unoccupied cycle. These operating modes are described as follows:
   a. Full Occupied Mode: This is the period of time during a typical weekday when all levels of the building will be occupied by students, staff, residents, etc. Schedule for full occupied mode shall be provided by Owner for programming into BAS system.

[select] Pass
[revision note]

   b. Partial Occupied Mode: This is the period of time outside of typical full occupied operation when the building is closed for business, but there are still individuals occupying the residential levels of the building. (i.e. nights, weekends, etc.)

[select] Pass
[revision note]

   c. Unoccupied Mode: This is the period of time in which the entire building, including resident rooms, are completely empty (i.e. possibly Winter Break, Thanksgiving Break, etc.). This mode shall be indexed manually and shall not be incorporated into an automatic building schedule, due to typical occupancy of the resident rooms.

[select] Pass
[revision note]

2. In addition to the normal operating modes, system shall be provided with an emergency smoke control operating mode.

[select] Pass
[revision note]

3. Building automation system will program time initiated, functions and other items as specified.

[select] Pass
[revision note]

4. Control Contractor shall provide all necessary devices such as relays required for interface.

[select] Pass
[revision note]

C. Unit Operation:

1. Unit operation shall be automatic and activated through building automation system.

[select] Pass
[revision note]

D. Interlocking:

1. Return fan shall be interlocked with supply fan so that return fan operates whenever supply fan operates. Return fan shall start before supply fan is allowed to start.

[select] Pass
[revision note]

2. Interlock exhaust fans with associated air handling unit supply fan as indicated in exhaust fan schedules.

[select] Pass
[revision note]

3. Interlocked exhaust fan(s) shall operate when unit supply fan operates during partial occupied and fully occupied cycle.

[select] Pass
[revision note]

4. Interlock automatic dampers on fan discharge with supply fans SF-1 and SF-2 respectively so that damper opens fully before associated supply fan starts and closes after associated supply fan stops.

[select] Pass
[revision note]

E. Full Occupied, Partial Occupied, and Unoccupied Operation:

1. During full occupied cycle, unit supply fan shall run continuously with outside air damper in occupied minimum position, unless commanded otherwise by mode different mode of operation specified herein. See AHU schedule for associated minimum OA value.
2. During partial occupied cycle, unit supply fan shall run continuously with outside air damper in minimum partial occupied position. During this partial occupied cycle, the basement, first, and second floors shall operate in the following manner: Air terminals located on basement, first, and second floors will operate to maintain unoccupied setpoints and will be allowed to fully close (0% open). Third floor (residence area) air terminals shall operate in the typical occupied manner. See AHU schedule for associated minimum OA value.
3. During unoccupied cycle, unit supply fan(s) shall stop with outside air damper and relief air damper fully closed. During unoccupied cycle, unit supply fan shall operate intermittently as required by night thermostats located on each level in Student Lounge [1001], Career Service [2004], and RA Suite 2 [3002] with 100% recirculated air.
4. Whenever unit supply fan stops or during unoccupied cycle operation, outside air damper and relief air damper shall close.
5. During unoccupied cycle, all VAV regulators shall be at minimum position scheduled.

[select] Pass
[revision note]

6. During unoccupied cycle, space thermostats shall maintain lower unoccupied cycle set point.

[select] Pass
[revision note]

F. System Air Volume Control:

1. System volume control will be accomplished by variable frequency drive(s).

[select] Pass
[revision note]

2. Arrange controls so that fans will start always on low speed. On failure of fan volume control signal, fans shall go to low speed and stop.

[select] Pass
[revision note]

3. Provide appropriate electrical signal input to speed control devices and necessary devices such as transducer.

[select] Pass
[revision note]

4. Static pressure controller with its static pressure sensing station in supply duct shall modulate supply fan volume control device(s) to maintain set static pressure of **1.25** inches WG (FA). If air systems TAB contractor determines a different value is necessary, consult A/E before making final setpoint.

[select] Pass
[revision note]

5. Unless otherwise shown on drawings, locate static pressure sensor in main supply duct at two-thirds down from unit supply fan.

[select] Pass
[revision note]

6. A static pressure controller with its pressure sensor located in return fan discharge duct shall modulate volume control device on return fan to maintain set static pressure of **~0.2** inches WG(FA), as determined by air systems TAB contractor.

[select] Pass
[revision note]

G. Unit Discharge Air Temperature Control:

1. Unit discharge air controller shall modulate control valve on cooling coil to maintain 55°F (FA) discharge air temperature.

[select] Pass
[revision note]

2. Cooling coil control valve shall be locked in closed position whenever outside air temperature is below 50°F (FA).

[select] Pass
[revision note]

3. Cooling coil control valve shall be closed whenever unit supply fan(s) are not operating.

[select] Pass
[revision note]

H. Heating Coil Discharge Temperature Control:

1. Heating coil discharge air controller with sensor located immediately downstream of heating coil shall modulate in sequence, control valve on heating coil and maximum OA damper to maintain 52°F (FA) coil discharge temperature.

[select] Pass
[revision note]

2. When coil discharge air temperature drops to 40°F (FA), controller shall override occupied cycle mode signal and modulate minimum OA damper to closed position.

[select] Pass
[revision note]

3. Whenever outside air temperature drops below 40°F for a minimum of 10 minutes, hot water circulation pump on AHU-1 preheat coil shall continuously operate. When outside air temperature rises above 40°F for a minimum of 10 minutes, pump shall be disabled.

[select] Pass
[revision note]

I. Mixed Air Control:

1. Mixed air controller shall modulate outside, relief, and return air dampers during occupied periods to admit outside air as indicated on the drawings.

[select] Pass
[revision note]

2. During periods when all spaces are programmed as unoccupied or shut down, reduce the outside air intake rate to zero.

[select] Pass
[revision note]

J. Return Air Damper Control:

1. A static pressure controller with its pressure sensor located in mixed air section shall modulate return air damper to maintain set static pressure of ~0.2 inches WG (FA), as determined by the TAB Contractor.

[select] Pass
[revision note]

K. Economizer Control:

1. Provide dry bulb economizer control. Whenever outside air dry bulb temperature exceeds the return air temperature minus 5°F (FA) for 10 consecutive minutes (FA), economizer control shall switch back to minimum outside air mode by commanding outside air damper to its minimum position.

[select] Pass

[revision note]

2. Economizer control shall be enabled when outside air dry bulb temperature is less than return air temperature minus 5°F (FA) for 10 consecutive minutes (FA).

[select] Pass
[revision note]

3. When economizer control is enabled and there is a call for mechanical cooling, the outside air damper and relief air damper shall open 100%, and the return air damper shall close. Cooling coil control valve shall provide additional cooling by modulating to maintain discharge air temperature setpoint, as necessary.

[select] Pass
[revision note]

4. When economizer control is enabled and there is no call for mechanical cooling, the outside air damper shall be controlled by averaging type temperature sensor located upstream of the pre-heating coil to maintain mixed air temperature of 52°F.

1). As mixed air temperature decreases, outside air damper shall modulate closed towards minimum position.

[select] Pass
[revision note]

L. Smoke Control:

1. Refer to Smoke/Fire Alarm Mode. SEE SECTION 3.16, THIS DOCUMENT.

M. Miscellaneous:

1. Provide 40°F safety low limit control (automatic reset) at entering side of cooling coil. When this 40°F low limit trips, it shall command the CHW valve to a 30% (FA) open position to circulate water through the cooling coil.

[select] Pass
[revision note]

2. Provide 35°F low limit switch (manual reset) at the leaving side of the preheating coil. When this 35°F low limit trips, the safety circuit shall de-energize the unit supply fan and close the outside air damper.

[select] Pass
[revision note]

3. Provide low limit discharge controller, which will not allow unit to discharge air at temperature below 50°F. During mechanical cooling, low limit becomes inoperative.

[select] Pass
[revision note]

4. Provide high static pressure limit control with sensor located in unit discharge to override fan volume control when pressure reaches 4 inches WG (FA).

[select] Pass
[revision note]

5. Provide low static pressure limit control with sensor located in inlet duct of return fan to override fan volume control when pressure falls below -1.5 inches WG.

[select] Pass
[revision note]

6. Provide high static pressure limit control with sensor located at return fan discharge to override fan volume control when pressure falls below 2 inches WG.

[select] Pass
[revision note]

7. Provide minimum positioner controller for outside air dampers.

[select] Pass

[revision note]

8. Provide damper positioning switch in control panel, to permit dampers to be positioned to supply various quantities of outside air. Minimum damper positioners shall never admit more outside air than amount indicated, and never more than low limit will allow.

[select] Pass
[revision note]

END OF SEQ OF OPR
AHU-1

3.14 SMOKE/FIRE ALARM MODE - CONTROL SEQUENCE

N. Smoke Detectors in Ductwork:

1. Smoke detectors will be furnished, installed, and wired to Fire Alarm Control Panel by Electrical Contractor.

[select] Pass
[revision note]

2. Wire contact on Fire Alarm System provided by EC to air handling unit supply fan starter to shut down unit fan when Fire Alarm System is in alarm condition.

[select] Pass
[revision note]

3. Wire auxiliary contact on smoke detector to air handling unit supply fan starter. Each air handling unit's smoke detector(s) upon detection of smoke shall stop its respective air handling unit.

[select] Pass
[revision note]

4. Smoke detectors will be provided for the following air handling units.

a. AHU-1

1). Supply air ductwork

[select] Pass
[revision note]

2). Return air ductwork

[select] Pass
[revision note]

3). In return main entering first floor

[select] Pass
[revision note]

4). In return main entering second floor

[select] Pass
[revision note]

5). In return main entering attic

[select] Pass
[revision note]

O. Smoke Dampers:

1. Smoke dampers provided by VC and wired by EC.

[select] Pass
[revision note]

2. Smoke dampers required in ducts passing through smoke partitions are shown on Mechanical Plans (smoke partitions are shown on Architectural Plans).

[select] Pass
[revision note]

3. Smoke dampers shall be provided at air handling units for isolation as follows:

a. AHU-1

1). Supply air discharge

[select] Pass
[revision note]

2). Return air inlet

[select] Pass
[revision note]

3). Smoke dampers isolating air handling system shall be closed automatically when air system is not in operation.

[select] Pass
[revision note]

4). Wire contacts provided by Fire Alarm System to close smoke dampers and shut down air handling units when fire alarm system is in alarm condition. Smoke dampers shall automatically reset on Fire Alarm System reset. Air handling units shall have manual restart on Fire Alarm System reset.

[select] Pass
[revision note]

END OF SEQ OF OPR
SMOKE/FIRE ALARM MODE

3.15 EXHAUST FANS - CONTROL SEQUENCE

A. Exhaust fans shall be controlled with PE switches or electrical interlock with air handling units. Refer to air handling unit control sequence for interlocking requirements.

[select] Pass
[revision note]

B. For exhaust fans controlled through PE switches, locate PE switch on respective air handling unit control panel.

[select] Pass
[revision note]

C. For exhaust fans controlled through user operated wall switch or wall mounted thermostat, locate switch/thermostat in space served.

[select] Pass / Fail / Revised
[revision note]

D. For exhaust fans interlocked with local equipment, provide current sensor to indicate when equipment is operating.

[select] Pass
[revision note]

E. Refer to the exhaust fan schedules for interlocking schedule.

[select] Pass
[revision note]

END OF SEQ OF OPR
EXHAUST FANS

3.16 RETURN FANS - CONTROL SEQUENCE

P. Return fans
Return fans shall be electrically interlocked with associated air handling unit as described in AHU control sequence.

[select] Pass
[revision note]

END OF SEQ OF OPR
RETURN FANS

Fin Tube Radiation Example:

facilities & SERVICES

Radiator Functional Test

Project: Center for Wounded Veterans (1494)

Associated checklists: Controls Sequence of Operation for Convectors & Fin Tube Radiation

Yellow Box: PERFORMED BY MECHANICAL CONTRACTOR
Green Box: PERFORMED BY CONTROLS CONTRACTOR
Orange Box: PERFORMED BY COMMISSIONING INSPECTOR

Contractor filling out this form _____ **CX Agent** _____

Start up sheets attached? YES / NO **Sequences of Operation attached? YES / NO**

ROOM # (Multiple FTR in some rooms, but controlled as one unit)	Casing Undamaged	Insulation complete & undamaged	Any damage to fins has been repaired	Piping Installed & Valves Checked	Piping Cleaned, Flushed & Tested	Heating water flow balanced	Controls Hardware complete	Set heating setpoint 20°F above room temperature. Verify BAS reading says 100% open. Visually verify valve is fully open.	Set heating setpoint to 20°F below room temperature. Observe the valve close.	Heating mode outdoor air temp.	Valves close when room reaches thermostat setpoint.	CI Verified Functional Performance	Notes
1030	x	x	x	x	x	x	X	X	X	X	X	x	
1028	x	x	x	x	x	x	X	X	X	X	X	x	
1026	x	x	x	x	x	x	X	X	X	X	X	x	
1024	x	x	x	x	x	x	X	X	X	X	X	x	
1022	x	x	x	x	x	x	X	X	X	X	X	x	
1020	x	x	x	x	x	x	X	X	X	X	X	x	
1018	x	x	x	x	x	x	X	X	X	X	X	x	
C1002	x	x	x	x	x	x	X	X	X	X	X	x	
1002 -w*	x	x	x	x	x	x	X	X	X	X	X	x	west wall control valve
1002 -s*	x	x	x	x	x	x	X	X	X	X	X	x	south wall control valve
1001	x	x	x	x	x	x	X	X	X	X	X	x	
1003	x	x	x	x	x	x	X	X	X	X	X	x	
1005	x	x	x	x	x	x	X	X	X	X	X	x	
1009	x	x	x	x	x	x	X	X	X	X	X	x	
1013	x	x	x	x	x	x	X	X	X	X	X	x	
1015	x	x	x	x	x	x	X	X	X	X	X	x	
1017	x	x	x	x	x	x	X	X	X	X	X	x	
1017a	x	x	x	x	x	x	X	X	X	X	X	x	

*** NOTE:** **RM 1002 has 2 control valves. The "west" & "south" designations are for Cx purposes only, and not shown on print.**
Basement does not have any FTR's

Lighting Controls Example:

PHILIPS

FORM: SAC-1 REV A

SYSTEM ACCEPTANCE CERTIFICATE

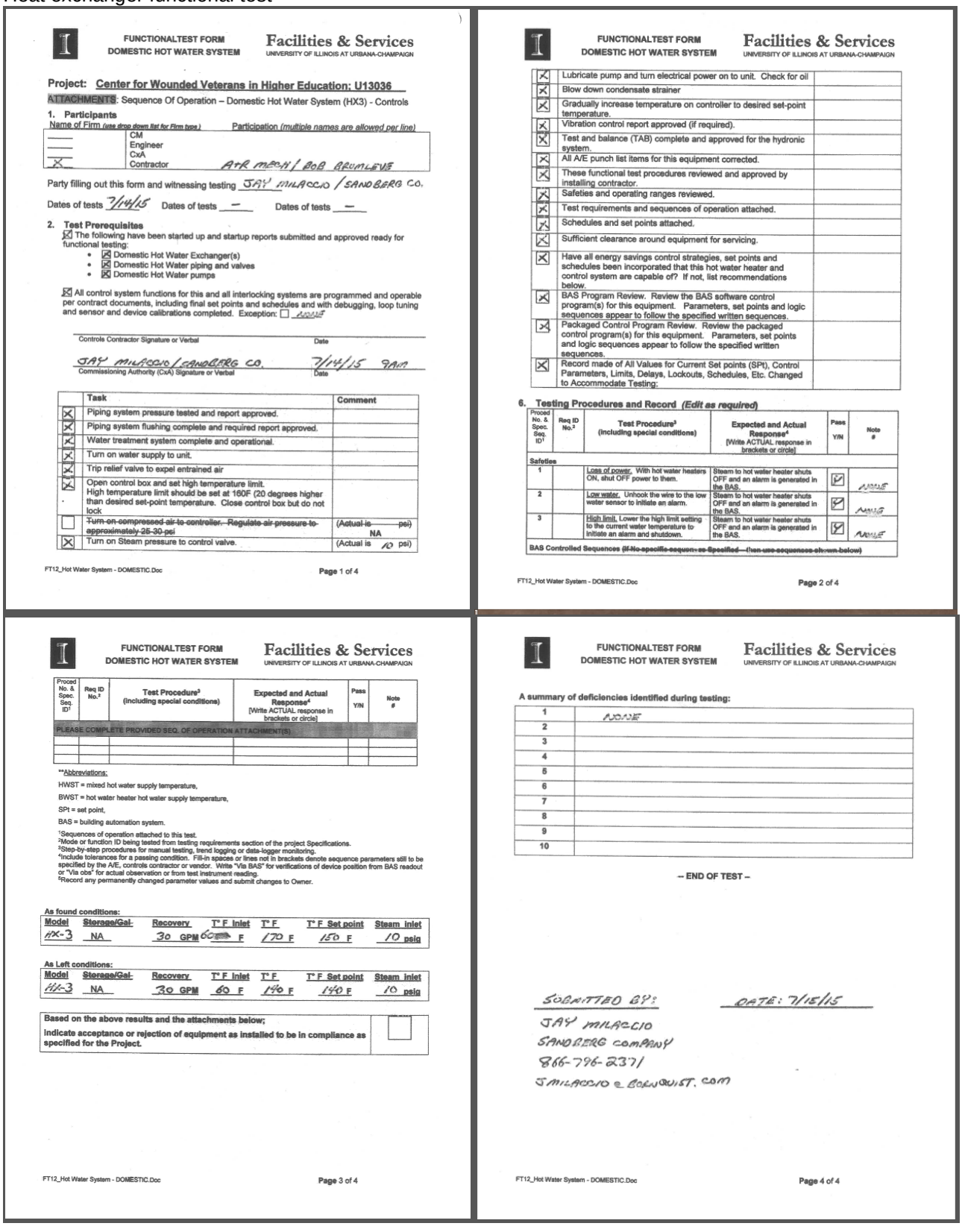
Job Name	CENTER FOR WOUNDED VETERANS
Sales Order Number(s)	1011745392
Location	908 W NEVADA URBANA, IL 61801
Date	7/14/15

ACKNOWLEDGEMENT OF SYSTEM ACCEPTANCE: I hereby acknowledge that this above referenced system has been energized, tested, programmed, and is in working order as per approved system documentation. All future service requests and alterations to this system shall be subject to Philips terms and conditions.

	Customer Representative	Field Service Representative
Print Name	Mark Creed	RYAN WORTZ
Title	Foreman	ALT
Company	CEI	
Date	7/14/2015	7/14/15
Signature	Mark Creed	B. M. Wortz

PHILIPS
Philips Lighting Systems – North America
3 Burlington Woods Drive
Burlington, Massachusetts, USA 01803
888-385-5742
http://www.usa.lighting.philips.com/

Heat exchanger functional test



FUNCTIONALTEST FORM
DOMESTIC HOT WATER SYSTEM

Facilities & Services
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Project: Center for Wounded Veterans in Higher Education; U13036

ATTACHMENTS: Sequence Of Operation – Domestic Hot Water System (HX3) - Controls

1. Participants

Name of Firm (use drop down list for Firm type)	Participation (multiple names are allowed per line)
	CM
	Engineer
	CxA
X	Contractor A+R MECH / BOB BRUMLEVE

Party filling out this form and witnessing testing JAY MILACCIO / SANDBERG CO.

Dates of tests 7/14/15 Dates of tests — Dates of tests —

2. Test Prerequisites

☒ The following have been started up and startup reports submitted and approved ready for functional testing:

- ☒ Domestic Hot Water Exchanger(s)
- ☒ Domestic Hot Water piping and valves
- ☒ Domestic Hot Water pumps

☒ All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set points and schedules and with debugging, loop tuning and sensor and device calibrations completed. Exception: ☐ NONE

Controls Contractor Signature or Verbal — Date

JAY MILACCIO / SANDBERG CO. — 7/14/15 9AM

Commissioning Authority (CxA) Signature or Verbal — Date

	Task	Comment
☒	Piping system pressure tested and report approved.	
☒	Piping system flushing complete and required report approved.	
☒	Water treatment system complete and operational.	
☒	Turn on water supply to unit.	
☒	Trip relief valve to expel entrained air	
☒	Open control box and set high temperature limit. High temperature limit should be set at 160F (20 degrees higher than desired set-point temperature. Close control box but do not lock	
☐	~~Turn on compressed air to controller. Regulate air pressure to approximately 25-30 psi~~	~~(Actual is psi)~~ NA
☒	Turn on Steam pressure to control valve.	(Actual is 10 psi)

FT12_Hot Water System - DOMESTIC.Doc — Page 1 of 4

FUNCTIONALTEST FORM
DOMESTIC HOT WATER SYSTEM

Facilities & Services
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

☒	Lubricate pump and turn electrical power on to unit. Check for oil	
☒	Blow down condensate strainer	
☒	Gradually increase temperature on controller to desired set-point temperature.	
☒	Vibration control report approved (if required).	
☒	Test and balance (TAB) complete and approved for the hydronic system.	
☒	All A/E punch list items for this equipment corrected.	
☒	These functional test procedures reviewed and approved by installing contractor.	
☒	Safeties and operating ranges reviewed.	
☒	Test requirements and sequences of operation attached.	
☒	Schedules and set points attached.	
☒	Sufficient clearance around equipment for servicing.	
☒	Have all energy savings control strategies, set points and schedules been incorporated that this hot water heater and control system are capable of? If not, list recommendations below.	
☒	BAS Program Review. Review the BAS software control program(s) for this equipment. Parameters, set points and logic sequences appear to follow the specified written sequences.	
☒	Packaged Control Program Review. Review the packaged control program(s) for this equipment. Parameters, set points and logic sequences appear to follow the specified written sequences.	
☒	Record made of All Values for Current Set points (SPt), Control Parameters, Limits, Delays, Lockouts, Schedules, Etc. Changed to Accommodate Testing:	

6. Testing Procedures and Record ***(Edit as required)***

Proced No. & Spec. Seq. ID[1]	Req ID No.[2]	Test Procedure[3] (including special conditions)	Expected and Actual Response[4] [Write ACTUAL response in brackets or circle]	Pass Y/N	Note #
Safeties					
1		Loss of power. With hot water heaters ON, shut OFF power to them.	Steam to hot water heater shuts OFF and an alarm is generated in the BAS.	☑	NONE
2		Low water. Unhook the wire to the low water sensor to initiate an alarm.	Steam to hot water heater shuts OFF and an alarm is generated in the BAS.	☑	NONE
3		High limit. Lower the high limit setting to the current water temperature to initiate an alarm and shutdown.	Steam to hot water heater shuts OFF and an alarm is generated in the BAS.	☑	NONE
BAS Controlled Sequences ~~(If No specific sequen- es Specified – then use sequences shown below)~~					

FT12_Hot Water System - DOMESTIC.Doc — Page 2 of 4

FUNCTIONALTEST FORM
DOMESTIC HOT WATER SYSTEM

Facilities & Services
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Proced No. & Spec. Seq. ID[1]	Req ID No.[2]	Test Procedure[3] (including special conditions)	Expected and Actual Response[4] [Write ACTUAL response in brackets or circle]	Pass Y/N	Note #
PLEASE COMPLETE PROVIDED SEQ. OF OPERATION ATTACHMENT(S)					

**Abbreviations:

HWST = mixed hot water supply temperature,

BWST = hot water heater hot water supply temperature,

SPt = set point,

BAS = building automation system.

[1]Sequences of operation attached to this test.
[2]Mode or function ID being tested from testing requirements section of the project Specifications.
[3]Step-by-step procedures for manual testing, trend logging or data-logger monitoring.
[4]Include tolerances for a passing condition. Fill-in spaces or lines not in brackets denote sequence parameters still to be specified by the A/E, controls contractor or vendor. Write "Via BAS" for verifications of device position from BAS readout or "Via obs" for actual observation or from test instrument reading.
[5]Record any permanently changed parameter values and submit changes to Owner.

As found conditions:

Model	~~Storage/Gal~~	Recovery	T° F Inlet	T° F	T° F Set point	Steam inlet
HX-3	NA	30 GPM	60 F	170 F	150 F	10 psig

As Left conditions:

Model	~~Storage/Gal~~	Recovery	T° F Inlet	T° F	T° F Set point	Steam inlet
HX-3	NA	30 GPM	60 F	140 F	140 F	10 psig

Based on the above results and the attachments below; indicate acceptance or rejection of equipment as installed to be in compliance as specified for the Project.	☐

FT12_Hot Water System - DOMESTIC.Doc — Page 3 of 4

FUNCTIONALTEST FORM
DOMESTIC HOT WATER SYSTEM

Facilities & Services
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

A summary of deficiencies identified during testing:

1	NONE
2	
3	
4	
5	
6	
7	
8	
9	
10	

– END OF TEST –

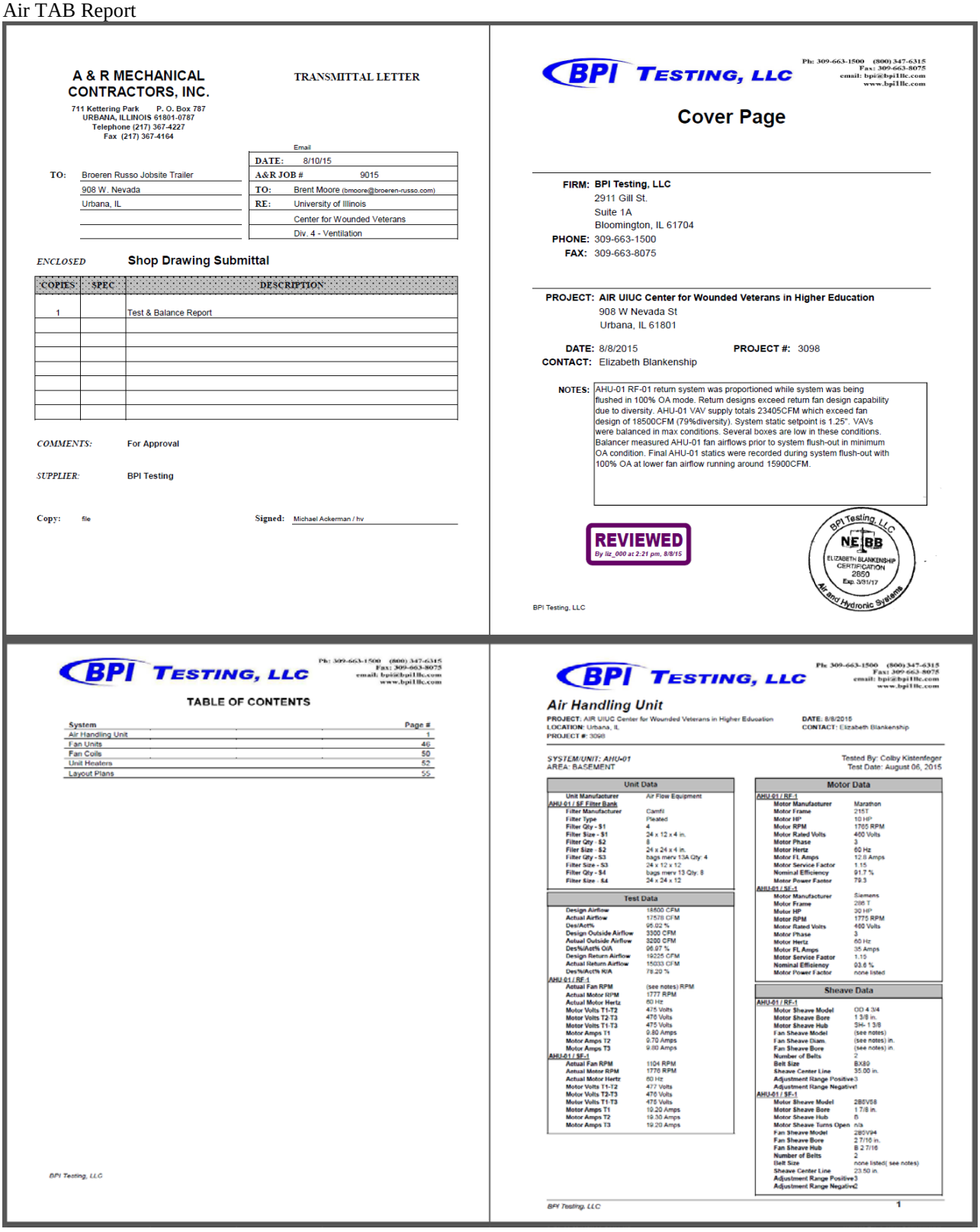
SUBMITTED BY: DATE: 7/15/15

JAY MILACCIO
SANDBERG COMPANY
866-796-2371
JMILACCIO@SANDBERG.COM

FT12_Hot Water System - DOMESTIC.Doc — Page 4 of 4

Appendix J - TAB Report Example

Air TAB Report



A & R MECHANICAL CONTRACTORS, INC.

711 Kettering Park P. O. Box 787
URBANA, ILLINOIS 61801-0787
Telephone (217) 367-4227
Fax (217) 367-4164

TRANSMITTAL LETTER

Email

	DATE: 8/10/15
TO: Broeren Russo Jobsite Trailer	A&R JOB # 9015
908 W. Nevada	TO: Brent Moore (bmoore@broeren-russo.com)
Urbana, IL	RE: University of Illinois
	Center for Wounded Veterans
	Div. 4 - Ventilation

ENCLOSED **Shop Drawing Submittal**

COPIES	SPEC	DESCRIPTION
1		Test & Balance Report

COMMENTS: For Approval

SUPPLIER: BPI Testing

Copy: file **Signed:** Michael Ackerman / hv

BPI TESTING, LLC

Ph: 309-663-1500 (800) 347-6315
Fax: 309-663-8075
email: bpi@bpi1llc.com
www.bpi1llc.com

Cover Page

FIRM: **BPI Testing, LLC**
2911 Gill St.
Suite 1A
Bloomington, IL 61704
PHONE: 309-663-1500
FAX: 309-663-8075

PROJECT: **AIR UIUC Center for Wounded Veterans in Higher Education**
908 W Nevada St
Urbana, IL 61801

DATE: 8/8/2015 **PROJECT #:** 3098
CONTACT: Elizabeth Blankenship

NOTES: AHU-01 RF-01 return system was proportioned while system was being flushed in 100% OA mode. Return designs exceed return fan design capability due to diversity. AHU-01 VAV supply totals 23405CFM which exceed fan design of 18500CFM (79%diversity). System static setpoint is 1.25". VAVs were balanced in max conditions. Several boxes are low in these conditions. Balancer measured AHU-01 fan airflows prior to system flush-out in minimum OA condition. Final AHU-01 statics were recorded during system flush-out with 100% OA at lower fan airflow running around 15900CFM.

REVIEWED
By liz_000 at 2:21 pm, 8/8/15

BPI Testing, LLC
NEBB
ELIZABETH BLANKENSHIP
CERTIFICATION
2650
Exp: 3/31/17
Air and Hydronic Systems

BPI Testing, LLC

BPI TESTING, LLC

Ph: 309-663-1500 (800) 347-6315
Fax: 309-663-8075
email: bpi@bpi1llc.com
www.bpi1llc.com

TABLE OF CONTENTS

BPI Testing, LLC

BPI TESTING, LLC

Ph: 309-663-1500 (800) 347-6315
Fax: 309-663-8075
email: bpi@bpi1llc.com
www.bpi1llc.com

Air Handling Unit

PROJECT: AIR UIUC Center for Wounded Veterans in Higher Education
LOCATION: Urbana, IL
PROJECT #: 3098
DATE: 8/8/2015
CONTACT: Elizabeth Blankenship

SYSTEM/UNIT: AHU-01
AREA: BASEMENT

Tested By: Colby Kistenfeger
Test Date: August 06, 2015

Unit Data

Unit Manufacturer	Air Flow Equipment
AHU-01 / SF Filter Bank	
Filter Manufacturer	Camfil
Filter Type	Pleated
Filter Qty - S1	4
Filter Size - S1	24 x 12 x 4 in.
Filter Qty - S2	8
Filter Size - S2	24 x 24 x 4 in.
Filter Qty - S3	bags merv 13A Qty: 4
Filter Size - S3	24 x 12 x 12
Filter Qty - S4	bags merv 13 Qty: 8
Filter Size - S4	24 x 24 x 12

Test Data

Design Airflow	18500 CFM
Actual Airflow	17578 CFM
Des/Act%	95.02 %
Design Outside Airflow	3300 CFM
Actual Outside Airflow	3200 CFM
Des%/Act% OA	96.97 %
Design Return Airflow	19225 CFM
Actual Return Airflow	15033 CFM
Des%/Act% RA	78.20 %
AHU-01 / RF-1	
Actual Fan RPM	(see notes) RPM
Actual Motor RPM	1777 RPM
Actual Motor Hertz	60 Hz
Motor Volts T1-T2	475 Volts
Motor Volts T2-T3	476 Volts
Motor Volts T1-T3	475 Volts
Motor Amps T1	9.80 Amps
Motor Amps T2	9.70 Amps
Motor Amps T3	9.80 Amps
AHU-01 / SF-1	
Actual Fan RPM	1104 RPM
Actual Motor RPM	1776 RPM
Actual Motor Hertz	60 Hz
Motor Volts T1-T2	477 Volts
Motor Volts T2-T3	476 Volts
Motor Volts T1-T3	475 Volts
Motor Amps T1	19.20 Amps
Motor Amps T2	19.30 Amps
Motor Amps T3	19.20 Amps

Motor Data

AHU-01 / RF-1	
Motor Manufacturer	Marathon
Motor Frame	215T
Motor HP	10 HP
Motor RPM	1765 RPM
Motor Rated Volts	460 Volts
Motor Phase	3
Motor Hertz	60 Hz
Motor FL Amps	12.8 Amps
Motor Service Factor	1.15
Nominal Efficiency	91.7 %
Motor Power Factor	79.3
AHU-01 / SF-1	
Motor Manufacturer	Siemens
Motor Frame	286 T
Motor HP	30 HP
Motor RPM	1775 RPM
Motor Rated Volts	460 Volts
Motor Phase	3
Motor Hertz	60 Hz
Motor FL Amps	35 Amps
Motor Service Factor	1.15
Nominal Efficiency	93.6 %
Motor Power Factor	none listed

Sheave Data

AHU-01 / RF-1	
Motor Sheave Model	OD 4 3/4
Motor Sheave Bore	1 3/8 in.
Motor Sheave Hub	SH- 1 3/8
Fan Sheave Model	(see notes)
Fan Sheave Diam.	(see notes) in.
Fan Sheave Bore	(see notes) in.
Number of Belts	2
Belt Size	BX80
Sheave Center Line	35.00 in.
Adjustment Range Positive	3
Adjustment Range Negative	1
AHU-01 / SF-1	
Motor Sheave Model	2B5V58
Motor Sheave Bore	1 7/8 in.
Motor Sheave Hub	B
Motor Sheave Turns Open	n/a
Fan Sheave Model	2B5V94
Fan Sheave Bore	2 7/16 in.
Fan Sheave Hub	B 2 7/16
Number of Belts	2
Belt Size	none listed(see notes)
Sheave Center Line	23.50 in.
Adjustment Range Positive	3
Adjustment Range Negative	2

BPI Testing, LLC 1

Hydronic TAB Report

A & R MECHANICAL CONTRACTORS, INC.

711 Kettering Park P. O. Box 787
URBANA, ILLINOIS 61801-0787
Telephone (217) 367-4227
Fax (217) 367-4164

TRANSMITTAL LETTER

Email

		DATE:	8/6/15
TO:	Broeren Russo	**A&R JOB #**	9014
	602 N. Country Fair Dr.	**TO:**	Brent Moore (bmoore@broeren-russo.com)
	Champaign, IL 61821	**RE:**	University of Illinois
			Center for Wounded Veterans
			Div. 3 - Heating

ENCLOSED

COPIES	DATE	DESCRIPTION
1	8/6/15	Hydronic Test & Balance Report

COMMENTS: For Your Approval

Copy: file **Signed:** Steve Hall / or

Illinois Certified TEST & BALANCE

3901 Yucan Drive
Springfield, Il 62711

Office 217-632-3479
Fax 217-726-9583

Test & Balance for Air & Water Systems
Analysis Report

Project: Wounded VETS- Champaign, IL

Contractor: A&R

Architect: LCM

Engineer: Affilitated / Matrix / Terra

Sheet Metal, Air Conditioning and Roofing Contractors Trade Association of Illinois, Inc.

Certificate # 590

By: Steven Plunkett

Date: 8/5/2015

Project # 1498

TABB Technician
Name: Steven Plunkett
TABB ID: BB821496T
Expiration Date: 12/31/2016

(TABB) Pump Data Sheet (Smarta)

Job Name: WOUNDED VET **Date:** 8/5/2015

System: HWP REHEAT **By:** BRIAN WOERLY

Pump Number	HWP-1		HWP-2
Service	VAV'S		VAV'S
Pump Mfg	AURORA 344A		AURORA 344A
Model No.	1.25 x 1.5 x 9B		1.25 x 1.5 x 9B
GPM/Head	55 / 75		55 / 75
Pump RPM	1750		1750
Impeller Diam	8.25		8.25
Motor HP / RPM	3/ 1765		3/ 1765
Volts/Phase/Hertz	460 / 3 / 60		460 / 3 / 60
F.L. Amps / S.F.	4 / 1.15		4 / 1.15
Seal Type	SOFT		SOFT
Pump Off-Press	43.5		43.5
Valve Shut Diff	83.16		80.85
Act Impeller Diam	8.25		8.25
Valve Open Diff	51.975		53.13
Valve Open GPM	97		97
Final Discharge FT	180.18		181.335
Final Suction FT	107.415		108.57
Final Delta FT	72.765		72.765
Final GPM	60		60
Actual Voltage	485/485/485		484/484/484
Actual Amperage	3.2 / 3.4 / 3.3		3.2 / 3.4 / 3.3
Remarks:	DP SET TO 4"		

(TABB) Pump Data Sheet (Smarta)

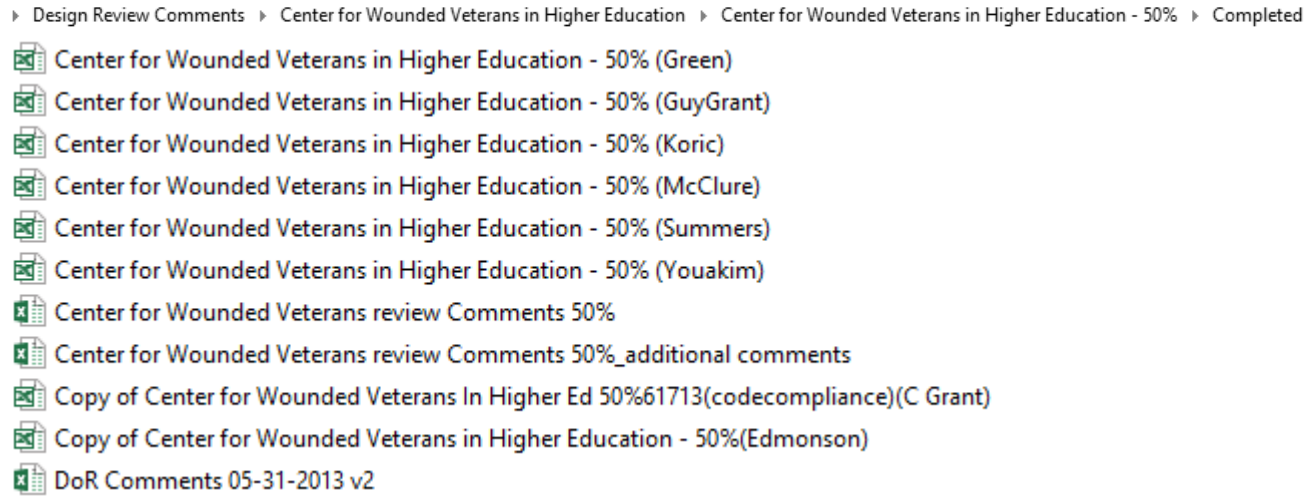
Job Name: WOUNDED VET **Date:** 8/5/2015

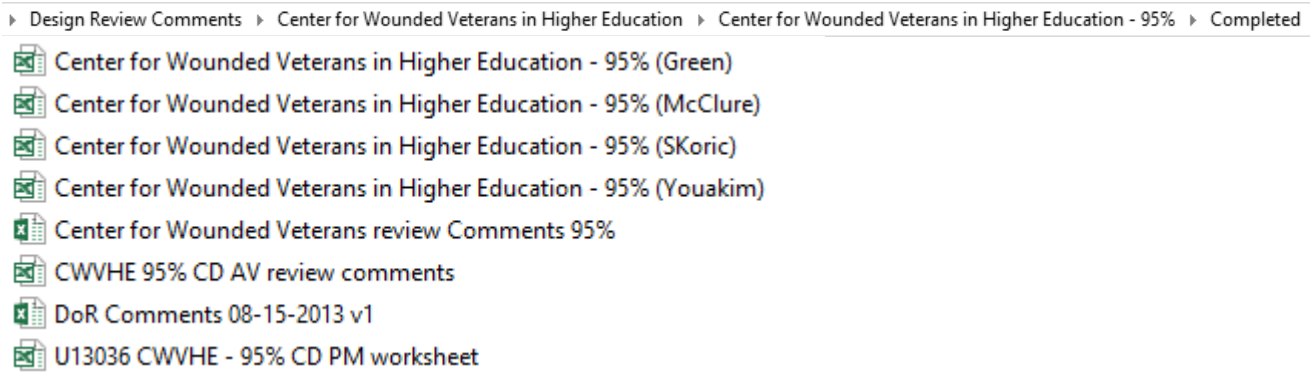
System: HWP PERIMETER **By:** BRIAN WOERLY

Pump Number	HWP-3		HWP-4
Service	FTR, AHU-1, UH, CUH		FTR, AHU-1, UH, CUH
Pump Mfg	AURORA 344A		AURORA 344A
Model No.	1.5 x 2 x9A		1.5 x 2 x9A
GPM/Head	85 / 75		85 / 75
Pump RPM	1800		1800
Impeller Diam	8.75		8.75
Motor HP / RPM	5 / 1755		5 / 1755
Volts/Phase/Hertz	460 / 3 / 60		460 / 3 / 60
F.L. Amps / S.F.	6.2 / 1.15		6.2 / 1.15
Seal Type	SOFT		SOFT
Pump Off-Press	51.25		51.25
Valve Shut Diff	92.4		90.09
Act Impeller Diam	8.75		8.75
Valve Open Diff	72		72
Valve Open GPM	87		87
Final Discharge FT	116.08		116.08
Final Suction FT	43.89		43.89
Final Delta FT	72.19		72.19
Final GPM	87		87
Actual Voltage	486 / 486 / 486		486 / 486 / 486
Actual Amperage	4.68/ 4.8 / 4.7		4.7 / 4.9 / 4.7
Remarks:	DP SET TO 22"		

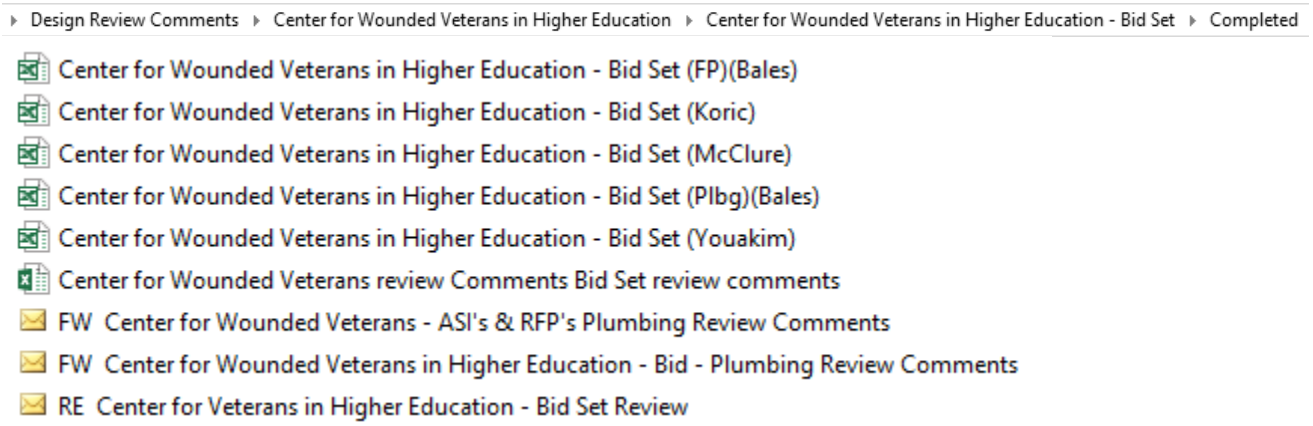
Appendix K - CxA Design Reviews

Example listing





Back check example early reviews.



Appendix L – Partial listing of CxA Review of Shop Drawings, Submittals

Davis, Alaina	Center For Wounded Veterans - 11 01 20 – Horizontal Lifeline System
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 09 29 00 – Hi-Impact Gypsum Board Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 11 19 – Washing Machine Outlet Box Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 41 00 – Water Closet Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 41 00 – Mop Basins Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 14 29 – Duplex Sump Pump Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 11 25 – Elevator Sump Pump Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 14 29 – Duplex Sewage Ejector Rev1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 11 19 – Master Mixing Valve Rev1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 23 82 14 – Fan Coil Units Rev 4
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 05 12 00 – Erection Plans & Shop Dwg.´s
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 08 11 13 – Doors & Hardware
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 22 35 00 – Domestic Water Heat Exchanger Rev 1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 07 13 26 – Foundation Insulation Rev1
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 26 32 13 – Engine Generator
We have received submittals for the following:	
Davis, Alaina	Center For Wounded Veterans - 23 37 13 – GRD Rev 2
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 05 50 00 – Misc. Steel
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 33 60 15 – Underground Chilled Water Valves
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 22 07 19 – Plumbing Insulation Rev 1
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 07 41 13 - Underlayment
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 07 24 20 - DEFS
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 20 07 00 – Ventilation Insulation / 22 07 19 – Heating Insulation / 07 84 ...
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 233400 – Fans Resubmittal / 233314 – Hoods Resubmittal
We have received submittals for the following:	
Davis, Alaina	Center for Wounded Veterans - 233314 – Louvers Resubmittal
We have received submittals for the following:	

Davis, Alaina Center for Wounded Veterans - 233114 – Spiral Seam Ductwork Resubmittal
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 233600 – Air Terminal Devices / 238216 - Coils
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 07 42 13 – Formwall Shop Dwg.'s / Graphix / Sealant
We have received submittals for the following:

Davis, Alaina Center For Wounded Veterans - 23 82 14 – Fan Coil Units REV2
We have received submittals for the following:

Davis, Alaina Center For Wounded Veterans - 08 42 13 – Aluminum Framed Entrances & Storefronts / 08 42 13 - LEED
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 07 13 26 – Sheet Waterproofing
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 238214 – FCU Resubmittal
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - Transmittal #14 - Floor Drains / Expansion Joints / Underground Pre-In...
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - Transmittal #14 - Division 06 / 07 – Wood, Plastics, Composites / Therm...
We have received submittals for the following: Division 06 & 07 – Wood, Plastics, Composites / Thermal & Moisture Protection

Davis, Alaina Center for Wounded Veterans - Division 2 Plumbing - Fixtures, Drains, Cleanouts, Equipment & Specialties
We have received submittals for the following: Division 2 Plumbing - Fixtures, Drains, Cleanouts, Equipment & Specialties Plea

Davis, Alaina Center for Wounded Veterans - 233114 – Spiral Seam Ductwork
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 23 82 14 – Unit Heaters
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 23 82 14 – Fin Tube Radiation
We have received submittals for the following:

Davis, Alaina RE: Center for Wounded Veterans - 23 82 14 – Heating & Cooling Terminal Devices - Cabinet Unit Heaters
Correction:

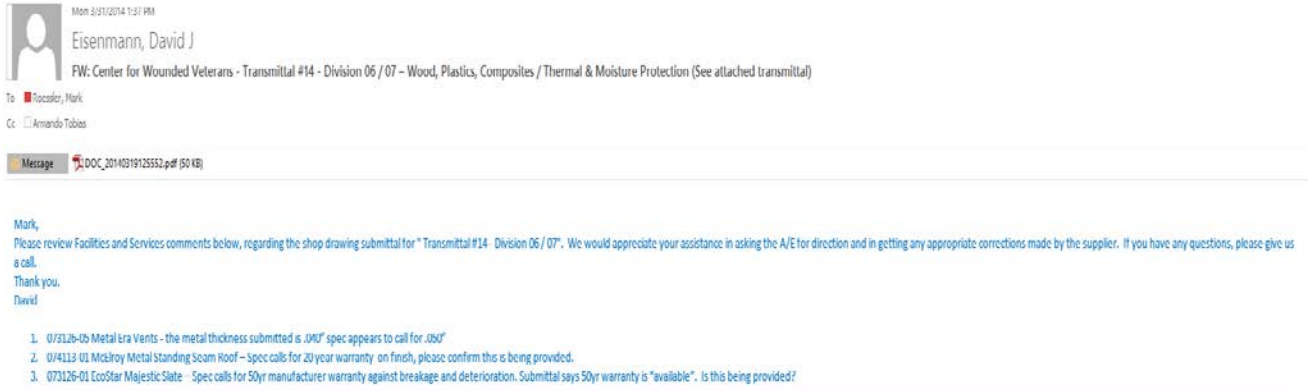
Davis, Alaina Center for Wounded Veterans - 23 82 14 – Heating & Cooling Terminal Devices
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 05 12 00 – Structural Steel Framing
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 23 82 14 - Initial Color Charts for CUH, UH, & FT
We have received submittals for the following:

Davis, Alaina Center for Wounded Veterans - 33 63 13 – Underground Pre-insulated Piping (Heating Systems)
We have received submittals for the following:

Example of Submittal Reviews



Mon 3/31/2014 1:37 PM

Eisenmann, David J

FW: Center for Wounded Veterans - Transmittal #14 - Division 06 / 07 – Wood, Plastics, Composites / Thermal & Moisture Protection (See attached transmittal)

To Roessler, Mark

Cc Armando Tobias

Message DOC_20140319125552.pdf (50 KB)

Mark,
Please review Facilities and Services comments below, regarding the shop drawing submittal for " Transmittal #14 Division 06 / 07". We would appreciate your assistance in asking the A/E for direction and in getting any appropriate corrections made by the supplier. If you have any questions, please give us a call.
Thank you.
David

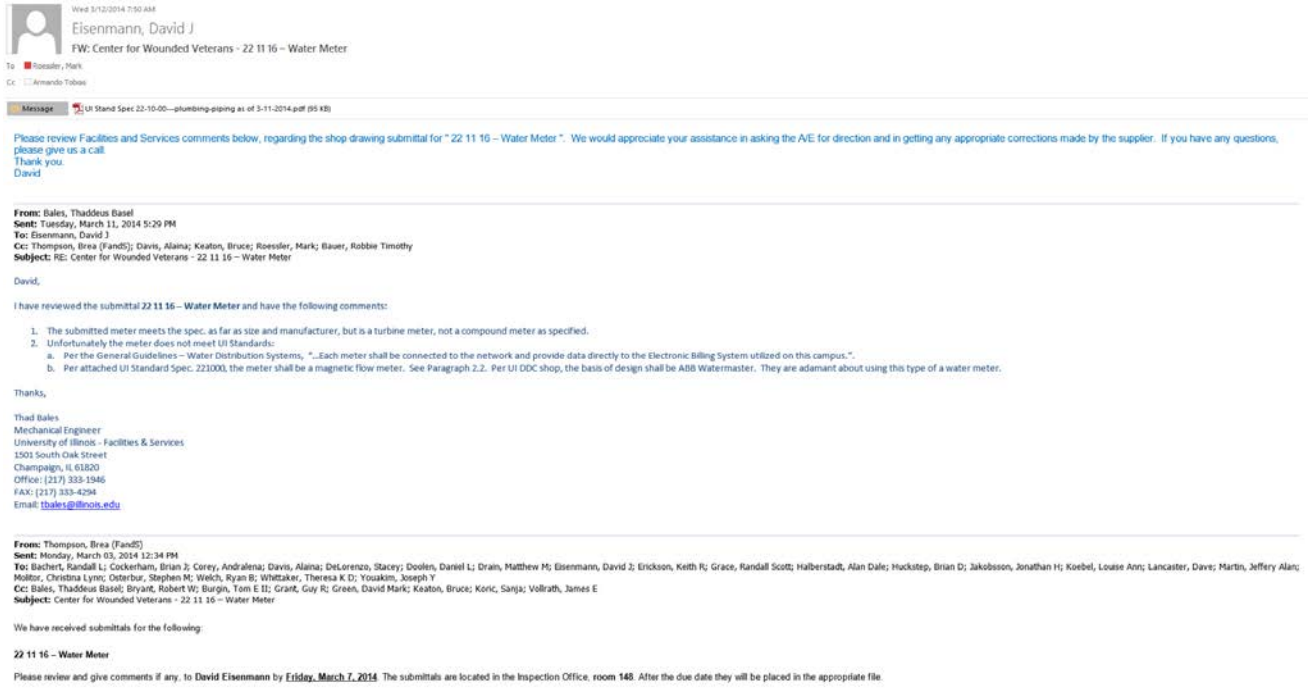
1. 073126-05 Metal Era Vents - the metal thickness submitted is .040" spec appears to call for .050"
2. 074113-01 McElroy Metal Standing Seam Roof – Spec calls for 20 year warranty on finish, please confirm this is being provided.
3. 073126-01 EcoStar Majestic Slate - Spec calls for 50yr manufacturer warranty against breakage and deterioration. Submittal says 50yr warranty is "available". Is this being provided?

From: Davis, Alaina
Sent: Wednesday, March 19, 2014 1:23 PM
To: Bachert, Randall L; Molitor, Christina Lynn; Cockerham, Brian J; Corey, Andralena; Doolen, Daniel L; DeLorenzo, Stacey; Drain, Matthew M; Eisenmann, David J; Erickson, Keith R; Grace, Randall Scott; Halberstadt, Alan Dale; Huckstep, Brian D; Jakobsson, Jonathan H; Koebel, Louise Ann; Lancaster, Dave; Martin, Jeffery Alan; Osterbur, Stephen M; Whittaker, Theresa K D; Thompson, Brea (FandS); Welch, Ryan B; Yousakim, Joseph Y
Cc: Ellison, Bradley J; McClure, Donna; Schaub, Vincent V; White, Roland W
Subject: Center for Wounded Veterans - Transmittal #14 - Division 06 / 07 – Wood, Plastics, Composites / Thermal & Moisture Protection (See attached transmittal)

We have received submittals for the following:

Division 06 & 07 – Wood, Plastics, Composites / Thermal & Moisture Protection (See attached transmittal)

Please review and give comments if any, to **David Eisenmann** by **Tuesday, March 25, 2014**. The submittals are located in the Inspection Office, **room 148**. After the due date they will be placed in the appropriate file



Wed 3/12/2014 7:50 AM

Eisenmann, David J

FW: Center for Wounded Veterans - 22 11 16 – Water Meter

To Roessler, Mark

Cc Armando Tobias

Message UI Stand Spec 22-10-00---plumbing-piping as of 3-11-2014.pdf (95 KB)

Please review Facilities and Services comments below, regarding the shop drawing submittal for " 22 11 16 – Water Meter ". We would appreciate your assistance in asking the A/E for direction and in getting any appropriate corrections made by the supplier. If you have any questions, please give us a call.
Thank you.
David

From: Bales, Thaddeus Basel
Sent: Tuesday, March 11, 2014 5:29 PM
To: Eisenmann, David J
Cc: Thompson, Brea (FandS); Davis, Alaina; Keaton, Bruce; Roessler, Mark; Bauer, Robbie Timothy
Subject: RE: Center for Wounded Veterans - 22 11 16 – Water Meter

David,

I have reviewed the submittal **22 11 16 – Water Meter** and have the following comments:

1. The submitted meter meets the spec. as far as size and manufacturer, but is a turbine meter, not a compound meter as specified.
2. Unfortunately the meter does not meet UI Standards:
   a. Per the General Guidelines – Water Distribution Systems, "...Each meter shall be connected to the network and provide data directly to the Electronic Billing System utilized on this campus.".
   b. Per attached UI Standard Spec. 221000, the meter shall be a magnetic flow meter. See Paragraph 2.2. Per UI DDC shop, the basis of design shall be ABB Watermaster. They are adamant about using this type of a water meter.

Thanks,

Thad Bales
Mechanical Engineer
University of Illinois - Facilities & Services
1501 South Oak Street
Champaign, IL 61820
Office: (217) 333-1946
FAX: (217) 333-4294
Email: tbales@illinois.edu

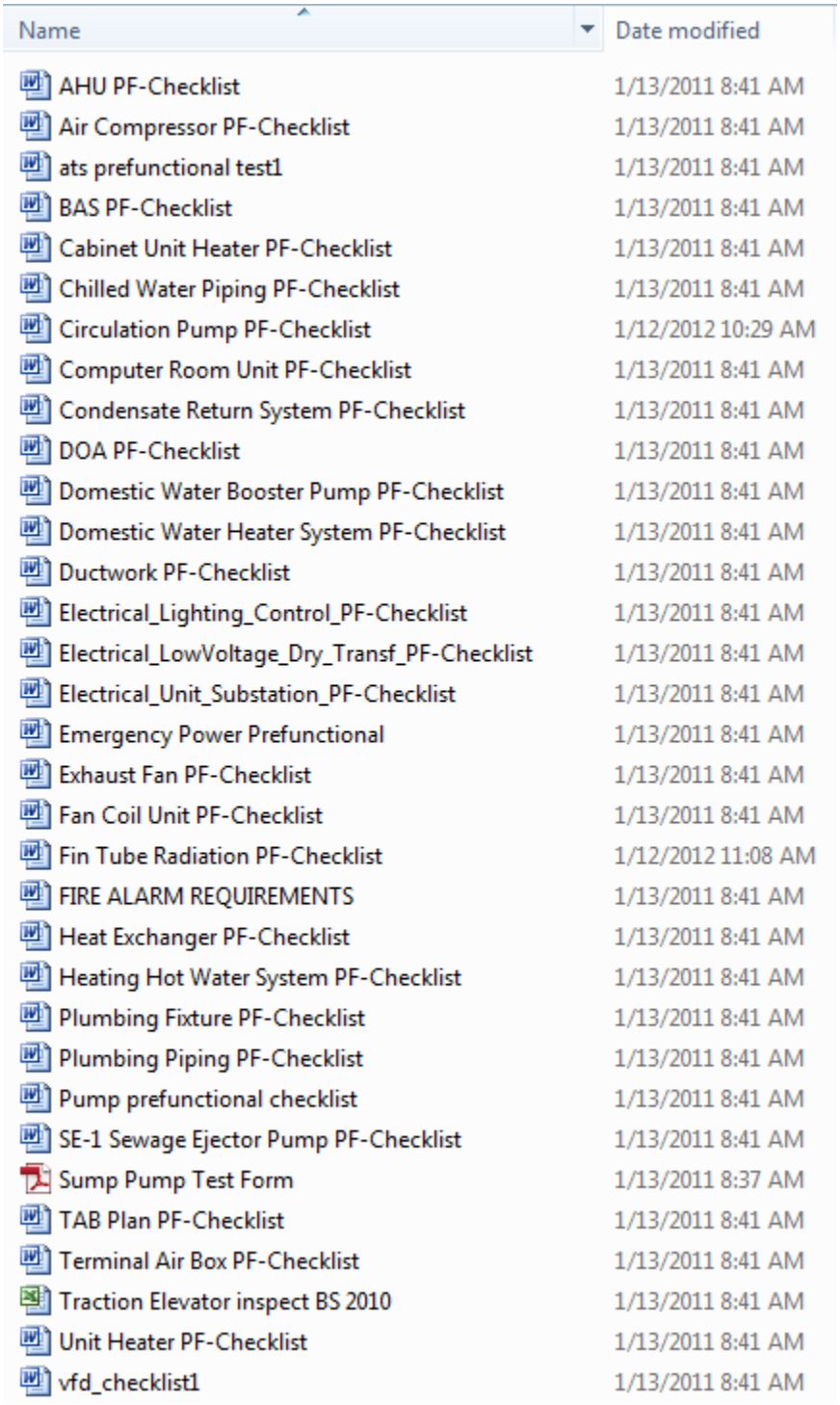
From: Thompson, Brea (FandS)
Sent: Monday, March 03, 2014 12:34 PM
To: Bachert, Randall L; Cockerham, Brian J; Corey, Andralena; Davis, Alaina; DeLorenzo, Stacey; Doolen, Daniel L; Drain, Matthew M; Eisenmann, David J; Erickson, Keith R; Grace, Randall Scott; Halberstadt, Alan Dale; Huckstep, Brian D; Jakobsson, Jonathan H; Koebel, Louise Ann; Lancaster, Dave; Martin, Jeffery Alan; Molitor, Christina Lynn; Osterbur, Stephen M; Welch, Ryan B; Whittaker, Theresa K D; Yousakim, Joseph Y
Cc: Bales, Thaddeus Basel; Bryant, Robert W; Burgin, Tom E II; Grant, Guy R; Green, David Mark; Keaton, Bruce; Koric, Sanja; Vollrath, James E
Subject: Center for Wounded Veterans - 22 11 16 – Water Meter

We have received submittals for the following:

22 11 16 – Water Meter

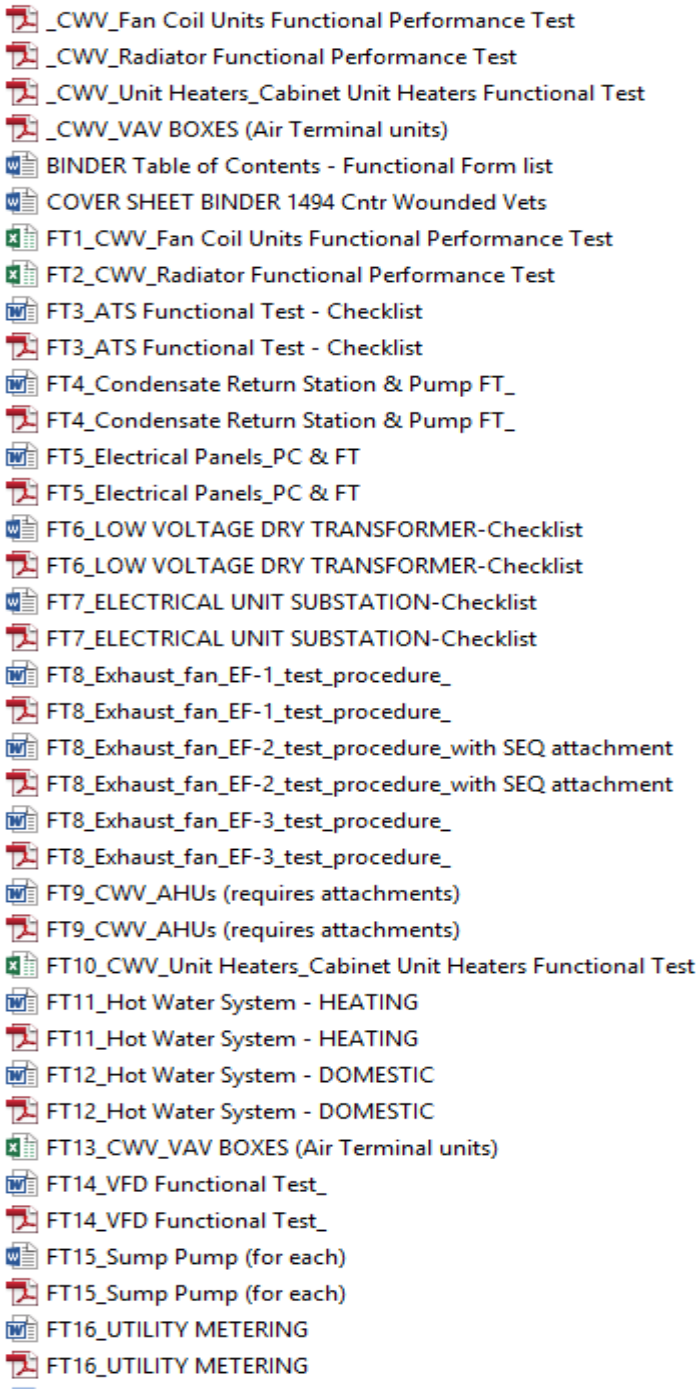
Please review and give comments if any, to **David Eisenmann** by **Friday, March 7, 2014**. The submittals are located in the Inspection Office, **room 148**. After the due date they will be placed in the appropriate file.

Appendix M – List of PFC & FT Template Procedures



Name	Date modified
AHU PF-Checklist	1/13/2011 8:41 AM
Air Compressor PF-Checklist	1/13/2011 8:41 AM
ats prefunctional test1	1/13/2011 8:41 AM
BAS PF-Checklist	1/13/2011 8:41 AM
Cabinet Unit Heater PF-Checklist	1/13/2011 8:41 AM
Chilled Water Piping PF-Checklist	1/13/2011 8:41 AM
Circulation Pump PF-Checklist	1/12/2012 10:29 AM
Computer Room Unit PF-Checklist	1/13/2011 8:41 AM
Condensate Return System PF-Checklist	1/13/2011 8:41 AM
DOA PF-Checklist	1/13/2011 8:41 AM
Domestic Water Booster Pump PF-Checklist	1/13/2011 8:41 AM
Domestic Water Heater System PF-Checklist	1/13/2011 8:41 AM
Ductwork PF-Checklist	1/13/2011 8:41 AM
Electrical_Lighting_Control_PF-Checklist	1/13/2011 8:41 AM
Electrical_LowVoltage_Dry_Transf_PF-Checklist	1/13/2011 8:41 AM
Electrical_Unit_Substation_PF-Checklist	1/13/2011 8:41 AM
Emergency Power Prefunctional	1/13/2011 8:41 AM
Exhaust Fan PF-Checklist	1/13/2011 8:41 AM
Fan Coil Unit PF-Checklist	1/13/2011 8:41 AM
Fin Tube Radiation PF-Checklist	1/12/2012 11:08 AM
FIRE ALARM REQUIREMENTS	1/13/2011 8:41 AM
Heat Exchanger PF-Checklist	1/13/2011 8:41 AM
Heating Hot Water System PF-Checklist	1/13/2011 8:41 AM
Plumbing Fixture PF-Checklist	1/13/2011 8:41 AM
Plumbing Piping PF-Checklist	1/13/2011 8:41 AM
Pump prefunctional checklist	1/13/2011 8:41 AM
SE-1 Sewage Ejector Pump PF-Checklist	1/13/2011 8:41 AM
Sump Pump Test Form	1/13/2011 8:37 AM
TAB Plan PF-Checklist	1/13/2011 8:41 AM
Terminal Air Box PF-Checklist	1/13/2011 8:41 AM
Traction Elevator inspect BS 2010	1/13/2011 8:41 AM
Unit Heater PF-Checklist	1/13/2011 8:41 AM
vfd_checklist1	1/13/2011 8:41 AM

Template Functional Test Procedures



Appendix N- Issues Log

Center for Wounded Veterans

Prepared by DJE

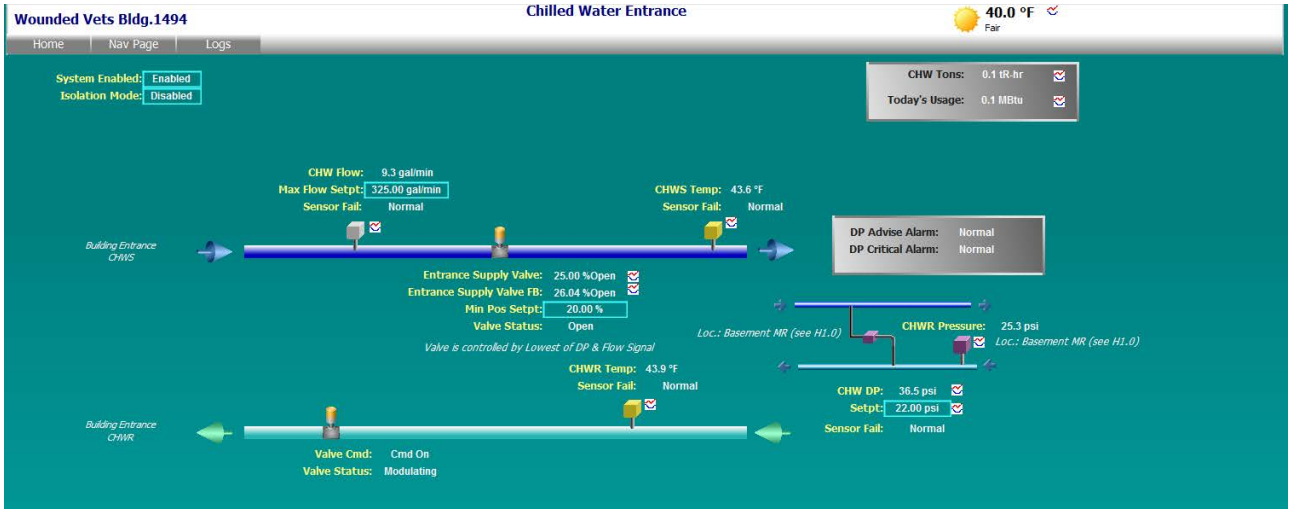
#	Issue Found	Date	Inspector	Comments	Date Resolved
1	Room 3013 has low water pressure on the hand held shower	9/10/015	RG	Complete	
2	Rooms 3012,3007,3005,3003 and 3004 need clear tape removed from the water closet seat.	9/10/015	RG	Complete	
3	No water or ice at the new refrigerators. Owner supplied?	9/10/015	RG	Complete	
4	Storage Room 002 – Repair insulation where domestic hot and cold water lines were repaired. Seal pipe penetrations on east wall.	9/10/015	RG	Complete	
5	Heating HWP-1 is very noisy at the impeller. Confirm pump is not damaged.	9/10/015	RG	Complete	
6	Heating HWP-1 thru 4 are not grouted at the base	9/10/015	RG	Complete	
7	Both side stream filters are piped with the inlet valve above the lid for changing filters. This will make it difficult to bleed out air after a filter change. Install air vent at the high point of the DP manifold or relocate isolation valve below the filter housing lid.	9/10/015	RG	Complete	11/11/2015
8	Steam Condensate pump is off and wasting condensate down the drain. Contractor is waiting on a part and this piece of equipment must be commissioned at a later date.	9/10/015	RG	Complete	11/11/2015
9	Insulation is covering all the labels to the different vessels for the heating systems (heat exchangers, air separator, expansion tanks etc). Labels must be located and marked for future maintenance and inspections.	9/10/015	RG	Complete	11/11/2015
10	Install float rod guides for both the storm and sanitary duplex pumps. (complete)	9/10/015	RG	Complete	9/10/2015
11	Seal air tight the storm and sanitary inspection lids. No gaskets on lids	9/10/015	RG	Complete	11/12/2015
12	Labels for storm and sanitary pumps are missing	9/10/015	RG	Complete	11/12/2015
13	Domestic hot water mixing valve discharging 105 degree water at the time of inspection. Documents call for 125 degrees. Please confirm the required temperature.	9/10/015	RG	Complete	11/12/2015
14	Missing thermometer on domestic hot water return line as per detail 2 on P-2.2. There is no place to confirm hot water return temperatures.	9/10/015	RG	Complete	11/12/2015
15	No pipe ID and arrows at domestic hot water main mixing valve	9/10/015	RG	Complete	11/12/2015
16	Domestic cold water booster pump is in alarm. Please investigate and report why this condition is a continuous problem.	9/10/015	RG	Complete	11/12/2015
17	Missing insulation hanger saddles for the domestic cold and hot water piping at the hot water heater area.	9/10/015	RG	Complete	11/12/2015
18	Insulation PVC fittings are not sealed (taped) at the joints as per the documents. Domestic hot water mixing valve area.	9/10/015	RG	Complete	11/12/2015
19	Replace and repair insulation that was removed for the condensate meter relocation.	9/10/015	RG	Complete	11/12/2015
20	Clean tape off of the sanitary floor clean outs in all locations of the basement	9/10/015	RG	Complete	11/12/2015
21	Building supply chilled water valve not working. (Scheduled for Thursday)	9/10/015	RB	Complete	9/17/2015
22	C1000 - No hot water flow for VAV valve and cabinet unit heater valve. Valve is opening. (A&R)	9/10/015	RB	Complete	9/17/2015
23	C1000 – No cfm reading and damper is 100 open and air is blowing. (alpha)	9/10/015	RB	Complete	9/17/2015
24	FCU- condensate alarm switches and DDC alarm	9/10/015	RB	Complete	9/17/2015
25	New steam and condensate taps for future hot water heater.	9/10/2015	RB	Complete	9/17/2015
26	CO2 sensors need replaced for 3rd floor.	9/10/2015	RB	Complete	9/18/2015
27	VAV 2009 – low flow alarm and low temp alarm.	9/10/2015	RB	Complete	9/18/2015

28	The chilled water return pressure transducer and reheat return pressure transducer needs to be swapped. The chilled water should be 0-100psi and reheat should be 0-50psi.	9/10/2015	RB	Complete	10/12/2015
29	VAV 002 and VAV 001 were swapped. VAV 002 max 150 cfm and is a 5" box was to supply "center storage room 002" and it was installed in the mechanical area.	9/10/2015	RB	Complete	10/12/2015
30	1 ½" blow down need's a plug. It's on the east wall.	9/10/2015	RB	Complete	10/12/2015
31	The BAS needs graphics for the generator.	9/10/2015	RB	Complete	10/12/2015
32	Light fixture in fan section of AHU not working.	9/10/2015	DL	Commercial EC found fixture full of water. They are waiting for condensation problem to be resolved;	10/12/2015
33	Domestic water pump VFD in fault: Motor Stall.	9/10/2015	DL	Complete	10/12/2015
34	On all three FCU, filter access insulated over and requires screws to flex to be removed for access. Cable tray blocking access to FCU-3 filter.	9/10/2015	BE	Complete	10/12/2015
35	Spare belts required for all belt driven fans	9/10/2015	BE	Verify in spec	10/12/2015
36	Spare Fuse cabinet and spare fuses are not in the Electrical room.	9/23/2015	AH	Complete	10/12/2015
37	Room 009 wall penetrations are not Fire Stopped see attached pictures.	9/23/2015	AH	Complete	10/12/2015
38	Room 009 has materials and ladder that should be removed. Pictures attached.	9/23/2015	AH	Complete	10/12/2015
39	Also, the sign for Room 007-Fire Valve Room is laying on the floor, broken. Pic attached.	9/23/2015	AH	Complete	10/12/2015
40	Down spouts at east entrance dump onto sidewalk creating ice/slip hazard in winter	9/23/2015	DE	Complete	10/12/2015

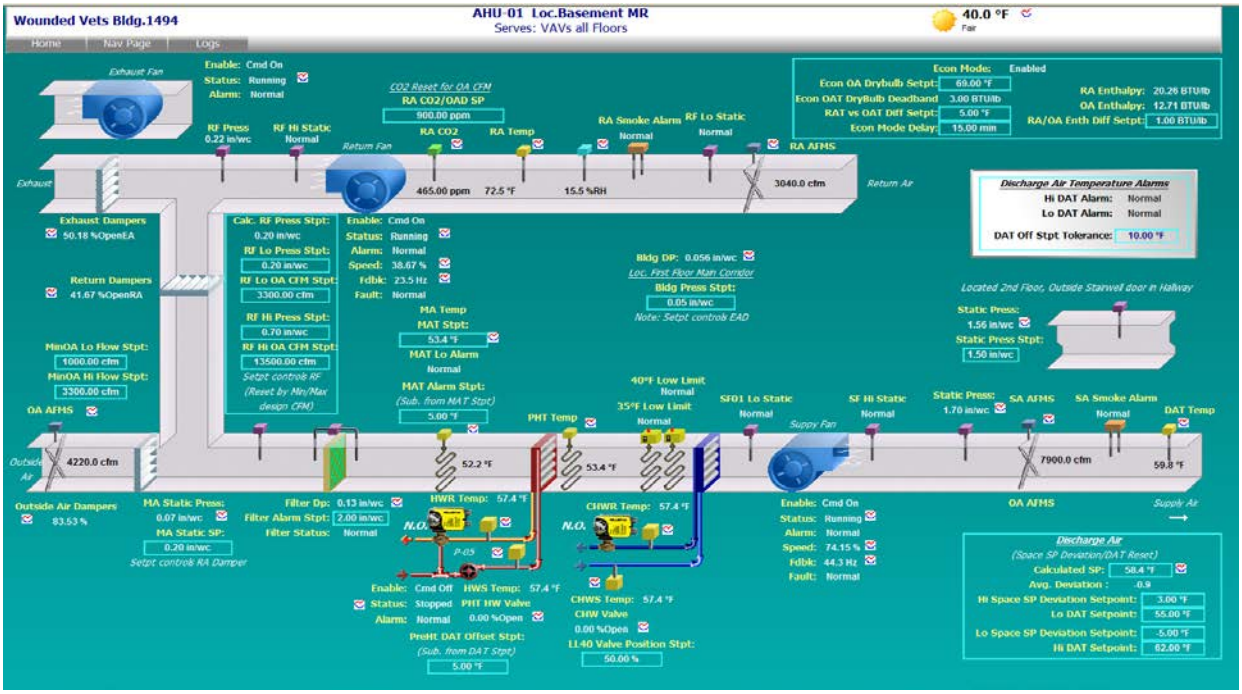
APPENDIX O - E x a m p l e BAS Graphics Verification

Utilities

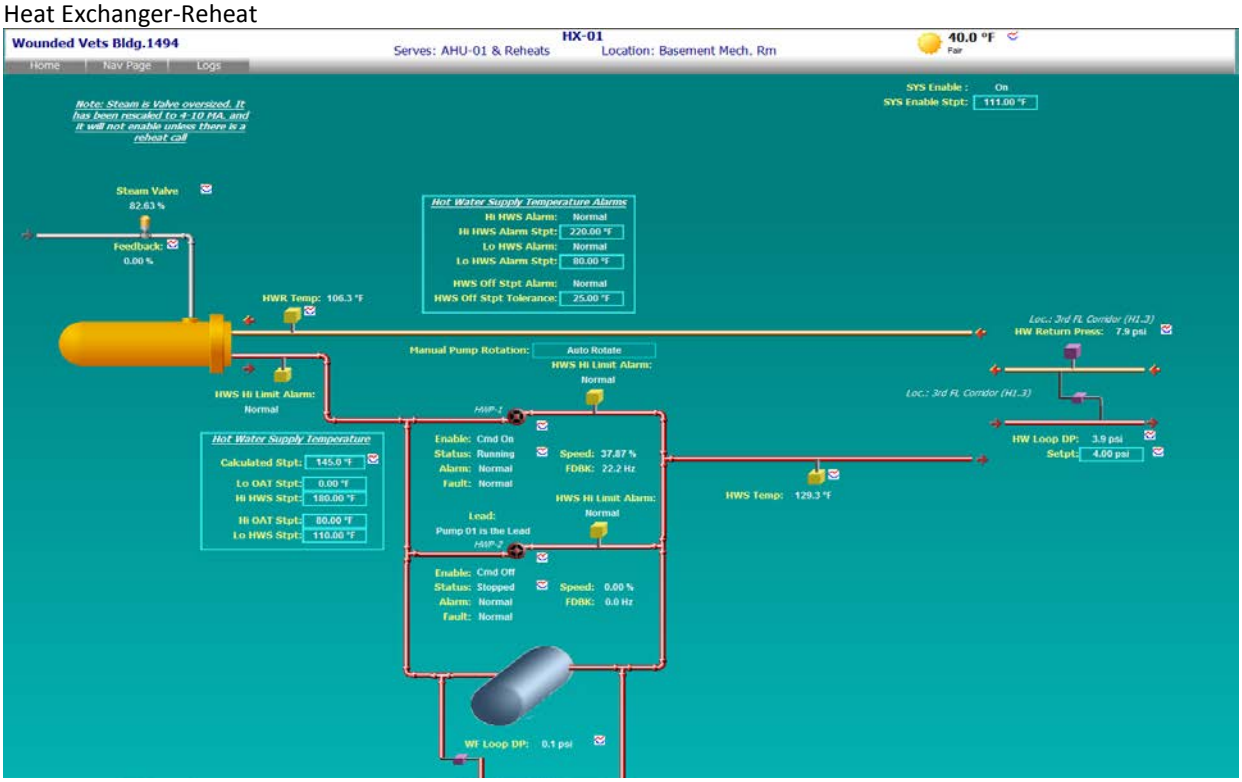
Chilled Water Entrance



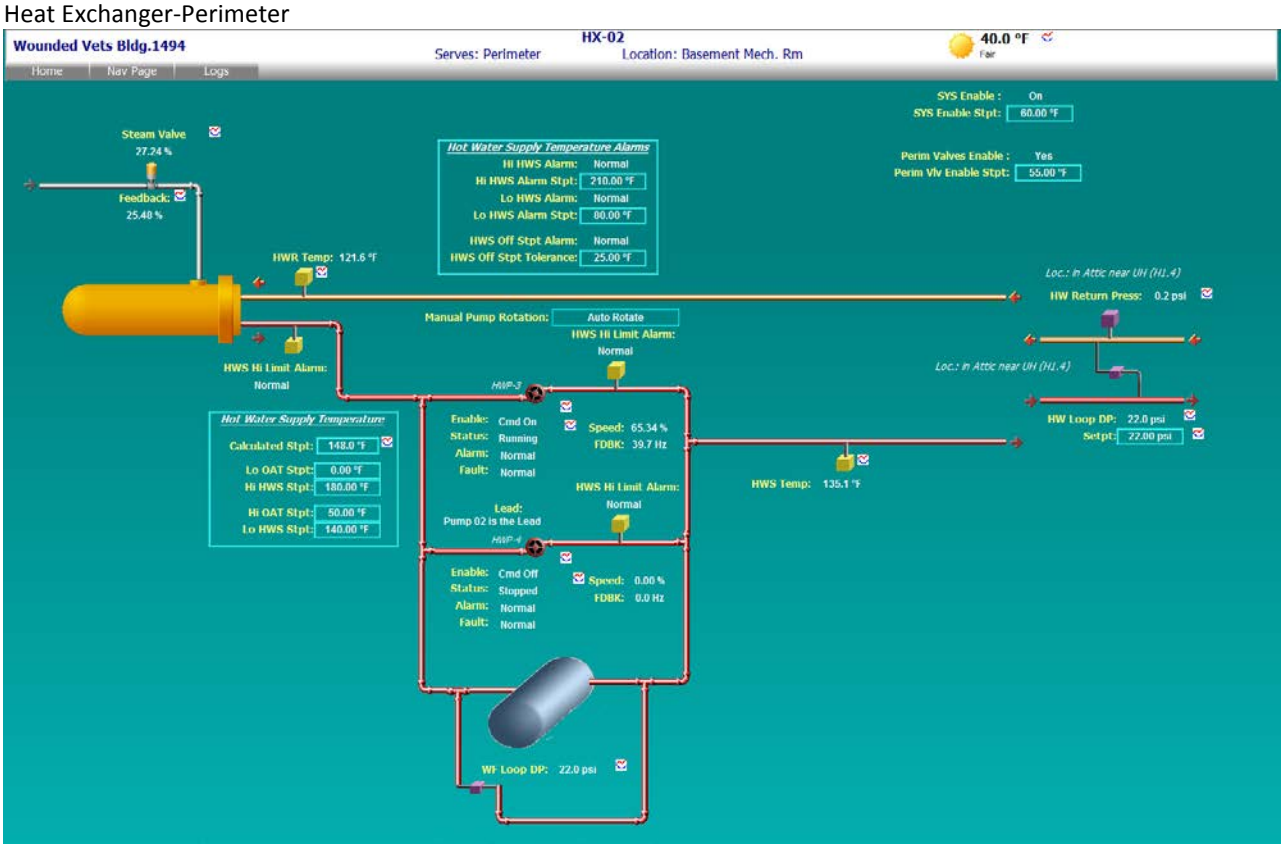
AHU-1



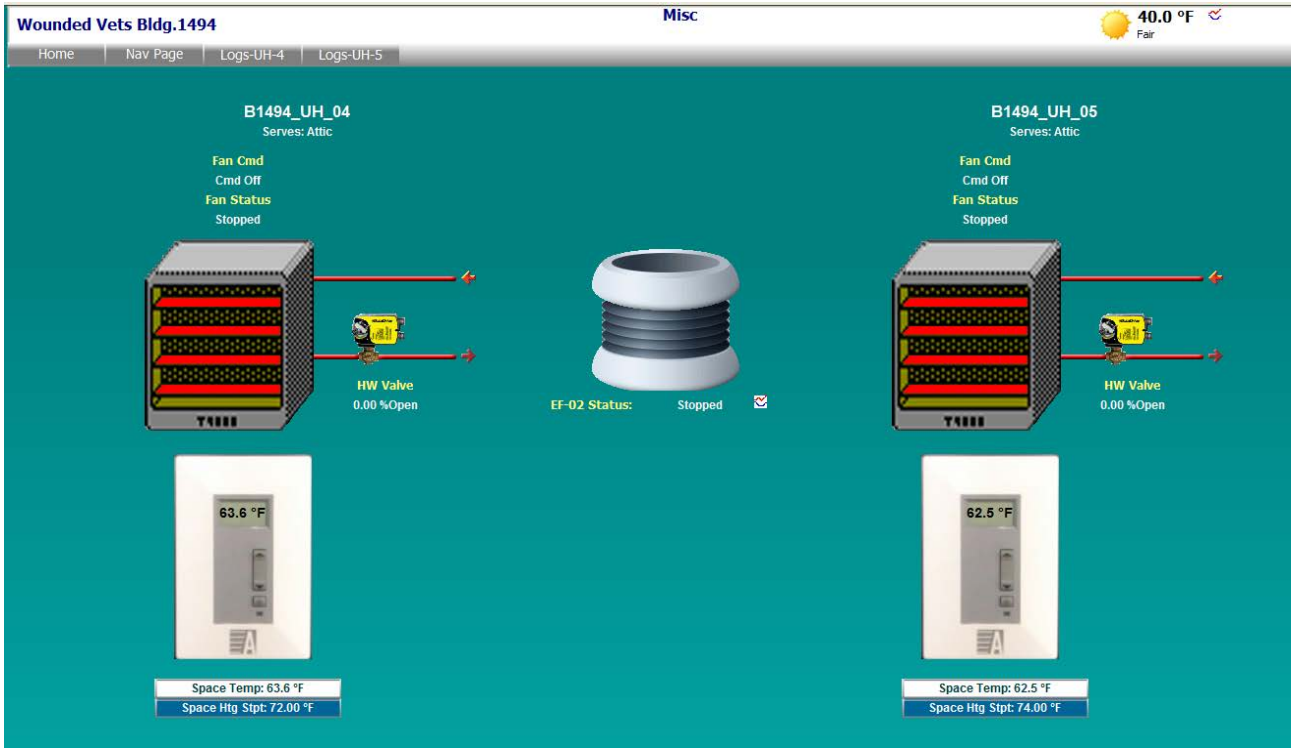
Heat Exchanger-Reheat



Heat Exchanger-Perimeter



Misc.



VAV Boxes

VAV Summary

VAV Tag	Area Served	Flow Stpt	Actual Flow	Damper Position	Disch Temp	Space Htg Stpt	Space Clg Stpt	Space Temp	Reheat Valve	High Flow Alarm	Low Flow Alarm
VAV_001	ST/HW Heat Exchanger	0 cfm	15 cfm	0.00 %	69.88 °F	60.00 °F	80.00 °F	71.5 °F	0.00 %	Normal	Normal
VAV_002	Building File Storage	0 cfm	0 cfm	0.00 %	70.03 °F	65.00 °F	78.00 °F	74.1 °F	0.00 %	Normal	Normal
VAV_009	Electrical ATS.	0 cfm	15 cfm	0.00 %	63.01 °F	60.00 °F	80.00 °F	72.4 °F	0.00 %	Normal	Normal
VAV_012	Corridors, Security Room	0 cfm	0 cfm	0.00 %	64.23 °F	68.00 °F	78.00 °F	72.1 °F	0.00 %	Normal	Normal
VAV_C002	Passage, Elevator Lobby	0 cfm	13 cfm	0.00 %	66.37 °F	68.00 °F	78.00 °F	72.6 °F	0.00 %	Normal	Normal

VAV Summary

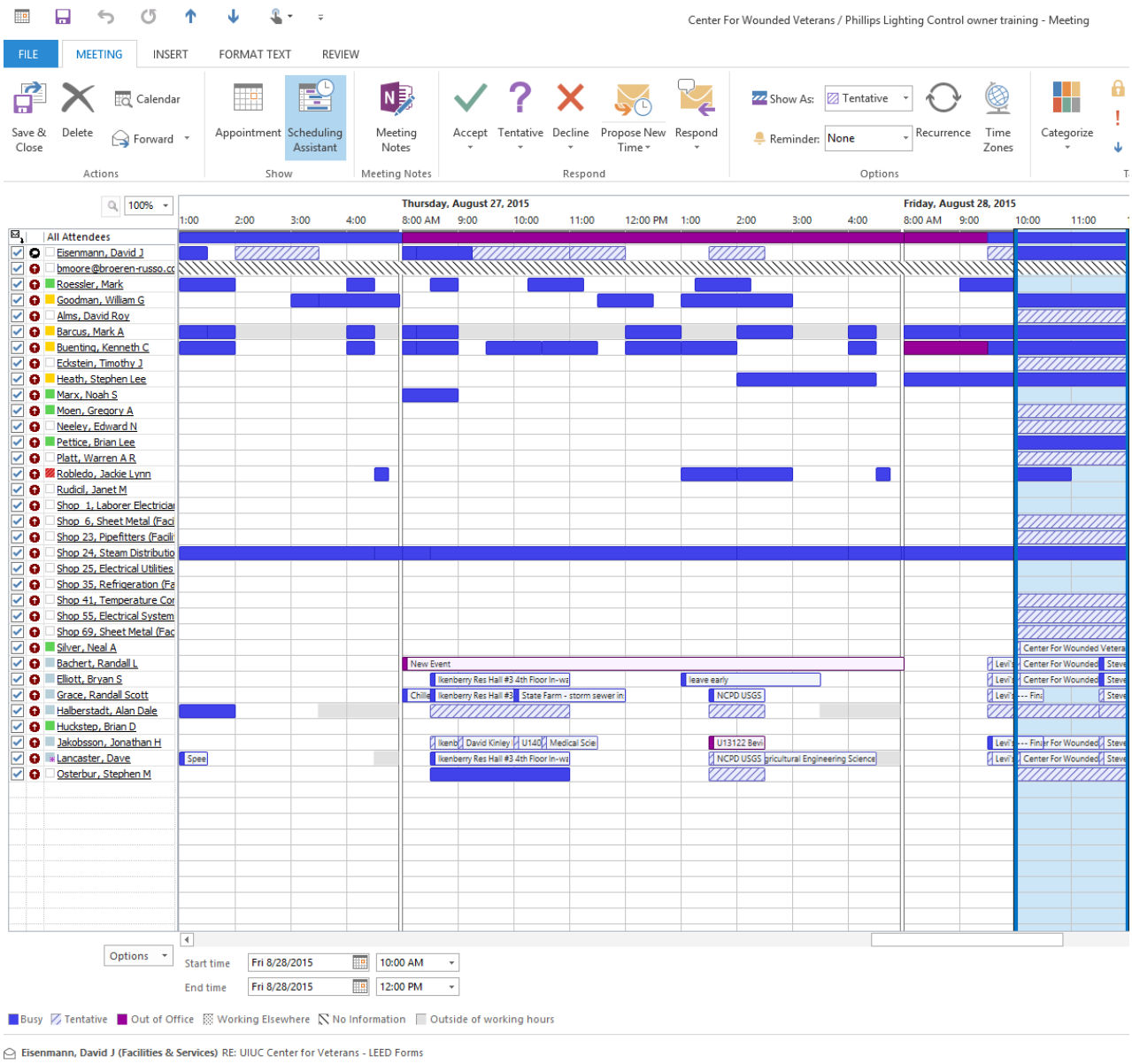
VAV Tag	Area Served	Flow Stpt	Actual Flow	Damper Position	Disch Temp	Space Htg Stpt	Space Clg Stpt	Space Temp	Reheat Valve	Box Occ Status	Occ Sensor Status	FT Valve	Space CO2
VAV_1001	Student Lounge	1383 cfm	1376 cfm	39.23 %	76.12 °F	70.00 °F	74.00 °F	69.2 °F	100.00 %	Occupied	On	83.00 %	
VAV_1002	Dining Food Storage	0 cfm	0 cfm	1.84 %	60.24 °F	68.00 °F	76.00 °F	71.8 °F	0.00 %	Unoccupied	Off	0.00 %	439.00 ppm
VAV_1003	Building Reception, Passage	180 cfm	174 cfm	19.73 %	91.82 °F	74.00 °F	78.00 °F	73.6 °F	51.85 %	Occupied	On	37.00 %	415.00 ppm
VAV_1004	Kitchen	220 cfm	215 cfm	19.58 %	58.69 °F	70.00 °F	74.00 °F	70.6 °F	0.00 %	Occupied	Off	0.00 %	
VAV_1005	Director's Office	191 cfm	201 cfm	1.67 %	59.55 °F	66.00 °F	70.00 °F	70.2 °F	0.00 %	Occupied	On	0.00 %	
VAV_1009	Benefits/ACSD Office	90 cfm	90 cfm	13.66 %	58.61 °F	68.00 °F	72.00 °F	68.9 °F	0.00 %	Occupied	On	0.00 %	
VAV_1011	Conference Room	0 cfm	0 cfm	0.00 %	62.53 °F	68.00 °F	86.00 °F	72.0 °F	0.00 %	Unoccupied	Off		433.00 ppm
VAV_1012	Restrooms	75 cfm	74 cfm	10.20 %	59.92 °F	70.00 °F	74.00 °F	70.5 °F	0.00 %	Occupied		0.00 %	
VAV_1013	Visitor Unit	90 cfm	92 cfm	15.00 %	60.34 °F	70.00 °F	74.00 °F	70.4 °F	0.00 %	Occupied	On	0.00 %	437.00 ppm
VAV_1015	Admin Office	0 cfm	16 cfm	0.00 %	62.81 °F	68.00 °F	76.00 °F	71.9 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_1017	Child Observation Room	0 cfm	22 cfm	0.00 %	74.45 °F	68.00 °F	76.00 °F	70.2 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_1017a	Child Observation Room	140 cfm	133 cfm	12.84 %	60.67 °F	69.00 °F	73.00 °F	69.3 °F	0.00 %	Occupied	Off	0.00 %	
VAV_1018	Computer Lab	0 cfm	0 cfm	5.88 %	61.33 °F	68.00 °F	76.00 °F	70.4 °F	0.00 %	Unoccupied	Off	0.00 %	499.00 ppm
VAV_1022	Classroom	250 cfm	236 cfm	17.98 %	58.85 °F	66.00 °F	70.00 °F	69.6 °F	0.00 %	Occupied	On	0.00 %	454.00 ppm
VAV_1024	Group Study/Roof Access	186 cfm	179 cfm	25.27 %	81.24 °F	76.00 °F	76.00 °F	75.7 °F	60.57 %	Unoccupied	Off	29.00 %	422.00 ppm
VAV_1028	Vet and Family Counseling Office	60 cfm	57 cfm	8.18 %	62.86 °F	75.00 °F	77.00 °F	75.3 °F	0.00 %	Occupied	On	0.00 %	
VAV_1030	Vet & Family Counseling / Corr.	0 cfm	0 cfm	0.00 %	71.35 °F	68.00 °F	76.00 °F	68.2 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_C1000	Main Entry	165 cfm	160 cfm	19.83 %	72.11 °F	65.00 °F	78.00 °F	61.2 °F	100.00 %	Unoccupied			
VAV_C1002	Elevator Lobby	50 cfm	49 cfm	8.01 %	59.48 °F	70.00 °F	74.00 °F	71.1 °F	0.00 %	Unoccupied		0.00 %	

VAV Tag	Area Served	Flow Stpt	Actual Flow	Damper Position	Disch Temp	Space Temp Stpt	Space Temp Stpt	Space Temp	Reheat Valve	Box Occ Status	Occ Sensor Status	FT Valve	Space CO2
VAV_2001	Clinic Consultation	0 cfm	22 cfm	0.00 %	66.52 °F	68.00 °F	76.00 °F	69.3 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_2002	Clinic Consultation	0 cfm	12 cfm	0.00 %	65.50 °F	68.00 °F	76.00 °F	69.7 °F	0.00 %	Unoccupied	Off		
VAV_2003	Vet Coord. Office/Corr.	0 cfm	0 cfm	1.89 %	95.43 °F	68.00 °F	76.00 °F	67.8 °F	0.00 %	Unoccupied	Off	0.00 %	433.00 ppm
VAV_2004	Career Service	115 cfm	112 cfm	23.46 %	75.44 °F	72.00 °F	76.00 °F	71.8 °F	34.85 %	Occupied	On	16.00 %	475.00 ppm
VAV_2005	Rehab Office/Corridor	0 cfm	0 cfm	1.92 %	64.96 °F	68.00 °F	76.00 °F	71.8 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_2006	Rehab Office	110 cfm	110 cfm	6.90 %	61.41 °F	70.00 °F	74.00 °F	70.4 °F	0.00 %	Occupied	On	0.00 %	
VAV_2007	Rehab Office/Corridor	0 cfm	0 cfm	0.00 %	62.92 °F	68.00 °F	76.00 °F	70.6 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_2008	Rehab Services Office	0 cfm	0 cfm	0.00 %	66.10 °F	68.00 °F	78.00 °F	71.5 °F	0.00 %	Unoccupied	Off		
VAV_2009	Vet Admin Office	445 cfm	467 cfm	9.84 %	60.38 °F	66.00 °F	70.00 °F	70.9 °F	0.00 %	Occupied	On		
VAV_2010	ACAD Counseling Office	0 cfm	0 cfm	0.00 %	63.14 °F	68.00 °F	76.00 °F	69.5 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_2011	Fitness Health Wellness	370 cfm	374 cfm	20.00 %	59.31 °F	66.00 °F	70.00 °F	67.1 °F	0.00 %	Occupied		0.00 %	423.00 ppm
VAV_2011a	Physical Therapist	0 cfm	0 cfm	0.00 %	61.72 °F	68.00 °F	76.00 °F	68.7 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_2012	Lab Faculty Office	0 cfm	0 cfm	0.00 %	64.79 °F	68.00 °F	76.00 °F	69.8 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_2013	Research Laboratory	250 cfm	250 cfm	17.39 %	79.02 °F	69.00 °F	73.00 °F	68.7 °F	52.00 %	Occupied	On	25.00 %	457.00 ppm
VAV_2014	Lab Faculty Office	0 cfm	0 cfm	0.00 %	62.63 °F	68.00 °F	76.00 °F	68.0 °F	0.00 %	Unoccupied	Off	0.00 %	530.00 ppm
VAV_2015	Research Laboratory	0 cfm	0 cfm	2.81 %	64.82 °F	68.00 °F	76.00 °F	68.3 °F	0.00 %	Unoccupied	Off	0.00 %	433.00 ppm
VAV_C2000	Corridor/Elevatory Lobby	90 cfm	70 cfm	14.29 %	84.59 °F	70.00 °F	74.00 °F	69.8 °F	16.28 %	Unoccupied		8.00 %	

VAV_3001	Residental Suite 11	50 cfm	43 cfm	11.22 %	59.12 °F	65.00 °F	71.00 °F	66.1 °F	0.00 %	Unoccupied	Off	0.00 %	457.00 ppm
VAV_3002	RA Suite 2	50 cfm	53 cfm	10.95 %	59.64 °F	67.00 °F	73.00 °F	67.6 °F	0.00 %	Unoccupied	Off	0.00 %	457.00 ppm
VAV_3003	Residential Suite 10	155 cfm	188 cfm	19.58 %	61.17 °F	74.00 °F	76.00 °F	74.2 °F	25.57 %	Occupied	On	15.00 %	597.00 ppm
VAV_3004	Residential Suite 12	125 cfm	128 cfm	17.58 %	85.58 °F	72.00 °F	76.00 °F	71.0 °F	47.42 %	Occupied	On	96.00 %	457.00 ppm
VAV_3005	Residential Suite 9	50 cfm	50 cfm	12.20 %	64.00 °F	73.00 °F	79.00 °F	73.1 °F	0.00 %	Unoccupied	Off	0.00 %	428.00 ppm
VAV_3006	Resident Prog. Office	90 cfm	67 cfm	13.58 %	62.42 °F	69.00 °F	73.00 °F	69.1 °F	8.28 %	Occupied	On	6.00 %	459.00 ppm
VAV_3007	Residential Suite 8	70 cfm	71 cfm	17.42 %	63.01 °F	71.00 °F	75.00 °F	71.1 °F	0.00 %	Occupied	On	0.00 %	557.00 ppm
VAV_3009	Residential Suite 7	125 cfm	129 cfm	18.45 %	87.11 °F	73.00 °F	77.00 °F	71.9 °F	83.57 %	Occupied	On	100.00 %	535.00 ppm
VAV_3011	Residential Suite 6	70 cfm	72 cfm	14.14 %	59.85 °F	66.00 °F	70.00 °F	67.8 °F	0.00 %	Occupied	On	0.00 %	546.00 ppm
VAV_3012	Residential Suite 1	80 cfm	81 cfm	13.60 %	60.68 °F	68.00 °F	72.00 °F	70.0 °F	0.00 %	Occupied	On	0.00 %	670.00 ppm
VAV_3013	Residential Suite 5	125 cfm	125 cfm	14.80 %	85.05 °F	68.00 °F	72.00 °F	67.4 °F	49.57 %	Occupied	On	60.00 %	942.00 ppm
VAV_3014	Residential Suite 2	80 cfm	81 cfm	10.99 %	64.63 °F	70.00 °F	74.00 °F	71.1 °F	0.00 %	Unoccupied	Off	0.00 %	474.00 ppm
VAV_3015	Residential Suite 4	0 cfm	15 cfm	0.00 %	61.43 °F	65.00 °F	71.00 °F	68.4 °F	0.00 %	Unoccupied	Off	0.00 %	461.00 ppm
VAV_3017	Residential Suite 3	70 cfm	66 cfm	18.60 %	59.70 °F	70.00 °F	74.00 °F	70.3 °F	0.00 %	Occupied	On	0.00 %	520.00 ppm
VAV_3018	Laundry	50 cfm	49 cfm	8.21 %	66.06 °F	70.00 °F	74.00 °F	70.2 °F	0.00 %	Unoccupied	Off	0.00 %	
VAV_3019	RA Suite 1	0 cfm	0 cfm	0.00 %	63.70 °F	68.00 °F	74.00 °F	69.0 °F	0.00 %	Unoccupied	Off	0.00 %	448.00 ppm
VAV_C3000	Elevatory Lobby	110 cfm	108 cfm	15.46 %	62.14 °F	70.00 °F	74.00 °F	69.9 °F	30.14 %			18.00 %	
VAV_C3001	Corridor	80 cfm	82 cfm	14.74 %	84.82 °F	72.00 °F	76.00 °F	70.6 °F	75.57 %			100.00 %	

COMMISSIONING REPORT

Appendix P –Owner Training



Appendix Q – O&M Manuals

Table of Contents

O&M's received.

Facilities Information Resources Project Submittal Log

J11098/U130	Center For Wounded Veterans in Higher Education		
Project #	*Project Name (as entered in FCPWeb)*		
Mark Roessler		1494	LCM Architects
PM:		*Bldg # / Utility:*	*PSC:*
yellow =	*issues need resolving*		

Operations & Maintenance Manuals

Rcvd Date	Division	Company	# Copies	CD	Notes
12/7/2015		UL	1		*mastr label for lighting protection*
2/25/2016	Division 1 - General	Broeren Russo Companies			*vols and 2*
2/25/2016	Division 2- Plumbing	A&R Mechanical	3		
2/25/2016	Division 3 - Heating	A&R Mechanical	3		
2/25/2016	Division 4- Ventilation	A&R Mechanical	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 5- Electrical	Commercial Electric	3		
2/25/2016	Division 6- Fire Protection	Superior Fire Protection Systems Inc.	3		
2/25/2016	Elevator	Thyssenkrupp Elevator	2		
2/25/2016	Voice Data Communications	Conference Technologies Inc..	2		
2/25/2016	Warranty & Cable Test Results	Commercial Electric	1	1	*sent r CD*

Heat Exchanger

RECO USA

INSTALLATION, OPERATION, & MAINTENANCE MANUAL

THERMO-DYNE® HX

RECO USA JOB# : U1718000

PROJECT: Center For Wounded Veterans In Higher Education

REPRESENTATIVE: Sandberg Co.
PHONE: 309-796-2371
FAX: 303-796-2330

RECO USA
1839 Dunbar Road
Cayce, S.C. 29033
Phone: (803) 794-3360
Fax: (803) 791-3304

American Investors LLC, dba RECO USA

Generator

Center for Wounded Veterans in Higher Education

UIUC Project # U13036

Operation and Maintenance Manual

26 32 13 Engine Generators
26 36 23 Automatic Transfer Switch

Electrical Contractor:

Commercial Electric Inc.
Commercial & Industrial Wiring Since 1969
MEMBER: I.B.E.W. & N.E.C.A.

PHONE: 217 235 0616
FAX: 217 235 0141

E MAIL: commelectric@consolidated.net

720 South 17th St. • P.O. Box 1157 • Mattoon, Illinois 61938

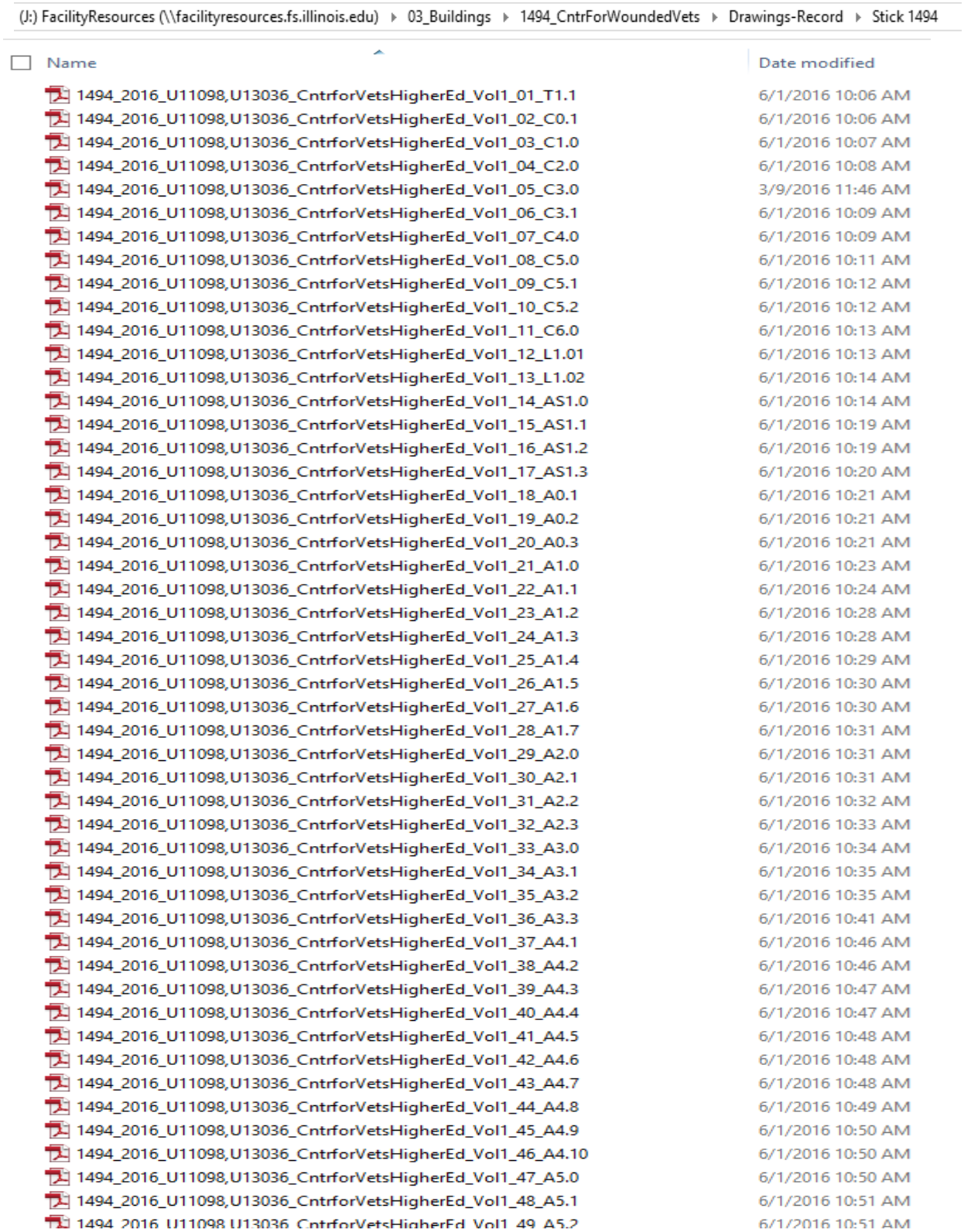
Submittal Date: June 2015

COMMISSIONING REPORT

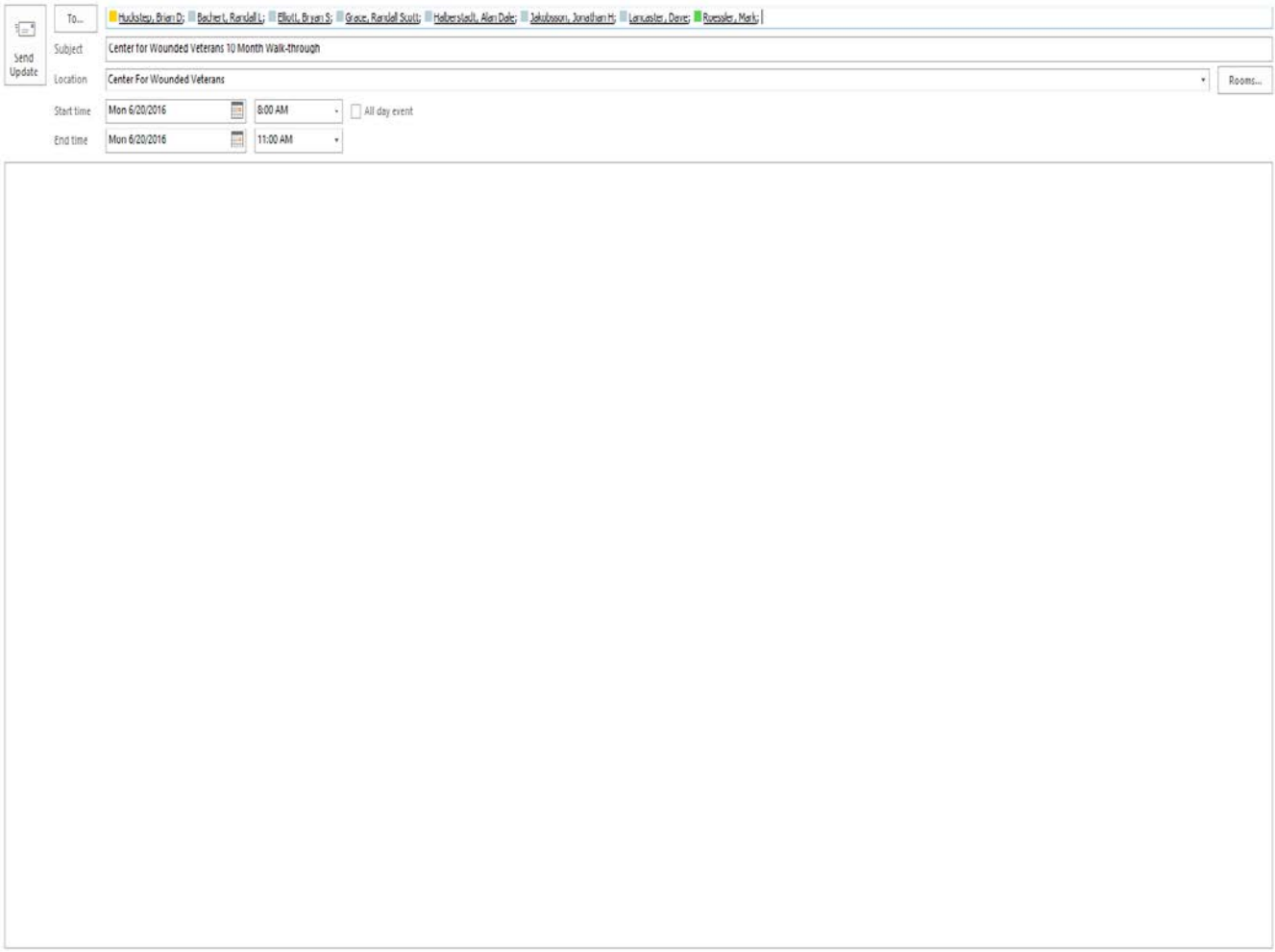
Elevator

COMMISSIONING REPORT

ELECTRONIC RECORD DRAWINGS



Appendix R – 10 Month Warranty Walkthrough



COMMISSIONING & INSPECTION PROPOSAL

APPENDIX S – PROPOSAL FOR BUILDING INSPECTION AND COMMISSIONING

Subject: University of Illinois at Urbana-Champaign Center for Veterans in Higher Education, UIUC Building # 1294
PROPOSAL FOR BUILDING INSPECTION AND COMMISSIONING

At your request, the F & S Division is pleased to submit to you a proposal for construction inspection, systems commissioning and project close-out services. We are confident that these services, representing our revised and expanded role in the construction process, will be of great benefit in providing contract compliant and functional facilities. These services will also allow a smoother, less time consuming transition from construction to occupancy. The following information details our proposed scope of services, the organization for providing those services, and an estimate of fees.

PROPOSED SCOPE OF SERVICES

Design Phase

1. Review the Project Owner's Scope (i.e. Owner's Project Requirements), subsequently the Designer's Basis of Design (BoD) as detailed.
2. Prepare specifications to be included in the Construction Documents that describe and detail the Commissioning process.
3. Preview Contractor-provided / prepare pre-functional test procedures for inclusion in Construction Documents.
4. Review Construction Documents at Design Development (DD), 50%, 95% and 100% completion stages.

Bidding and Award Phase

Attend Pre-bid Meeting to provide an overview of construction inspection, component inspections systems commissioning and project closeout initiatives that will be employed in this project. Provide a brief introduction to the process, paperwork, and Construction Team's roles and responsibilities.

Construction Phase

1. Attend Pre-construction meeting to explain (in detail) construction inspection procedures, commissioning activities, utilize the commissioning plan (developed/updated for the Project) and project close-out requirements.
2. Advise the successful bidders of the inspection, commissioning and project close-out schedule requirements for incorporation into the Project Master Schedule.
3. Provide inspection services, to confirm work is in conformance with contract documents, for the duration of the construction, during substantial completion and prior to final acceptance. Recommend stop any work that is observed in nonconformance and notify the Project Manager immediately. Make recommendations for corrective actions.
4. Meet, as needed, with construction team to establish activities and schedules for inspecting and commissioning the building. Attend routine progress meetings.

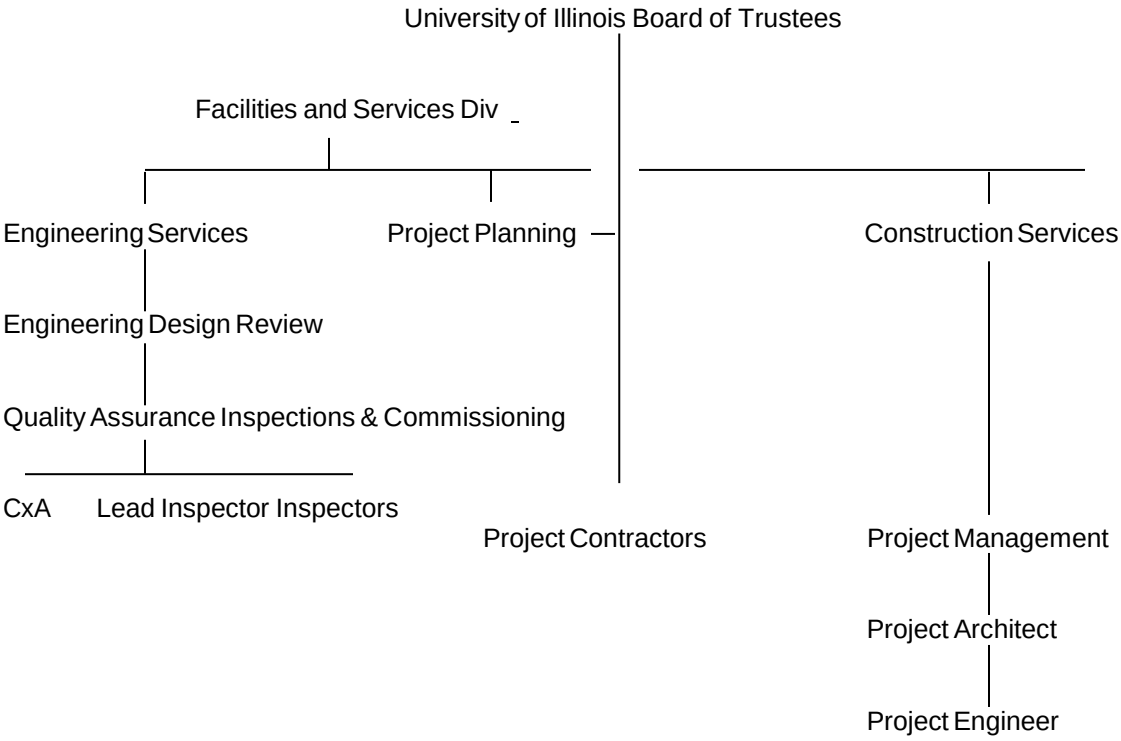
5. Review shop drawings, submittals and change order proposals for technical coordination of all components.
6. Observe all pre-functional / testing procedures and equipment start-up and activations which are required by the contract documents. Provide written reports of results. Require tests to be repeated as necessary to confirm correction of any problems discovered. Coordinate resolutions of all problems relating to test failures.
7. Implement building systems commissioning procedures. Reaffirm roles and responsibilities with project team members as per the Contract Documents. Observe and document functional performance procedures (Project Contract requires Contractors to perform work) to verify equipment or system installations are in compliance with the Contract Documents.
8. Participate in the Substantial l Completion process. Provide input to the A/E for the punch-list. Review submitted O&M Manuals. Organize and coordinate required operator training and systems demonstrations.
9. Insure that all Substantial Completion punch-list items are fully completed. Make recommendation when work is ready for final inspection. Make final inspections and assist A/E with all closeout procedures.
10. Finalize Commissioning Report.
11. Coordinate with the Architect ensuring the Contractor assembles the Systems Manual sets making available relevant system(s) information for subsequent re-commissioning.
12. Coordinate and confirm schedules for Contractor/Manufacturer provided Training and be completed within the Warranty period.

Warranty and Maintenance Phase

1. Establish and implement administration and management procedures for processing maintenance and warranty requests. Insure resolutions for all requests are implemented. Maintain a Warranty / Maintenance Activity Log.
2. Establish and implement administration and management procedures for Preventative Maintenance Program to be performed by the F & S Division during the warranty period.
3. Conduct a tenth-month walk-through of the project with Operation and Maintenance personnel.
4. Review Warranty and maintenance log and confirm that no issues are outstanding.
5. Prepare final Project Closeout Report.

COMMISSIONING & INSPECTION PROPOSAL

PROJECT ORGANIZATIONAL STRUCTURE



The F & S Division's assigned Project Inspection Liaison (Lead Inspector) will remain the single point of contact for the Project Team during Construction and Warranty. All correspondence, inspection comments and commissioning criteria will flow through this representative. The Liaison will dispatch inspection and commissioning personnel and distribute all documentation of observations and reports.

Construction inspection and systems commissioning will be performed by technically qualified F & S Division craftsmen, each having multiple years of experience commissioning University owned buildings and will be specifically assigned to this project. Staff will have a full understanding of the conditions specified in the contract documents and be prepared to enforce its requirements.

Engineering support will be provided by F & S Division Engineering and Utilities Services. Civil, Mechanical and Electrical engineering disciplines are represented in this group, with advanced expertise in the areas of controls, utilities, heating and ventilation systems design, and testing and balancing.

We the undersigned agree to the proposal for Building Inspection and Commissioning.

Owner Signature _____

CxA Signature _____

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN
OPERATION AND MAINTENANCE DIVISION

Professional Services Agreement
PROJECT INSPECTION AND COMMISSIONING
Revised May 28, 2002

A. Project Proposal

B. Site Selection

C. Project Conceptualization

- All project budgets shall include within their Owner's cost, a line item for Commissioning and Inspection services. This budget will also be shown in CDB budgets (but funds are not included in the CDB funds).

- Provide proposal for Inspection/Commissioning services.

- For projects with an estimated construction cost under $10M, 1.5% fee will be used. This fee will be computed on the budgeted construction cost with .5% designated for design phase, .75% for construction phase and .25% for warranty phase. Billing of fees will occur at the beginning of each phase.

- For projects with an estimated construction cost over $10M, the fee will be negotiated based upon the projected number of man-hours to perform the services and an associated fully burdened labor rate. Billing of fees will occur at the beginning of each phase.

- All proposals will include a projection of the number of man-hours required to complete commissioning activities for all specified systems.

D. Project Feasibility

E. Program Statement Development

F. Funding Sources

G. Project Approval

- When a fee is provided to O&M, the fee will be computed on the budgeted construction cost.

H. A/E/CM Selection

- Attend meeting among PDC, Consultant(s), and Inspection/Commissioning Team members to discuss the pre-construction phase roles, the construction phase roles, on-site responsibilities and any duplication of services prior to negotiation of the consultant's services. (See attached Description of Services)

I. Program Verification

- Review the Program Verification Documents to make sure documents contain requirements that support the commissioning objectives. Deliver comments to PDC.

J. Schematic Design

- Review the Schematic Design Documents to make sure documents contain requirements that support the inspection/commissioning objectives. Deliver comments to PDC.

K. Design (BOT) Approval

L. Design Development

- Review the Design Development Documents to make sure documents contain requirements that support the inspection/commissioning objectives. Deliver comments to PDC.

M. Construction Documents

- Prepare specifications to be included in the Construction Documents that describe and detail the Inspection/Commissioning process.

- Prepare specifications for standard Close Out language to be included in the Construction Documents. (See Attached Section 01700 – language to be modified.)

- Prepare pre-functional test procedures for inclusion in Construction Documents.

- Review the Construction Documents at 50% and 100% completion stages, to make sure documents contain requirements that support the inspection/commissioning objectives. Deliver comments to PDC.

- Review the Bidding Documents to confirm all agreed upon comments were incorporated into the drawings and specifications. Deliver comments to PDC.

N. Bidding and Award

- Attend Pre-bid Meeting to provide an overview of construction inspection, systems commissioning, and project closeout initiatives that will be employed in the project. Provide a brief introduction to the process, paperwork, and Contractors' roles and responsibilities, as described in the Bidding Documents. (See attached Pre-bid Meeting Script)

- Assist PDC in Evaluating the Consultant

O. Construction

- Attend Pre-construction Meeting to introduce the Inspection/Commissioning Team and to explain (in detail) construction inspection procedures, commissioning activities and project close-out requirements, as described in the Contract Documents. (Sample Agenda Items Attached).

- Advise the successful bidders of the inspection, commissioning and project close out schedule requirements for incorporation into the Project Master Schedule, as described in the Contract Documents.

- Provide inspection services, as required, to help confirm work is in conformance with Contract Documents, for the duration of the construction, during substantial completion, and prior to final acceptance. Deliver inspection reports to PDC. Make recommendations for corrective actions to PDC.

- All inspection comments are prepared by individual Inspectors but distributed by the Lead Inspector to PDC, the Consultant, and the O&M Liaison. If comments are of an emergency nature, Inspectors may immediately discuss directly with the Consultant, then follow up in writing to PDC, the Consultant, and the O&M Liaison. Responses are expected from the Consultant if they do not concur with O&M. The Inspection Team will provide a weekly log to PDC. The Log should be included in the weekly progress meeting minutes.

- Attend all progress meetings, recognizing that conflicts may occur occasionally. Meet, as required, with construction team to establish activities and schedules for inspecting and commissioning of the building and its systems.

- Review shop drawings, submittals, RFI (Request for Information) responses, and RFP (Request for Proposal) for technical coordination of all system components. Deliver comments to PDC.

- All shop drawings are submitted to the O&M Inspection Team Clerk simultaneously with the Consultant. O&M comments are returned to PDC and Consultant within (5) working days. Responses are expected from the Consultant if they do not concur with O&M. Upon approval by the Consultant(s), one copy of each shop drawing should be returned to the O&M Inspection Team Clerk. If all are provided during the course of the project, no additional sets are required at the finish of the project.

- Observe all testing procedures and equipment start-up and activations, which are required by the Contract Documents. Provide written reports of results to PDC. Advise the project team of any tests that need to be repeated and confirm the corrective requirements of any problems discovered. Coordinate resolutions of all problems relating to test failures with the project team.

- The Inspection/Commissioning Team must receive (24) hour notification of all testing, that is to be done by the contractor, according to the Contract Documents. Inspectors will observe and confirm all testing. Consultant shall attend, as required, to provide system design information. Forms for documenting the results will be provided, collected and filed in the final commissioning report. (See attached form)

- The Inspection/Commissioning Team must receive (72) hour's notification of all equipment start-ups that are indicated in the Contract Documents. Inspector will observe and confirm all start-ups. Consultant shall attend, as required, to provide system design information. Forms for documenting the results will be provided, collected and filed in the final commissioning report.

- Implement building systems commissioning procedures. Reaffirm roles and responsibilities with the project team per the Contract Documents. Perform and document functional performance tests to verify equipment or system installations are in compliance with the Contract Documents.

- The Contractors will conduct a thorough and systematic performance test on each individual element, subsystem, and total system. These tests will be conducted in the presence of the Inspection/Commissioning Team. The Consultant shall attend, as required, to provide system design information. Test will demonstrate that all systems and components operate in all reasonable respects and comply with the requirements of the Contract Documents. (Checklists included in attached Section 01700 – language to be modified). If items are discovered during performance testing that may prevent Owner's acceptance of the project, notify PDC in writing immediately.

- Review submitted O&M manuals. Deliver comments to PDC. Organize and coordinate required operator training systems demonstrations with the project team.

- The Contractors and the Consultant(s) will provide formal training in the operation and maintenance of all building systems as specified in the contract documents. O&M manuals shall be the basis of this training. All videotaping of the sessions will be determined by the project team and performed by O&M. Other training may be required from the manufacturer for special equipment as specified in the Contract Documents.

- Participate in the substantial completion process, advising PDC regarding the condition of the project with respect to substantial completion. Deliver comments to PDC.

P. Substantial Completion

- Provide input for the punchlist**,** which is prepared by the Consultant and attached to the Certificate of Substantial Completion. Deliver comments to PDC. Items identified by O&M shall be included on the Consultant's punchlist or the Consultant shall provide justification for not including them.

- Assist PDC in Evaluating the Consultant and Contractors.

Q. FF&E (if applicable)

R. Occupancy

S. Warranty

- Establish and implement administration and management procedures for processing maintenance and warranty requests. Insure resolutions for all requests are implemented. Maintain a Warranty/Maintenance Activity Log. Keep PDC apprised of the status of all warranty items.

- The Lead Inspector will be responsible for getting all warranty issues corrected, confirmed and documented. (See Attached form). Keep PDC apprised of the status of all warranty items.

- Conduct a nine-month "walk-through" of the project with Operation and Maintenance personnel. Review Warranty and Maintenance Log and confirm that no issues are outstanding. Deliver comments to PDC.

- PDC will schedule and conduct the 11-month Warranty "walk-through" Meeting with the project team. The Lead Inspector will attend.

T. Final Completion

- Finalize Commissioning Report.

- Make final inspection (when notified by the Contractors that the substantial completion punchlist is complete) with Consultant to determine if all of the punchlist items are fully complete. Deliver comments to PDC. Assist the Consultant with all close out procedures.

- Prepare final Project Closeout Report.

- Assist PDC in Evaluating the Consultant and Contractors.

U. Post-Construction Evaluation

- Participate in the post-construction evaluation of the delivery process for the project.

Documentation Required

- Project Plans
- Approved Shop Drawings
- RFI
- RFP
- Executed Change Orders
- Meeting Minutes
- Project Schedules

Organization of Staff (See Attached) –

PDC 2/21/01
O&M Revisions 3/19/01
PDC Revised 05/28/2002