Commissioning Report

Natural History Building Design & Construction
UNIVERSITY OF ILLINOIS
URBANA – CHAMPAIGN

BUILDING 32 **PROJECT NO U-13016**

Facilities & Services Engineering Services,

Quality Assurance Division

For New Construction & Major Renovations (LEED 2009)

U.S. Green Building Council
1015 18th Street NW, Suite 805
Washington, DC 20036
(202) 828-7422 Phone
(202) 828-5110 Fax

www.usgbc.org info@usgbc.org leedinfo@usgbc.org www.leedbuilding.org

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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 P.

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 the NHB Renovation *The Systems are: HVAC and related controls, Lighting and control, Domestic Hot Water System, Electrical distribution and Emergency Power generation..*

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 Appendices O & P. 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 Chemistry Department 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 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.

Brian Huckstep, 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 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 November 22, 2018 with the Occupant/Owner verifying status of warranty claims and overall building and systems performance.

COMMISSIONING AUTHORITY

Mr. Brian Huckstep was the designated Commissioning Authority and primary author of this Report. 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 2007. 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 previous major projects ranging from Silver to Platinum to date. Major Projects equate to buildings typically larger than 50,000 sq. ft. Mr. Huckstep does not report to or have any accountability to the University Construction / Construction Management Division or the University Planning Division. Mr. Huckstep also is independent of the AE Design group and independent of all Contractors.

Mr. Huckstep, as well as five Inspectors and one other Lead Inspector report to Mr. Jim Sims, the Director for F&S Quality Assurance Division of the University. Mr. Brian Huckstep is the Lead Inspector for this Project and also became LEED Accredited in 2008. Brian was the LEAD inspector and CxA for Ikenberry Residence Hall Phase C&D and Ikenberry Commons Residence Hall #2. Both of those projects were LEED certified.

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

Project seeking certification. See Appendix P 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 M 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 Owner's Project Requirement document throughout Pre-Design, Design, Construction, and Occupancy and Operations.

IV. Project Schedule

Projected Schedule	
Conceptualization	01/07/11 - 12/15/11
Program Verification	03/13/13 - 04/13/13
Schematic Design	04/14/13 - 05/23/13
BOT for Design Approval	
Design Development	05/24/13 - 08/19/13
Construction Document Phase	
50% Submittal	08/20/13 - 10/29/13
95% Submittal	10/30/13 - 01/17/14
Bidding and Negotiation *	01/18/14 - 07/02/14
BOT for Approval	06/05/14
Construction**	07/03/14 - 11/29/16
Commissioning	09/02/16
Substantial Completion	10/31/16
Final Completion	11/29/16
Total Duration	01/07/11 - 11/29/16
Post Construction (Warranty)	10/31/16 - 10/31/17

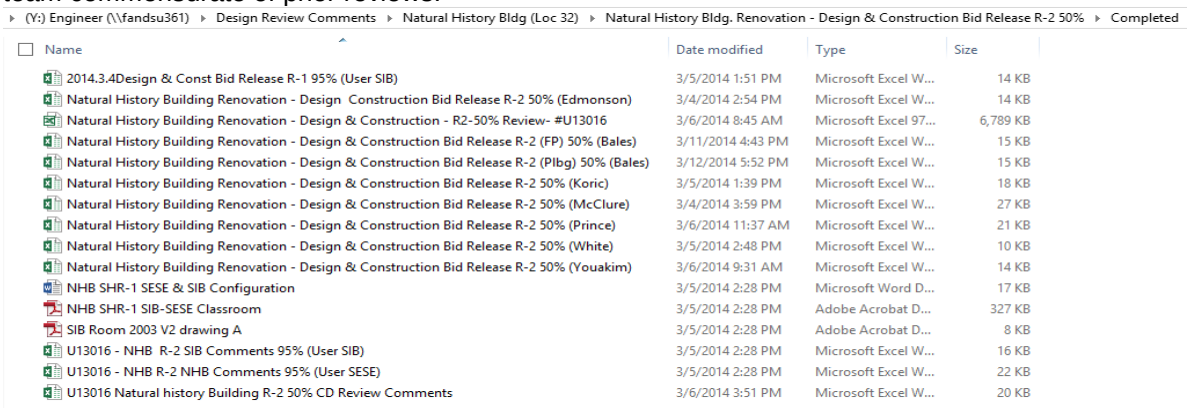
BASIS OF DESIGN - REVIEW

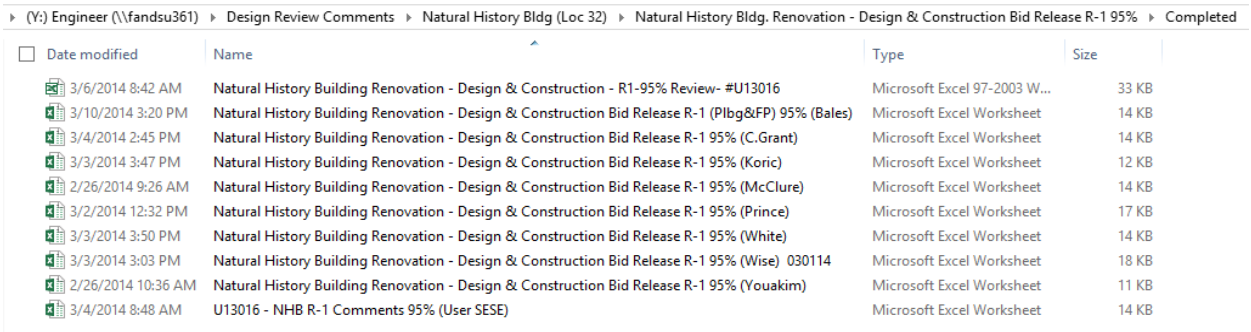
The BOD for this project was developed by the Engineer of Record for the NHB Renovation and may be found in Appendix C.

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.





(Y:) Engineer (\\fandsu361) ▸ Design Review Comments ▸ Natural History Bldg (Loc 32) ▸ Natural History Bldg. Renovation - Design & Construction Bid Release R-1 95% ▸ Completed

Date modified	Name	Type	Size
3/6/2014 8:42 AM	Natural History Building Renovation - Design & Construction - R1-95% Review- #U13016	Microsoft Excel 97-2003 W...	33 KB
3/10/2014 3:20 PM	Natural History Building Renovation - Design & Construction Bid Release R-1 (Plbg&FP) 95% (Bales)	Microsoft Excel Worksheet	14 KB
3/4/2014 2:45 PM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (C.Grant)	Microsoft Excel Worksheet	14 KB
3/3/2014 3:47 PM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (Koric)	Microsoft Excel Worksheet	12 KB
2/26/2014 9:26 AM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (McClure)	Microsoft Excel Worksheet	14 KB
3/2/2014 12:32 PM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (Prince)	Microsoft Excel Worksheet	17 KB
3/3/2014 3:50 PM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (White)	Microsoft Excel Worksheet	14 KB
3/3/2014 3:03 PM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (Wise) 030114	Microsoft Excel Worksheet	18 KB
2/26/2014 10:36 AM	Natural History Building Renovation - Design & Construction Bid Release R-1 95% (Youakim)	Microsoft Excel Worksheet	11 KB
3/4/2014 8:48 AM	U13016 - NHB R-1 Comments 95% (User SESE)	Microsoft Excel Worksheet	14 KB

Review Comments: Below are examples of the design review comments from our design review team.

Project Review

Natural History Building Renovation - Design & Construction Bid Release R-2 50%

Building Automation Review Comments

Plan Reviewer: Sanja Koric - Natural History Bldg. Renovation R.2 50%

Comment Number	Drawing or Spec Reference	UIUC Facilities & Services Comment	AE Response
Drawing Comments			
101	V 4.0	This is the same question as on DD phase. What type of DDC/HVAC controls are you planning to use for Clean Lab/ Clean Room. If the Clean Room was going to be provided with packaged system that includes its own controller, then we need to understand how this controller will be connected to campus network, the type of controller, etc. Also, hard wired connections for alarming & safeties need to be provided. All of this needs to be included on TC drawings.	
102	R2 - TC4.1	Packaged VFD systems or PLC control are not approved by the University standards. See UIUC standards 23 09 23 , division 23 and division 26 - 26 29 23. Show each VFD with four hard wired points, including supply fans, return fans and exhaust fans; (The IO points are as following: Start/ Stop, VFD Fault, VFD Status, Speed Control) and Data Connection (Serial Communication). Correct and add IO points on this control schematic dwg.	
103	R2 - TC4.1	Also, let's discuss redundant VFD. This might not be necessary, and this option will have complicated controls sequence.	
104	R2 - TC4.1	Detail 3 - All Contacts need to be Normally Open. See and implement UIUC Standard Detail 23 09 23-06.	
105	R2 - TC4.1	There should be Min. of 2 separate configured VFD drive, and maximum of 6 motors per one VFD. See fan array standard 23 09 23. Also, all VFD need to be controlled from main unit DDC controller. Correct on this control schematic dwg. And show separate configured drives controlled by DDC. Let's discuss number of motors in a fan array and number of VFD.	

106	R2 - TC4.1	The number of VFD drives, motor size, and VFD size do not match electrical and ventilation sheet. Coordinate V, TC, and E sheets and different divisions of work!
107	R2 - TC4.1	For example: This TC 4.1 drawing shows two VFD drives per fan. However, electrical schedule and plan view E2.5 shows only one VFD (40HP). Which drawing and information is correct? Correct and Coordinate divisions of work.
108	R2 - TC4.1	For example: This TC 4.1 drawing shows two VFD per supply fan (units AHU-2, AHU-3, AHU4). However, electrical schedule and plan view E2.5 shows only one supply fan VFD . Also, we could not find VFD drives for exhaust fans nor power supply on E2.7. Correct and Coordinate V, TC, and E sheets and equipment schedule.
109	R2 - TC 4.1	Why is the signal on isolation damper analog? See controls schematic inlet damper TC4.1 and IO points type (AO, AI)? Correct as necessary.
110	R2 - TC 4.1, and TC 4.2	Are these multiple supply fans, in a fan array, provided with back draft dampers? Comment related to all air handling units with a fan array.
111	R2 - TC 4.1	Check the Sequence of Operation - very last paragraph related to unit shut down, and listed as following: "All fire/ smoke and smoke dampers associated with the air handling system shall fully close." Are there any smoke dampers associated with this unit? I remember this was an issue at some previous project, because of the divisions work, BAS controllers vs. Fire Alarm controllers. Smoke dampers should be closed by Fire Alarm system. Please correct as necessary.
112	R2 -TC 4.1and other TC sheets	This isolation damper should be controlled by VFD. Damper End Switches must be connected to VFD input .Unless independent isolation damper control by the BAS is required by an approved smoke purge or other special sequence. Add a note to clarify
113	R2 - TC4.2	The other example is AHU-1. V5.1 . This drawing TC 4.2 shows two VFD per fan function. However electrical drawing calls for one 40 HP drive. Also, there are listed 3 x 15 HP motors on V5.1 sheet. This needs to be corrected, and drive size should be 50 HP , or 2 X 25 HP depending on number of motors in a fan array. The drive size is not sufficient, and the number of drives is not coordinated with other divisions of work -26 and ventilation 23. Correct and coordinate.
114	R2 - TC4.2	Packaged VFD systems are not approved by the University standards. See UIUC standards 23 09 23 and 26 29 23. Show each VFD with four hard wired points, including supply fans, return fans and exhaust fans; (The IO points are as following: Start/ Stop, VFD Fault, VFD Status, Speed Control) and Data Connection (Serial Communication), and erase line around VFDs. Correct and add IO points on this control schematic dwg.
115	R2 - TC4.2	Detail 3 - All Contacts need to be Normally Open. See and implement UIUC Standard Detail 23 09 23-06.

116	R2 - TC4.2	Also, the number of drives, motor size, and VFD size does not match for AHU-6. See sheets TC4.2, V 5.1, E 2.5. AHU-6 has (2x 15 HP) motors, and VFD schedule lists 25 HP SF VFD. This SF VFD needs to be bigger (30 HP min.). The same applies to RF VFD. The Return fan needs to be bigger (2 x 10 HP motor = 25 HP VFD) .
117	R2 - TC4.2	Also, see the number of drives, motors, and VFD size does not match for AHU-7. See sheets TC4.2, V 5.1, E 2.5. AHU-7 has (2x 7.5 HP) motors, and VFD schedule lists 15 HP SF VFD. This SF VFD needs to be bigger = 20HP.
118	R2 - TC4.2	Also, the energy recovery wheel VFD will be provided by electrical contractor. Erase line around VFD and coordinate information with electrical work division 26. There are already shown 1 HP VFD for ERW on electrical E 2.5. Coordinate.
119	R2 - TC4.2	Return Air by pass Damper , this drawing TC 4.2, need to be N.O. - normally open.
120	R2 - TC4.4	Show each Exhaust Fan VFD with four hard wired points. The IO points are as following: Start/ Stop, VFD Fault, VFD Status, Speed Control, and Data Connection (Serial Communication). Correct and add IO points on this control schematic dwg.
121	R2 - TC4.4	Exhaust Fans operation need to be controlled by Variable Frequency Drives. Correct the sequence of operation and on drawing. All isolation damper's signal has to come off of individual VFD drive.
122	R2 - TC4.4	Why Exhaust dampers have analog signal, I/ O points AO and AI? Are these modulating or isolation dampers? Please clarify and correct.
123	R2 - TC4.4	Detail 2, drawing TC 4.4 - All Contacts need to be Normally Open. See and implement UIUC Standard Detail 23 09 23-06.
124	R2 - TC4.5	Show each Pump VFD with four hard wired points - Detail 1, Detail3, Detail 5 this drawing TC 4.5. The IO points are as following: Start/ Stop, VFD Fault, VFD Status, Speed Control, and Data Connection (Serial Communication). Correct and add IO points on this control schematic dwg.
125	R2 - TC4.5	Show 1/3 and 2/3 Steam Control valves , since load is too big to be handled with one single control valve. Also, there might not be enough of a turn down ratio to operate min. load conditions. Verify and add as necessary.
126	R2 - H4.0	Show 1/3 and 2/3 Steam Control valves (HE-1, HE-2, HE-3, HE-4) , since load is too big to be handled with one single control valve. Also, there might not be enough of a turn down ratio to operate min. load conditions. Verify and add as necessary.
127	R2 -TC 1.1	Show occupancy sensors location on this plan view.
128	R2 -TC 1.2	Show occupancy sensors location on this plan view.
129	R2 -TC 1.3	Show occupancy sensors location on this plan view.
130	R2 -TC 1.4	Show occupancy sensors location on this plan view.
131	R2 - TC 4.1	Detail 4 is not the UIUC standard. Include new detail 23 09 23-1 - (40 deg. F Freeezestat) -Normally Open Electric Spring Return Chilled water valve override. See F&S web site under drawing details.
132	R2 - TC 4.2	Detail 4 is not the UIUC standard. Include new detail 23 09 23-1 - (40 deg. F Freeezestat) -Normally Open Electric Spring Return Chilled water valve override. See F&S web site under drawing details.

133	R2 -TC 4.1, and R2-V3.2	Coordinate mechanical drawings and Air Handling Unit Configuration (R2-V3.2) with controls schematic R2-TC 4.1 (V, and TC sheets), which shall include coils location, filters location, mechanical by-pass location, fans location, Air Flow Monitor Station, etc.
134	R2 -TC 4.1, and R2-V3.2	Also is there enough space to locate air flow monitor station downstream from SF fan and upstream from filter? Shouldn't be an AFM station located downstream from filter in straight and clean section of duct?
135	R2 -TC 4.2, and R2-V3.3	Coordinate mechanical drawings and Air Handling Unit Configuration - AHU-5,AHU-6, AHU-7-(R2-V3.3) with controls schematic R2-TC 4.2 (V, and TC sheets), which shall include coils location, filters location, mechanical by-pass location, fans location, Air Flow Monitor Station, etc.
136	R2 -TC 4.2, and R2-V3.3	Also is there enough space to locate air flow monitor station downstream from SF fan and upstream from filter? Shouldn't be an AFM station located downstream from filter in straight and clean section of duct?
137	R2-TC 4.7	Detail 9 - Indicate on this detail, that Reheat Valve and Perimeter Valve will have a separate signal.
138	R2-TC 4.7	Detail 9 and Detail 12 - Add occupancy sensors to these controls details.
139	R2 - V3.2	Details 5, 6, 7, 8 - What is a MSP Panel? Who is providing and installing it?
140	R2 - V3.3	Details 4, 5, 6, - What is a MSP Panel? Who is providing and installing it?
141	R2-E 2.7	Need to show Exhaust Fans VFD drives and power supply in this plan view location of.
142	R2-E6.0	Variable Frequency Drive Schedule- We do not approve VFD Drive Bypass as per the UIUC standard. Correct.

Specification Comments

143	23 09 23	Add graphic screen examples at the end of specification. You can find those on F&S web site under Related Exhibits (23 09 23-01a through 23 09 23 -10a) http://www.fs.illinois.edu/resources/facilities-standards/exhibits
144	23 09 23	Add UIUC IO Point Naming Convention, also located on F&S web site(23 09 23-11 and 23 09 23-12). http://www.fs.illinois.edu/resources/facilities-standards/exhibits
145	23 09 23	Add Siemens Apogee or Siemens BACnet, under acceptable manufacturers, part 2.1.
146	23 09 13.1-7	Add Occupancy Sensors to this specification , this is the UIUC standard for spaces such as offices, open plan offices, or classrooms. D. OCCUPANCY SENSORS 1. Occupancy sensors (auto on/off) and vacancy sensors (manual-on, auto-off) shall be used where appropriate. 2. Sensors shall be dual-technology type unless specifically contradicted for the application 3. Sensors subject to abuse (such as wall switch type) shall have tamper resistant housing.

		4. Sensors shall be provided with extra set of auxiliary contact for VAV, and other TAB box controls.	
		5. Areas with automatic lighting controls shall always have manual override wall switches.	
		6. Manufacturers: Hubbell, Watt Stopper, Leviton, Sensor Switch. Or equivalent.	
147	23 73 23 -13	Add a reference note that manufacturer needs to provide instruments and components as listed in specification 23 09 13.1 Instrumentation & Control Devices for HVAC, and 23 09 23 BAS.	

Project Review

Natural History Bldg. - Design & Construction Bid Release R-2 95%

Building Automation Review Comments

Plan Reviewer: Sanja Koric - Natural History Bldg. R-2 95%

Comment Number	Drawing or Spec Reference	UIUC Facilities & Services Comment	AE Response
Drawing Comments			
101	R2-TC 4.2	Energy Recovery Wheel VFD-variable frequency drive needs to be provided by Electrical division 26.	
102	R2-TC 4.2	Wheel controls need to be provided by the Temperature Controls contractor. Single wheel, as per the UIUC standard, can be controlled by main AHU DDC controller. This would be preferred and recommended option. The integration part of these third party controllers is challenging, especially on a BACnet network, and very costly.	
103	R2-TC 4.2	**Please make sure that this controls schematic matches true mechanical unit configuration in regards to coils position, return by-pass location, filter location, etc.! This applies to all TC sheets. (we had a similar issue on the Armory project and it ended up being a change order).**	
104	R2-TC 4.2	**RA return By pass Damper is located directly downstream from ERW(energy recovery wheel and upstream from heating coil on V3.2 sheet. RA Damper is located downstream from a heating coil on this control schematic. Coordinate V and TC sheets and divisions of work.**	
105	R2-TC 4.2	Air Flow monitor station downstream from a supply fan need to be marked as a Supply Air Flow monitor station. Also, please indicate location of air flow monitor stations on plan view drawings. Add reference notes to V sheets& TC sheets, and coordinate work in between V and TC divisions of work	
106	R2-TC 4.2	Please double check RA damper fail position. Shouldn't be a position N.O. normally open.	

107	R2-TC 4.2	Sequence of Operation - Whenever AHU is shutdown the following shall occur- The Engineer indicated here that All Fire Smoke dampers shall fully closed when AHU shuts down. There were no smoke dampers nor smoke detectors shown on a control schematic. Does this apply to this unit and is this code requirement? It seems that this question comes up frequently. We thought that all fire /smoke dampers are controlled by fire alarm system not BAS. Please clarify.
108	R2-TC 4.2	Sequence of Operation - Return By-pass damper control - We are concern that this RA damper will not have full authority to control to Mix. Temperature set point, based on a exhaust fan position. We would recommend a true return fan unit configuration. However we might not see the full benefit of the proposed AHU unit configuration and design. Also, we can not correct everything with a sequence unless mechanical components are in placed. Please clarify. The Commissioning Inspection group has seen similar design through out the campus and they have expressed their concerns.
109	R2-TC 4.3	**DITTO! Same question and comments in regards to AHU-6 as listed above for AHU-1,5,7.**
110	R2-TC 4.3	Control Energy recovery wheel by main AHU DDC controller, work by TC.
111	R2 -TC 4.4	Detail 3 _General Lab Exhaust Fan EF-4 - Where is this EA Airflow station located. Please show in plan view drawings.
112	R2 -TC 4.4	Isolation Damper with VFD - Please add a note and list in the sequence a clarification to the HAND-OFF-AUTO operation - When the VFD receives a run command , whether in HAND" OR "AUTO" the VFD shall close contacts on the VFD output relay energizing damper motor or relay controlling damper motor. When damper end switched closes proving the damper open, then the VFD will allow motor to start."
113	R2-TC4.5	This is a new drawing at 95% submission. We are seeing this drawing for the first time at 95% submission. As listed in UIUC 23 09 23 Building Automation Standards third party controllers are not approved. This packaged recovery loop needs to be controlled by approved temperature controls vendors (Siemens, Schneider, as listed in 23 09 23 BAS standard) . Also all components including control valves, temperature instruments, etc. that are part of ER loop needs to comply with UIUC standards, 23 09 23; 23 09 13; 23 09 13.33; 23 09 13.34.

114	R2-TC 4.6	Detail 2 and Detail3 -Perimeter and Reheat control valve will have to have a separate signal. Please add a note that Radiation Valve and Reheat Valves can not share IO point in terminal box controller.
115	R2 - TC4.7	**Details on sheet R2-TC4.7** - Add standard CHW building Entrance UIUC detail. Chilled water metering station is part of this project, correct? - Also, Add two (2) new pressure transmitters to be installed upstream of the CHWS metering station at the building entrance and downstream of the CHWR service valve - to be located on the campus main side of the building system. Connect these devices to building CHW BAS control valve.
116	R2 - TC4.7	Detail 8 - Please add a note to this detail , that BELDEN shielded cable shall be used for all IO points wiring, including DI, DO, AI, AO.
117	R2-TC 4.8	**Control Valve Schedule** - We would recommend all utility valves to be provided with **Pneumatic Actuators** and electric Digital positioners including chilled water and steam service. We have experienced some issues with RCS electric actuators.
118	R2 - TC4.7	DETAIL 1 - Edit this detail and add BAS components that apply to this project. Add NIM/Building Network controller and other management control devices.NIM will be installed as needed based on Manufacturer controller type. Also, approved "third party" controllers might require additional integration component and will be product/manufacturer specific, and will require additional integration.
119	R2 - TC4.7	This building might need new BBMD device. Please check with CITES type of network connection. Add this component to drawing as necessary. Typically F&S provides a BBMD device, but TC contractor provides cabinet and connections. Please double check and include in scope of work.

Specification Comments

120	23 09 13.1-7	Page 7 - Add clarification of air flow monitor stations installation and transmitter installation to the specification. We had one project where AFM transmitter was installed inside air handler in air stream. Unacceptable. Please make it clear to the contractors, V and TC divisions of work, how these instruments need to be installed. Indicate in documents that the contractor needs to meet with the Owner(UIUC Commissioning Inspection group) prior to installation of these instruments.

121	23 09 13.33-15	Control Valves for Medium Pressure steam applications - MPS-MOD-2W-EPV-FLG-S1, (b) Leakage Class need to be corrected to VI (six).
122	23 09 13.34	Page 4 - Recently, we have experienced some problems with RCS actuators. Please try to replace it with equivalent brand like Limitork, till we resolve this.
123	23 09 23	1.2 Under REFERENCES add a reference note to VFD and wiring section division 26.

BACK CHECK 50% EXAMPLE USING 95% CDS:

Yes each of these has been verified.

The BOD complied with the University requirements as well as including Heat Recovery Coils, two condensing domestic water heaters.
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 91 13. 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 with oversight from the AE for their due-diligence. 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 insert illustrates the first page of 01 91 13.

SECTION 019113 - GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:

1. Verify that the work is installed in accordance with the Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
2. Verify and document that functional performance is in accordance with the Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority and AE are utilized to achieve this.
3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion

C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

D. The Commissioning Authority of Record is the University of Illinois (Owner).

E. KJWW (A/E) will support the commissioning effort for systems to be Commissioned per LEED Fundamental Commissioning requirements. Where in this specification it is stated that the A/E will assist the contractor in contractor commissioning tasks, the assistance will be focused on developing pre-functional and functional test forms, witnessing and overseeing contractor testing, and providing technical assistance in resolving issues, prior to the Commissioning Authorities final inspection. Assistance provided by the A/E does not relieve the contractor of commissioning responsibilities outlined in this and other project specification sections.

1.2 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Plumbing Systems:

1. Domestic Hot water heaters.
2. Booster pumps.
3. Water conservation devices.
4. Related metering.

C. HVAC System, including:

1. Major and minor equipment items.

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 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 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, Chilled Water, Heating Hot Water, Domestic Water, Communications, Alarm, Interior/Exterior Lighting, Plumbing System)
2. Building HVAC Systems: (Heating, DOA Ventilating, Air Conditioning, Heat Recovery Coils, FCU's)
3. Building Automation System (managing, controlling, trending, graphics)

COMMISSIONING SCOPING MEETING

The "Kick off" meeting occurred on 06/18/15. 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 J.

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 NHB Renovation 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 I.
- Overall, minor quality issues relating to finishes, we had some difficulty with getting the proper exhaust flow for the labs.

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.

Examples of Contractor Tests and Verifications

From: Elliott, Bryan S
Sent: Thursday, October 15, 2015 2:58 PM
To: Huckstep, Brian D <bdhuckst@illinois.edu>
Subject: Natural History

Fyi

Performed 7 duct tests today and 6 last Thursday on the first floor. Most if not all risers in chase way have been tested and passed also. All but 1 ahu has been tested.

Thanks Bryan

From: Elliott, Bryan S
Sent: Wednesday, September 27, 2017 11:52 AM
To: Huckstep, Brian D <bdhuckst@illinois.edu>
Subject: FW: U13016: NHB: Reviewed King Lar Air Test & Balance Report

1. Ahu 1-was unit designed to run at 68hz or was this a correction to meet air flow? Is voltage correct?
2. AHU-4-is filter sp 1.27? if so was filters replaced before balance was performed?
3. Vav-3077 only at 870% design with 2 grilles at 0 cfm-needs corrected must be + or – 10% at grille
4. AHU-5 –was unit designed to run at 72 hz or was this a correction to meet air flow?
5. Return in rm 1062 needs proportional balance. Install dampers if required.
6. Ahu-6 was unit designed to run at 67hz or was this a correction to meet airflow?
7. Rf-6 was a limit installed to prevent from going beyond cfm? Reaching design at 43hz.
8. Ahu-7 was unit designed to run at 70 hz or was this a correction to meet airflow?
9. Was unit designed to run at 68 hz?
10. Ahu-8 need static profile for each section completed.
11. Vav-eab 2084 room 284 needs proportional balance. Install dampers if required.
12. Ex-eab 510 rm 2069 at 310% of design. Fix damper to meet = or – 10% at grille.
13. Ef-1 a- need static profile complete at each section(ie-across filters)
14. Ef-1-b-need static profile complete at each section. Is motor volts typo?
15. Ef-2-a,b-static profile
16. Ef-3 –a,b-static profile
17. Fcu-1082-motor amps?
18. Info on air flow station-23-05-93-7-H
19. Air terminal units 23-05-93-7-G-3a,b This may be included in water balance?
20. Wheel information and start up sheets-energy recovery systems 23-05-93-13-4.6
21. Fume hood testing?
22. Fan curve info for all fans-23-05-93 -6-B-1-e
23. Have all duct pressure reports been summited. 23-05-93-5-4.2
24. Has list of fire dampers been summited?23-05-93-8-4.2-J
25. Trends for performance tests-23-05-93-4-3.6
26. Have leed requirements been met?

Thanks Bryan

From: Grace, Randall Scott
Sent: Monday, July 18, 2016 7:01 AM
To: Huckstep, Brian D <bdhuckst@illinois.edu>
Cc: Bachert, Randall L <rlbacher@illinois.edu>; Grace, Randall Scott <rgrace@illinois.edu>; Steve Hall <shall@ar-mech.com>
Subject: re: Natural History - 4th floor re-heat piping test

Brian,

I witnessed a 100 psi hydrostatic test on all the re-heat piping on the 4th floor. This test passed and I have attached the test report for our records.

Note: One VAV on the north end of the building was not installed and will be tested later.

Randy Grace
Commissioning and Inspection

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	GC 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.

Testing and Balance reports. The Air Report was submitted 09/06/17 and the Water Report was submitted 08/17/17. Final TAB Reports were provided with Final O&M Manuals.

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

- 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 N.

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.
- 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 D 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 AHU and FCU's not getting enough Chilled Water through the units. The strainers were cleaned out and the units rebalanced.

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.
- The hot water heaters were supposed to each have two steam traps. Only one was installed which resulted in the vacuum breaker having to be replaced on one of the units. The additional traps are now installed and the units are operating properly.

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.

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 M 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 1070 issues that needed to be addressed during commissioning and inspection of the project. The majority of the items are closed 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 K 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 K 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

After completion of all commissioning activities, the Commissioning Authority issues 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 L 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 O in the Manual, 10th Month Warranty Review Walkthrough (scheduled for 11/19/2018) is designated to include the results of this session. The warranty walkthrough date is the first day of Thanksgiving Break.

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 had trouble getting the proper amount of Chilled Water flow through the AHU's with all the valves open 100%. We went through each unit in the building twice after the balancer was done to verify flows. After the second time the flows through each unit was verified to be at the design flow.
- 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.
- We could not start up the AHU's until the building was clean enough to start the units. The general contractor was still finishing drywall and flooring, which delayed the vent and controls contractors work. We need to look at in the future to having the GC have an earlier SC date so they are out of the building and not delaying the other contractors.
- The substantial completion date was supposed to be in 10/31/16. We didn't reach substantial completion until 01/18/18 for the BAS system. We could not finish commissioning until the TAB and controls were completed.

CONTACT INFORMATION

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

NHB Renovation

APPENDIX A – COMMISSIONING PLAN PROJECTED SCHEDULE

	Start
Bid and Award	Jan//2014
Submittals	July//2014
Kick-off Meeting	July/2014
Construction	July//2014
Startups	Oct/2016
TAB	Oct/2016
IAQ Test or Flush-out (Requires stable Trends)	Dec/2016
Functional Test Forms Distributed	June/2015
Inspections through Final Witness Functional Performance Testing	July/2014 – Jan/2018
Substantial Completion	Jan/2018
Warranty Phase (base 1 calendar year)	Jan /2018- Jan/2019
10 Month Walkthrough	Nov/2018

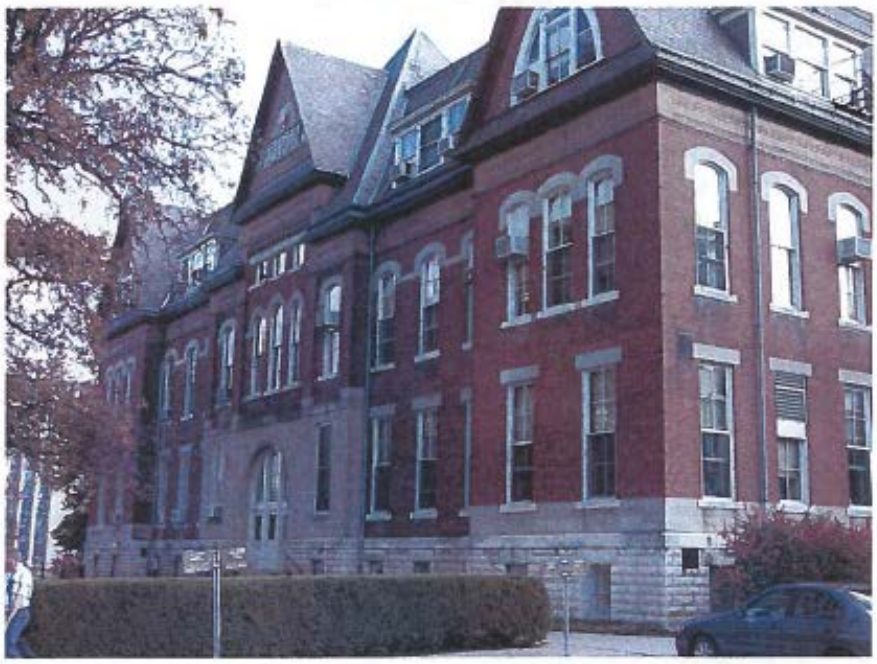
IV. Project Schedule

Projected Schedule

Conceptualization	01/07/11 - 12/15/11
Program Verification	03/13/13 - 04/13/13
Schematic Design	04/14/13 - 05/23/13
BOT for Design Approval	
Design Development	05/24/13 - 08/19/13
Construction Document Phase	
50% Submittal	08/20/13 - 10/29/13
95% Submittal	10/30/13 - 01/17/14
Bidding and Negotiation *	01/18/14 - 07/02/14
BOT for Approval	06/05/14
Construction**	07/03/14 - 11/29/16
Commissioning	09/02/16
Substantial Completion	10/31/16
Final Completion	11/29/16
Total Duration	01/07/11 - 11/29/16
Post Construction (Warranty)	10/31/16 - 10/31/17

NHB Renovation

APPENDIX B – OWNER'S PROJECT REQUIREMENTS



Program Statement
Owner's Project Requirements

for

U13016: Natural History Building – Design and Construction

Date: March 2013

Prepared By: F&S Capital Programs Division
Capital Planning and Space Management
University of Illinois at Urbana Champaign

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NATURAL HISTORY BUILDING

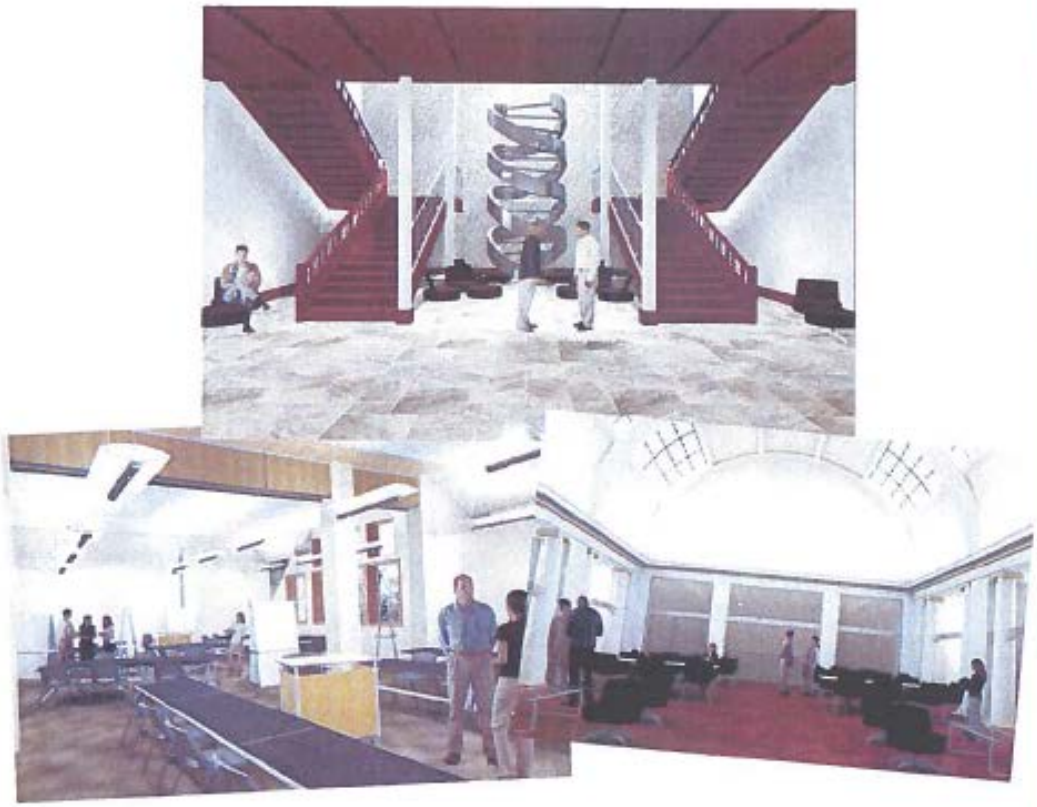
Conceptualization

U11007

prepared for:

University of Illinois Urbana-Champaign

November, 2011



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APPENDIX D – FUNCTIONAL TEST PROCEDURES

Construction Phase Start-Up Sheets & Functional Test Forms

Inspection Forms ▸ Natural History Building

FPT-01 AHU-2 (100pct OA, ER loop) as of 07.21.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:31 PM
FPT-02 AHU-6 (wHRW) as of 07.21.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:31 PM
FPT-04 HRC-4 (Genl Lab Exh) as of 07.21.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:31 PM
FPT-05 Lab Exhaust Fans as of 07.21.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:31 PM
FPT-06 Point Exhaust Fans as of 07.26.17_FAIL (OPEN ISSUES)	7/9/2018 2:33 PM
FPT-07 Attic Exhaust Fan as of 07.26.17_FAIL (OPEN ISSUES)	7/9/2018 2:33 PM
FPT-08 Heating Water as of 06.28.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:32 PM
FPT-09 Reheat Water as of 06.28.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:32 PM
FPT-12 TAB (wReheat) as of 07.26.17_IN PROGRESS (OPEN ISSUES)	7/9/2018 2:33 PM
FPT-13 TAB (wReheat and Rad) batch 1 as of 07.26.17_IN PROGRESS (OPEN IS...	7/9/2018 2:33 PM
FPT-13 TAB (wReheat and Rad) batch 2 as of 07.26.17_IN PROGRESS (OPEN IS...	7/9/2018 2:33 PM
FPT-14 TAB (wReheat and Offset) as of 07.26.17_FAIL (OPEN ISSUES)	7/9/2018 2:33 PM
FPT-15 TAB (wReheat, Rad and Grossing Offset) as of 07.26.17_FAIL (OPEN ...	7/9/2018 2:32 PM
FPT-16 TAB (CAV wReheat) as of 07.26.17_IN PROGRESS (OPEN ISSUES)	7/9/2018 2:33 PM
FPT-17 TAB (wReheat, Rad and Offset) as of 07.26.17_FAIL (OPEN ISSUES)	7/9/2018 2:33 PM
FPT-18 FCU (Cooling Only) as of 06.28.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:32 PM
FPT-19 FCU (Cooling Only, wRad) as of 06.28.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:32 PM
FPT-20 FCU (Heating and Cooling) as of 06.28.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:32 PM
FPT-21 Cabinet Unit Heaters as of 07.26.17_FAIL (OPEN ISSUE)	7/9/2018 2:33 PM
FPT-26 Standalone EAB as of 07.26.17_COMPLETE (OPEN ISSUES)	7/9/2018 2:33 PM
Issued for Testing FPTs - combined PDF	5/16/2017 10:20 AM
pdf Checklist	7/9/2018 2:25 PM
pdf Functional Test	7/9/2018 2:18 PM
pdf Test	7/9/2018 2:26 PM
UIUC NHB FPT-06 Point Exhaust Fans Rev1_IN PROGRESS (OPEN ISSUES)	7/9/2018 2:34 PM
UIUC NHB FPT-14 TAB (wReheat and Offset) Rev1_COMPLETE (OPEN ISSUES)	7/9/2018 2:34 PM
UIUC NHB FPT-17 TAB (wReheat, Rad and Offset) Rev1_COMPLETE (OPEN ISSUES...	7/9/2018 2:34 PM
UIUC NHB FPT-21 Cabinet Unit Heaters Rev1_COMPLETE (OPEN ISSUES)	7/9/2018 2:34 PM
UIUC NHB FPT-22 Unit Heaters Rev1_IN PROGRESS (OPEN ISSUES)	7/9/2018 2:34 PM
UIUC NHB FPT-25 Standalone RCP Rev1_IN PROGRESS (OPEN ISSUES)	7/9/2018 2:34 PM

APPENDIX E – Building Equipment Schedule

CAB-1 STAIR 2 Cabinet Heater
CAB-2 STAIR 2
CAB-3 STAIR 1
CAB-4 STAIR 1
CAB-5 STAIR 3
CAB-6 STAIR 3
CAB-7 STAIR 4
CAB-8 STAIR 4
CAB-9 STAIR 5
CAB-10 STAIR 5
HCP-1 AHU-1 Heating Coil Pump
HCP-5 AHU-5
HCP-6 AHU-6
HCP-7 AHU-7
HWP-1 HEATING WATER SYSTEM PUMP
HWP-2 HEATING WATER SYSTEM
HWP-3 REHEAT WATER SYSTEM
HWP-4 REHEAT WATER SYSTEM
CRS-1 Condensate Return Station
PRV-1 AUTOCLAVE Pressure Reducing Valve
HE-1 HEAT EXCHANGER - HEATING WATER SYSTEM
HE-2 HEAT EXCHANGER - REHEAT WATER SYSTEM
RAD-0032-2 Fin Tube Radiation
RAD-1002A
RAD-1004A
RAD-1014
RAD-1020A
RAD-1020B
RAD-1022A
RAD-1022B
RAD-1022C
RAD-1036A
RAD-1036B
RAD-1038A
RAD-1038B
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RAD-1046
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RAD-1054A
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RAD-1086B
RAD-1088A
RAD-1088B
RAD-2002A
RAD-2002B
RAD-2002C
RAD-2004A
RAD-2004B
RAD-2006A
RAD-2006B
RAD-2010
RAD-2012
RAD-2020A
RAD-2020B
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FCU-0032-1 ELEV 1
FCU-0032-2 ELEV 2
FCU-1010A DATA CLOSET
FCU-1012 DATA CLOSET
FCU-1034 ELECTRICAL CLOSET
FCU-1035A MAIN ELECTRICAL ROOM
FCU-1035B MAIN ELECTRICAL ROOM
FCU-1035C MAIN ELECTRICAL ROOM
FCU-1035D MAIN ELECTRICAL ROOM
FCU-1037 DATA CLOSET
FCU-1039 ELECTRICAL CLOSET
FCU-1050 ELEV 3 MEP ROOM
FCU-1082 ELECTRICAL CLOSET
FCU-1084 FACULTY OFFICE
FCU-1086 FACULTY OFFICE
FCU-1088A COMPUTER LAB
FCU-1088B COMPUTER LAB
FCU-2008 DATA CLOSET
FCU-2025 DATA CLOSET
FCU-2073B EQUIPMENT ROOM
FCU-2081 AV ROOM
FCU-3008 DATA CLOSET
FCU-3037 ELECTRICAL CLOSET
FCU-3039 DATA CLOSET
FCU-3094 ELECTRICAL CLOSET
FCU-4008 DATA CLOSET
FCU-4033 DATA CLOSET
FCU-1008 CHILLED WATER SERVICE
FCU-1074 MEP ROOM HORIZONTAL
FCU-1080 MEP ROOM
FCU-5010 MECH ROOM
FCU-5012 MECH ROOM
FCU-5014 MECH ROOM
FCU-5016 MECH ROOM
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EHRC-2 EF-2A & EF-2B
EHRC-3 EF-3A & EF-3B
EHRC-4 HRC-4
SHRC-2 AHU-2

SHRC-3 AHU-3
SHRC-4 AHU-4
ERS-1
BFP-1 BACK FLOW PREVENTER
BFP-2 BACK FLOW PREVENTER
CP-1 CIRCULATING PUMP
ET-1 EXPANSION TANK
ET-2 EXPANSION TANK
EWC-1 ELECTRIC WATER COOLER
EWC-2 ELECTRIC WATER COOLER
F-1 WATER FILTER
FCO-1 FLOOR CLEANOUT
FD-1 FLOOR DRAIN
FD-2 FLOOR DRAIN
FD-3 FLOOR DRAIN
FH-1 FUME HOOD
FH-2 FUME HOOD
FS-1 FLOOR SINK
GVB-1 GAS VALVE BOX
HB-1 HOSE BIBB
HB-2 HOSE BIBB
L-1 LAVATORY
LS-1 LAB SINK ACCESSORIES
LS-2 LAB SINK ACCESSORIES
LS-3 LAB SINK ACCESSORIES
LS-4 LAB SINK ACCESSORIES
MB-1 MOP BASIN
MBT-1 MOP BASIN TRIM
MV-1 MIXING VALVE -
MV-2 MIXING VALVE
RD-1 ROOF DRAIN
RD-2 ROOF DRAIN
RDO-1 ROOF DRAIN OUTLET
SE-1 SEWAGE PUMP
SI-1 SEDIMENT INTERCEPTOR
SK-1 SINK
SK-2 SINK
SP-1 SUMP PUMP
SP-2 SUMP PUMP
SP-3 SUMP PUMP
SP-4 SUMP PUMP
SS-1 SCULLERY SINK ACCESSORIES
UR-1 URINAL
UR-2 URINAL
VB-1 VACUUM BREAKER
WC-1 WATER CLOSET

WC-2 WATER CLOSET
WCO-1 WALL CLEANOUT
WH-1 WATER HEATER
WH-2 WATER HEATER
WHA-1 WATER HAMMER ARRESTER
WHA-2 WATER HAMMER ARRESTER
WHA-3 WATER HAMMER ARRESTER
WM-1 WATER METER
YCO-1 YARD CLEANOUT
PB-1 Pressure Booster Pump
VP-1 Lab Vacuum Pump
AC-1 Lab Air Compressor
AC-CR1-W CARD READER
AC-PS-1 ACCESS CONTROL LOW VOLTAGE DOOR POWER SUPPLY
AC-SEC-CON ACCESS CONTROL SECURITY CONTROL PANEL
CC-C1-W WIRELESS ANALOG CLOCK
CC-CMC-1 WIRELESS GPS/NTP TIME SYNCHRONIZATION 467 MHZ TRANSMITTER
CC-PS-1 POWER SUPPLY FOR CLASSROOM CLOCK
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PE-1 POINT EXHAUST ARM - 4" WALL MOUNTED EXHAUST ARM
DC-1 DUST COLLECTION SYSTEM
EF-1A Exhaust Fan
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EF-1B
EF-1B
EF-2A
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EF-2B
EF-3A

EF-3B
EF-5
EF-6
EF-7
EF-8
AHU-1 Air Handling Unit
AHU-2
AHU-3
AHU-4
AHU-5
AHU-6
AHU-7
HRC-4
RHU-1
MOD-1 Motor Operated Damper
MOD-2
MOD-3
MOD-4
MOD-5
MOD-6
MOD-7
MOD-8
MOD-9
MOD-10
MOD-11
MOD-12
MOD-13
Elevator 1
Elevator 2
Elevator 3
VFD-1H Variable Frequency Drive
VFD-1R
VFD-1S
VFD-2S
VFD-3S
VFD-4S
VFD-5H
VFD-5R
VFD-5S
VFD-6H
VFD-6R
VFD-6S
VFD-7H
VFD-7R
VFD-7S
VFD-EF-1A

VFD-EF-1B
VFD-EF-2A
VFD-EF-2B
VFD-EF-3A
VFD-EF-3B
VFD-HRC-4
VFD-HWP-1
VFD-HWP-2
VFD-HWP-3
VFD-HWP-4
32-ATS1034A Automatic Transfer Switch
32-ATS1034B
32-ET1034A Transformer
32-ET1034B
32-T1039-1035
32-T1082-1035
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32-T3094-1035
DS-30 Disconnect Switch
DS-30A2
DS-30R
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FCS-HCP-1
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FCS-HCP-6
FCS-HCP-7
FDS-30L
FDS-30L
FDS-VP-1
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FED2-1035 Elevator Shunt Trip
FED3-1035 Elevator Shunt Trip
FED-60 Elevator Shunt Trip
MX-14

NHB Renovation

APPENDIX F – CONSTRUCTION TEAM

Contractor Information Logs By Division

Natural History Building Renovation - Design and Construction (#U13016)

Division of Work	Contractor	Phone	Fax	Status
Division 01 - 01A - BP2 General Work - R-1 Demolition and Structure Rebid U14095	Williams Brothers Construction Inc.	(309) 688-0416	(309) 688-0891	Completed
Division 01 - BP2 - General Work (U13016)	CORE Construction Services of Illinois, Inc.	(309) 266-9768	(309) 266-6553	Completed
Division 01 - General Work	CORE Construction Services of Illinois, Inc.	(309) 266-9768	(309) 266-6553	Completed
Division 02 - BP2 - Plumbing Work (U13016)	G.A. Rich And Sons, Inc.	(309) 447-6231	(309) 447-6500	Completed
Division 03 - BP2 - Heating, Piping, Refrigeration, and Temperature Control Work (U13016)	A & R Mechanical Contractors	(217) 367-4227	(217) 367-4164	Completed
Division 04 - BP2 - Ventilation and Air Distribution Work (U13016)	King-Lar Company	(217) 429-2323	(217) 429-2381	Completed
Division 05 - BP2 - Electrical Work (U13016)	Bodine Electric of Decatur	(217) 420-4983	(217) 420-4283	Completed
Division 06 - BP2 - Sprinkler Work	Automatic Fire Sprinkler Co.	(309) 862-2724	(309) 862-2914	Completed
Division 16 - Demolition Work	CORE Construction Services of Illinois, Inc.	(309) 266-9768	(309) 266-6553	Completed
Division 28 - Structural Steel Work	Ben Hur Steel Worx, LLC	3142988007	3142182179	Completed

APPENDIX G – PROJECT TEAM

Team Members

Natural History Building Renovation - Design and Construction (#U13016)

Name	Title	Office	Phone	Email
Alaina Davis	Business/Adminv Associate	University of Illinois at Urbana-Champaign	(217) 244-5486	adavis3@illinois.edu
Alva Thomas Jr	Senior Project Manager	Barton Malow Company	(312) 751-9800	alva.thomas@mckissackmw.com
Bradley Klein1	Arch Cap Maint Plng	University of Illinois at Urbana-Champaign	(217) 333-0340	bradklei@illinois.edu
Brian Huckstep	Construction Superintendent	University of Illinois at Urbana-Champaign	217-333-1852	bdhuckst@illinois.edu
Brittany Miller	Billing Specialist	Bodine Electric of Decatur	(217) 420-4983	brittanym@bodinemail.com
Bryan Shelton1	project manager	King-Lar Company	(217) 429-2323	bryanshelton@kinglar.com
Candy Deaville	Construction Projects	University of Illinois at Urbana-Champaign	n/a	candyd@illinois.edu
Cathy Roelfs	Contracts Administrator	A & R Mechanical Contractors	(217) 367-4227	croelfs@ar-mech.com
Christina Molitor1	Audiovisual Planner	University of Illinois at Urbana-Champaign	(217) 265-4063	cmolitor@illinois.edu
Cindy Pruitt	Administrative Aide	University of Illinois at Urbana-Champaign	(217) 333-0340	cpruitt@illinois.edu
Clarence Odom	Capital Construction Sr Proj Mgr	University of Illinois at Urbana-Champaign	217-333-0340	codom@illinois.edu
Daren Funk	Accounting Associate	University of Illinois at Urbana-Champaign	(217) 333-0340	dfunk@illinois.edu
David Lancaster	Electrical Construction Superintendent	University of Illinois at Urbana/Champaign	(217) 300-2347	dlancast@illinois.edu
Doug Kurasek	NA	LCM Architects	(312) 913-1717	dkurasek@lcmarchitects.com
Douglas Partney	Project Manager	Ben Hur Steel Worx, LLC	3142988007	dwp@benhurconstruction.com
Ed Costello	NA	Barton Malow Company	(312)281-0800	edc@benhurconstruction.com
Eric Kunkel	NA	Barton Malow Company	(312)281-0800	afsco02@icloud.com
Eric Kunkel1	Foreman	Automatic Fire Sprinkler Co.	(309) 862-2724	EKLINKEL40@YAHOO.COM
Grant Nohren	Project Financial Reporting Coordinator	University of Illinois at Urbana-Champaign	(217) 244-1145	nohren@uillinois.edu
Greg Carter	NA	Bodine Electric of Decatur	(217) 420-4983	gcarter@bodinemail.com
Hal Strider	Sr. Project Manager	Barton Malow Company	(312)281-0800	hal.strider@bartonmalow.com
Heather Comer	A/R	King-Lar Company	(217) 429-2323	heathercomer@kinglar.com
Heather Villa	Senior Cost Analyst	Barton Malow Company	(312)281-0800	heather.villa@bartonmalow.com
Jackie Smith	Accountant	Williams Brothers Construction Inc.	(309) 688-0416	jackie@wbci.us
James Lev	Architect, Capital Planning	University of Illinois at Urbana-Champaign	217-244-5095	jrlev@illinois.edu
Jason Ackerman	NA	Williams Brothers Construction Inc.	(309) 688-0416	jason.ackerman@wbci.us
John Knittle	State Purchasing Officer		(217) 333-2831	john.knittle@illinois.gov
Jonathan Lundeen	Project Manager	LCM Architects	(312) 913-1717	jlundeen@lcmarchitects.com
Judy Stechman	Office Manager	G.A. Rich And Sons, Inc.	(309) 447-6231	judy@garich.com
Ken Pagett	Project Manager		(312)281-0800	Ken.Pagett@bartonmalow.com
Khristian Shaffer	Facilities And Services	University of Illinois at Urbana-Champaign	(217) 333-0340	ks16@illinois.edu
Kim Sydnor	Ksydnor	LCM Architects	(312) 913-1717	ksydnor@lcmarchitects.com
Kimberly Hubbard	Administrative Aide	University of Illinois at Urbana-Champaign	n/a	kmhubbar@illinois.edu
LaShonya Quince	Xh Offic Assoc 1	University of Illinois at Urbana-Champaign	(217) 333-4752	lquince@illinois.edu
Latonya Webb	Asst Dir For Contracts Admn	University of Illinois at Urbana-Champaign	(217) 244-6738	lmburton@illinois.edu
Logan Hangartner	NA	CORE Construction Services of Illinois, Inc.	(309) 266-9768	loganhangartner@coreconstruction.com
Louise Ann Koebel	Project Manager	University of Illinois at Urbana-Champaign	(217) 265-0831	koebel@illinois.edu
Mark Laughery1	Construction Manager	Bodine Electric of Decatur	(217) 420-4983	mlaughery@bodinemail.com
Matthew Drain	Project Manager	University of Illinois at Urbana-Champaign	(217) 300-0372	mdrain@illinois.edu
Michael Accurso	Project Engineer		(312)281-0800	michael.accurso@bartonmalow.com
michael bobruk	director	Barton Malow Company	(312)281-0800	michael.bobruk@bartonmalow.com
Mike Stilger	Project Manager	University of Illinois at Urbana-Champaign	(217) 300-3961	mstilger@illinois.edu
Misty Dietrich	Accountant	Williams Brothers Construction Inc.	(309) 688-0416	misty@wbci.us
Richard Lehner	Principal	LCM Architects	(312) 913-1717	rlehner@lcmarchitects.com
Rick Strack1	Na	Bodine Electric of Decatur	(217) 420-4983	rstrack@bodinemail.com
Robin Wells	Office Support	University of Illinois at Urbana-Champaign	(217) 265-5013	rrwells@illinois.edu
Rod Justus	General Manager	G.A. Rich And Sons, Inc.	(309) 447-6231	rod@garich.com
Roger Terven	Comm Network Specialist Ii	University of Illinois at Urbana-Champaign	(217) 244-0106	terven@illinois.edu
Sandra Yoo	Associate Director	University of Illinois at Urbana-Champaign	(217)244-2528	syoolee@illinois.edu
Ted Christy	Assoc Director Project Planning	University of Illinois at Urbana-Champaign	(217) 265-6515	tchristy@illinois.edu
Tim Leung	Project Engineer	Barton Malow Company	(312)281-0800	tim.leung@bartonmalow.com
Timothy Jenvey	Office Assistant Ii	University of Illinois at Urbana-Champaign	n/a	tjenvey@illinois.edu
Todd Douglas	Project Architect	LCM Architects	(312) 913-1717	tdouglas@lcmarchitects.com
Todd Stone	Sr. Construction Administrator	KJWW, P. C.	(309) 788-0673	Todd.A.Stone@imegcorp.com
Tom Cole1	NA	CORE Construction Services of Illinois, Inc.	(309) 266-9768	tomcole@coreconstruction.com
Tom O'Dea	Project Manager	G.A. Rich And Sons, Inc.	(309) 447-6231	tom@garich.com
Ziad Sweid	Financial Services	University of Illinois at Urbana-Champaign	(217) 333-4752	sweid@illinois.edu

NHB Renovation

APPENDIX H - FACILITIES & SERVICES COMMISSIONING & INSPECTION GROUP

Name	Title	Phone	Email
Brian Huckstep	Lead Inspector/Construction Superintendent LEED AP	(217) 333.1852	bdhuckst@illinois.edu
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

APPENDIX I – PRE-FUNCTIONAL CHECKLISTS & FUNCTIONAL TEST PROCEDURE EXAMPLES

AHU- example:

The FUTURE.® Built SMARTER. KJWW

Functional Performance Test:
FPT-01 - AHU-2,3,4 (100pct OA, ER loop)
AHU- 2

University of Illinois at Urbana-Champaign
Natural History Building
Urbana, IL

KJWW #12.0660.00

Revision			
Level	Date	Description	Author
0	9/14/15	Issued for Review	Greg Eisenmann
1	1/19/16	Issued for Testing (Changes made per controls ASI-049)	Greg Eisenmann

1. Participants: & 7/20/17

Date	Person	Organization	Participant Signature
7/19/17	Pablo Benitez	IMEG	
	Nathan Seymour	Alpha	
	Derek Webber	Alpha	

2. System Summary
   A. AHU-2,3,4 provide 100% OA to lab spaces (exhaust is provided by HRC-4) and are controlled to maintain supply duct differential pressure. Discharge air humidity is maintained to be 50%rh or lower.

3. Test Prerequisites:

Prerequisite	Complete Y / N	Notes:
Pre-functional checklists have been completed and approved by the CxA.	(N)	
Manufacturer/equipment startup reports are complete and submitted.		
Testing and Balancing has been completed and report has been provided.	(N)	
All control system functions for this and interlocking systems are programmed and operate. Point to point field tests are complete and submitted. (N)	Y	
These functional test procedures have been reviewed by the installing contractor.	Y	

(*) Section of 2"x2" OA intake filter is not secured right. Needs clips.

231 South LaSalle, Suite 600, Chicago, IL 60604
213.294.0501 | Fax: 312.294.0003 | www.kjww.com

(*) – Y strainer on chilled water supply piping missing insulation (was cut-off). Replace. Pipe is sweating.

4. System Point Review / Check
   A. BAS Points → The command is the system command. End switch status is what's on the screen

Point No.	Point Description	Point Values	Pass Y / N	Notes
1)	OA humidity	60 %rh	Y	Global point
2)	Global CO₂ – NOT used at	ppm	N/A	Global point
3)	Building pressure this AHU	N/A "w.c.	N/A	Global point NOT used for
4)	OA temperature	96.5 °F	Y	Global point this AHU
5)	Fire alarm status	NO INPUT	(N)	
6)	OA damper position (*) no feedback	OPEN %	Y (N)	~~no feedback attached~~
7)	OA damper command (local = .15" w.g.)	OPEN %	Y	Linked to SF start.
8)	Filter status (reads = .08" w.g.)	NORMAL "w.c.	Y	Setpoint = 1.6"w.c. = 2" w.g.
9)	OA low static switch	NORMAL	Y	Set at -2"w.c. -4" w.g.
10)	Energy recovery valve command	100 %	Y	(*) TOO HOT. Nathan confirmed 3-way valve wired backwards at ERC loop
11)	Energy recovery valve position (*)	0.3 %	(N)	
12)	Energy recovery supply temperature NOT on graphic	88.7 °F (local = 88°F)	(N)	Check local gauges
13)	Energy recovery return temperature	88.6 °F	Y (N)	
14)	Energy recovery leaving air temperature	87.4 °F	Y	
15)	Energy recovery leaving air temperature SP	55 °F	Y	OA<50°F:DAT SP = 55°F OA>50°F: LAT SP = coolest possible
16)	Primary low limit switch	NORMAL	Y	Set at 35°F — check locally, found Hal-...
17)	Secondary low limit switch	NORMAL	Y	Set at 40°F
18)	Cooling coil valve command	42.3 %	Y	
19)	Cooling coil valve position	43.9 %	Y	
20)	Chilled water supply temperature	42.2 °F	(N)	NOT ON GRAPHIC
21)	Chilled water return temperature	64.9 °F	(N)	
22)	Coiling coil leaving air temperature	50.9 °F	Y	multiple on points list. Limited
23)	Supply fan VFD status	"Running"	Y	Verify full list of VFD points is also available at BAS — points on graphic.
24)	Supply fan VFD on/off command	ON	Y	
25)	Supply fan VFD speed command (local 42 Hz)	61 %	Y	Hardwired from static pressure sensor ✓
26)	Supply fan VFD alarm (our hertz? 60 Hz)	NORMAL	Y	
27)	SA high static switch	NORMAL	Y	Set at +3"w.c. +4"
28)	SA relative humidity	90.9 %rh	Y	
29)	SA discharge temperature	52.4 °F	Y	setpt = 53°F

(*) MISSING VFD % feedback

(*) COULD NOT FIND WHERE THE LOW STATIC SAFETY IS INSTALLED INSIDE THE AHU.

Point No.	Point Description	Point Values	Pass Y / N	Notes
30)	SA discharge temperature SP	53 °F	Y	Setpoint = 55°F
31)	SA airflow (local AFMS) = 12,245	11,950 CFM (BAS)	Y	AHU-4: 3 ducts
32)	Duct Static Pressure	1.50 "w.c.	(N)	setpt = 1.40" → Review during SP test. Appears to not be hitting setpt smoothly
33)	Duct Static Pressure SP max value	1.40 "w.c.	Y	As determined by balancer

5. Sequence of Operation Review / Test
   A. Refer to contract document R2-TC4.1 and control shop drawings pp20-34 for sequence of operation.

6. Functional Testing Record
   A. Air Volume Control

Step No.	Test Procedure	Expected Results	Pass Y / N	Remarks/ Actual Response
1)	Verify system is in normal operation OAT = 90.9°F	a. OA damper open b. Supply fan is on c. Duct static pressure setpoint is such that only 1 or 2 terminal air boxes are >95% open d. Duct static pressure setpoint is being maintained e. Exhaust fan HRC-4 is on (see FPT-04 for remaining testing of HRC-4) f. ER valve modulates as required g. CW valve modulates as required h. Energy recovery and cooling coil leaving air setpoints are being maintained	Y Y (N) Y Y Y Y Y	Refer to points list for initial conditions – NOT programmed yet SP setpt = 1.40" SP = 1.42" ER valve = 100% CHW = 37.3% DAT setpt = 53°F DAT actual = 52.4°F
2)	Command AHU off at BAS (*) TIME OF DAY Schedule is set.	a. Supply fan turns off b. CW valve closes c. ER valve closes d. OA damper closes (2 min delay)	Y Y (N) Y	(N) – still open, although ER LAT > 85°F

(*) AHU DAT reset not programmed yet. Will be based on zone temps., similar to reset at AHU-6.

✓ (local = 77°F/78°F) ERS = 77.1°F, ERR = 80.04°F; CHWS = 42.4°F, CHWR = 63.2°F, local (45°F/63°F) ✓

Step No.	Test Procedure	Expected Results	Pass Y / N	Remarks/ Actual Response
3)	Command AHU on at BAS commanded on thru sfan command	a. OA damper opens b. Supply fan turns on and ramps to maintain duct static pressure setpoint c. ER valve modulates open as required to maintain ER LAT d. CW valve modulates pen as required to maintain CC LAT	Y Y Y Y	Supply fan: 67 % Duct static pressure: 1.54 "w.c. Duct static pressure sp: 1.4 "w.c. ER valve: 100 % OAT = 94.3°F ER LAT: 77.5 °F CW valve: 76.7 % DAT = 53.3°F CC LAT: 51.3 °F DAT setpt = 50°F
4)	Cause additional airflow demand by placing connected terminal boxes in cooling mode such that more than 2 boxes are greater than 95% open (N) – NOT programmed	a. Duct static pressure setpoint increases until only two terminal air boxes are >95% open b. Duct static pressure setpoint does not exceed max value c. Supply fan ramps up to meet duct static pressure setpoint		Supply fan: ____% Duct static pressure: ____"w.c. Duct static pressure sp: ____"w.c.
5)	Cause reduced airflow demand by placing connected terminal boxes in "satisfied" mode such that less than 2 boxes are 95% open (N) – NOT programmed	a. Duct static pressure setpoint decreases until two terminal air boxes are >95% open b. Supply fan ramps down to meet duct static pressure setpoint c. Verify fan does not ramp below minimum speed recommended by manufacturer		Supply fan: ____% Duct static pressure: ____"w.c. Duct static pressure sp: ____"w.c.
6)	Release all overrides	a. System resumes normal operation	Y	

– (*) There is a min setpt of 50% for the ER valve. Should be "0", since valve should be allowed to close when not required (ECON MODE).

→ CAUSE → OAT > DAT setpt (such that we are in cooling mode) ↳ & ERS TEMP > OAT
→ THEN, ERC valve SHOULD close.

B. Temperature Control

Step No.	Test Procedure	Expected Results	Pass Y / N	Remarks/ Actual Response
1)	Verify system is in normal operating conditions (assume OA>50°F) (CONFIRM MODULATION OF ER valve to ER LAT setpt)	a. Energy recovery valve maintains minimum possible ER LAT (no less than 53°F) b. CW valve modulates to maintain ~~CC LAT at 53°F~~ ER LAT setpt → DAT setpt / DAT setpt	Y Y	OAT: 94.5°F ER valve: 45 % ER LAT: 77 °F (overrode ER LAT setpt = 80°F) CW valve: 99.5 % CC LAT: 51.8 °F DAT: 53.7 °F
(2)	~~Cause OA to be less than ER LAT~~ (water temp.)	a. Energy recovery valve closes b. Release override	(N)	— NOT programmed.
3)	Cause OA temperature to be <50°F (HEAT MODE) ↳ DID NOT COMPLETE. ↳ Retest once sequence is completed.	a. Energy recovery valve maintains ER LAT SP ~~at 55°F~~ b. CW valve modulates closed		OAT: _____°F ER valve: _____% ER LAT: _____°F CW valve: _____% CC LAT: _____°F DAT: _____°F
4)	Release all overrides	a. System resumes normal operation	Y	

C. Alarms and Safeties

Step No.	Test Procedure	Expected Results	Pass Y / N	Remarks/ Actual Response
1)	Simulate a Fire Alarm condition	a. Supply fan turns off b. CW valve closes c. ER valve closes d. OA damper closes (2 min delay)	N/A	→ Need to coordinate ↳ WILL ADD TO Cx Allow.
2)	Release alarm condition	a. OA damper opens b. Supply fan turns on and ramps to maintain duct static pressure setpoint c. ER valve modulates open as required to maintain ER LAT d. CW valve modulates pen as required to maintain CC LAT		

→ ✱ ER valve modulates to a constant ER LAT. Recommend this be reset based on ~~[illegible]~~ AHU DAT setpt.

Step No.	Test Procedure	Expected Results	Pass Y / N	Remarks/ Actual Response
3)	Cause AHU to trip on low static pressure	a. AHU shuts down b. Alarm at BAS	Y Y	Set at -4 "w.c. (should be -2"w.c.") → ✱ NOT REQ
4)	Manually reset low static pressure switch	a. AHU starts up b. Alarm clears	Y Y	
5)	Cause AHU to trip on high static pressure	a. AHU shuts down b. Alarm at BAS	Y Y	Set at 4 "w.c. (should be +3"w.c.")
6)	Manually reset high static pressure switch	a. AHU starts up b. Alarm clears	Y Y	
7)	While AHU is running, disconnect power to supply fan (FAN STATUS/ failure alarm)	a. Fan turns off b. ~~VFD fault~~ BAS alarm c. BAS wait 30 seconds, then sends ~~start signal~~ to fan VFD d. BAS waits another 30 seconds, ~~then sends a second start signal to~~ fan VFD e. Fan ~~does not start~~ f. Alarm at BAS	Y Y Y ↓ Y Y	
8)	Restore power to fan	a. Fan turns back on b. Alarm clears	Y Y	
9)	Trip secondary low limit switch (<40°F)	a. AHU keeps running b. CW valve opens c. Alarm at BAS	Y Y Y	CW valve: 50 %
10)	Trip primary low limit switch (<35°F)	a. AHU shuts down b. OA damper closes c. Alarm at BAS	Y Y Y	
11)	Reset low limit switches	a. AHU starts up b. Alarm clears	Y Y	
12)	Cause discharge air temperature to be 5°F above or below setpoint — 5°F +/-, for 6 min.	a. Alarm at BAS	Y Y	→ checked high alarm — checked low alarm
13)	Release override	a. Alarm clears	Y	
14)	Simulate pre-filter bank dirty filter alarm	a. Alarm at BAS 5 min delay	Y	— set to 2" w.g. (alarm setpt) ↳ per U of I standard
15)	Release override	a. Alarm clears	Y	

D. BAS Report Generation Verification (2/R2-TC4.1)

Step No.	Test Procedure	Expected Results	Pass Y / N	Actual Response
1)	Confirm the BAS is programmed to generate the following trends	a. The following points are trended on 5 min intervals and stored for 14 days: • Date • Time • Global OAT • Global OA %RH • Global bldg Pressure • Global OA CO2 • OA damper position • SA fan status • SA fan speed • Sa fan airflow • ~~EA fan status~~ • ~~EA fan speed~~ • ~~EA fan airflow~~ • ~~EA/SA airflow diff. SP~~ • ~~OA inlet temp~~ • OA discharge temp • ERC LAT • ERC LAT SP • SA discharge %rh • SA static pressure • SA static pressure SP • CW valve position • CWS temp • CWR temp • ~~OA inlet temp~~ b. Once per month, the largest heating and cooling load, as well as the date, time, OAT, OA and EA fan airflow are recorded and stored	Y N/A N Y (N) N (N)	→ Stored indefinitely on U of I server → Trended every 15 min. (adjustable) — only global OAT → (N) → NOT ALL Trends have been checked out/set-up. ↳ open CAC item to track this for all systems → NOT programmed.

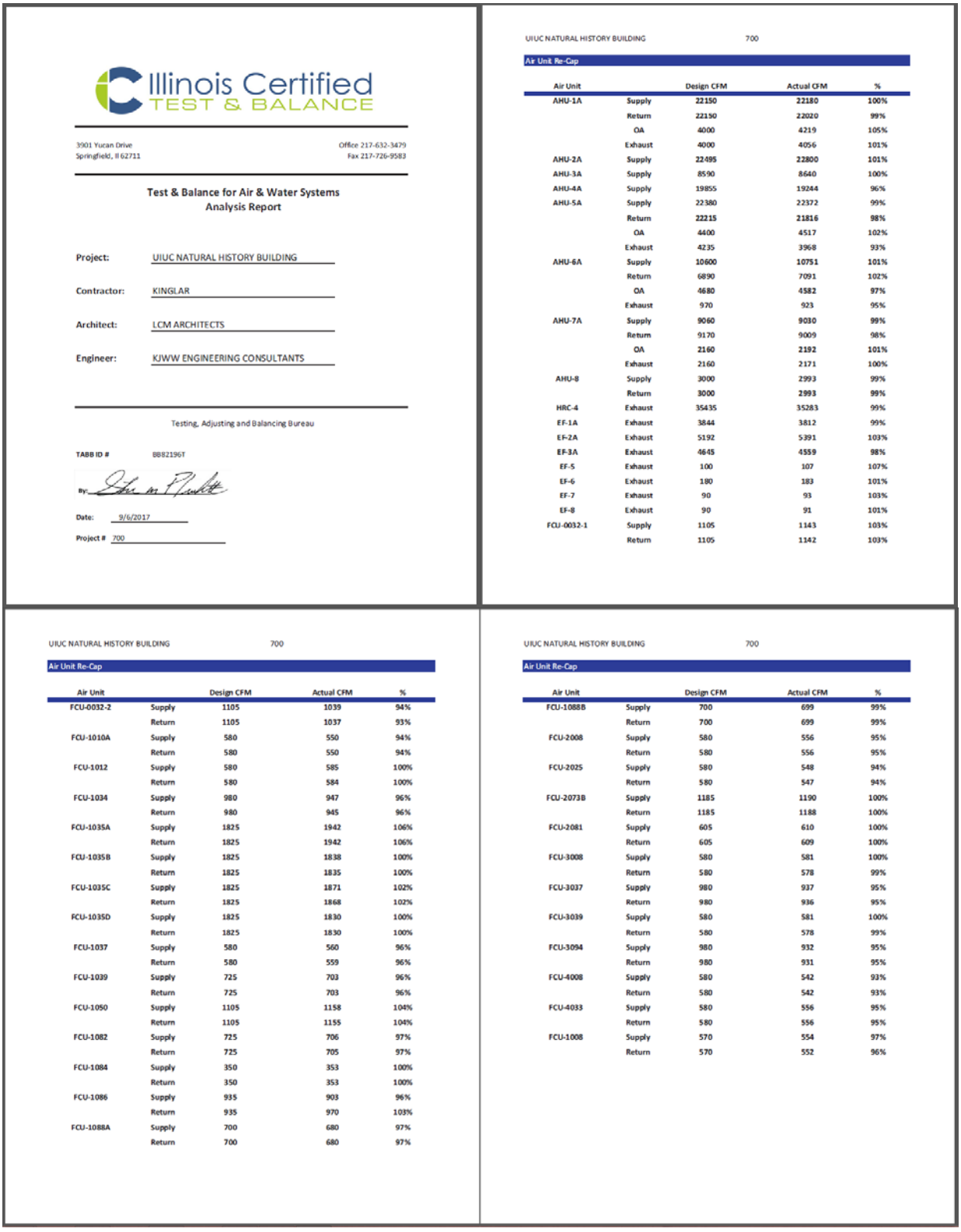
✱ ERS/ supply & return pipe arrows are incorrect leading to the coils (same at AHUs)

E. Final Inspections

Step No.	Test Procedure	Expected Results	Pass Y / N	Actual Response
1)	Labeling is complete	a. All equipment has appropriate label b. All related piping is properly labeled.	(N) Y	devices not labeled → recurring comment ↳ on equipment. (AHU)
2)	All overrides have been restored to original positions		Y	

--END OF TEST--

TAB Report Example: AIR



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: UIUC NATURAL HISTORY BUILDING

Contractor: KINGLAR

Architect: LCM ARCHITECTS

Engineer: KJWW ENGINEERING CONSULTANTS

Testing, Adjusting and Balancing Bureau

TABB ID # BB82196T

By:

Date: 9/6/2017

Project # 700

UIUC NATURAL HISTORY BUILDING 700

Air Unit Re-Cap

Air Unit		Design CFM	Actual CFM	%
AHU-1A	Supply	22150	22180	100%
	Return	22150	22020	99%
	OA	4000	4219	105%
	Exhaust	4000	4056	101%
AHU-2A	Supply	22495	22800	101%
AHU-3A	Supply	8590	8640	100%
AHU-4A	Supply	19855	19244	96%
AHU-5A	Supply	22380	22372	99%
	Return	22215	21816	98%
	OA	4400	4517	102%
	Exhaust	4235	3968	93%
AHU-6A	Supply	10600	10751	101%
	Return	6890	7091	102%
	OA	4680	4582	97%
	Exhaust	970	923	95%
AHU-7A	Supply	9060	9030	99%
	Return	9170	9009	98%
	OA	2160	2192	101%
	Exhaust	2160	2171	100%
AHU-8	Supply	3000	2993	99%
	Return	3000	2993	99%
HRC-4	Exhaust	35435	35283	99%
EF-1A	Exhaust	3844	3812	99%
EF-2A	Exhaust	5192	5391	103%
EF-3A	Exhaust	4645	4559	98%
EF-5	Exhaust	100	107	107%
EF-6	Exhaust	180	183	101%
EF-7	Exhaust	90	93	103%
EF-8	Exhaust	90	91	101%
FCU-0032-1	Supply	1105	1143	103%
	Return	1105	1142	103%

UIUC NATURAL HISTORY BUILDING 700

Air Unit Re-Cap

Air Unit		Design CFM	Actual CFM	%
FCU-0032-2	Supply	1105	1039	94%
	Return	1105	1037	93%
FCU-1010A	Supply	580	550	94%
	Return	580	550	94%
FCU-1012	Supply	580	585	100%
	Return	580	584	100%
FCU-1034	Supply	980	947	96%
	Return	980	945	96%
FCU-1035A	Supply	1825	1942	106%
	Return	1825	1942	106%
FCU-1035B	Supply	1825	1838	100%
	Return	1825	1835	100%
FCU-1035C	Supply	1825	1871	102%
	Return	1825	1868	102%
FCU-1035D	Supply	1825	1830	100%
	Return	1825	1830	100%
FCU-1037	Supply	580	560	96%
	Return	580	559	96%
FCU-1039	Supply	725	703	96%
	Return	725	703	96%
FCU-1050	Supply	1105	1158	104%
	Return	1105	1155	104%
FCU-1082	Supply	725	706	97%
	Return	725	705	97%
FCU-1084	Supply	350	353	100%
	Return	350	353	100%
FCU-1086	Supply	935	903	96%
	Return	935	970	103%
FCU-1088A	Supply	700	680	97%
	Return	700	680	97%

UIUC NATURAL HISTORY BUILDING 700

Air Unit Re-Cap

Air Unit		Design CFM	Actual CFM	%
FCU-1088B	Supply	700	699	99%
	Return	700	699	99%
FCU-2008	Supply	580	556	95%
	Return	580	556	95%
FCU-2025	Supply	580	548	94%
	Return	580	547	94%
FCU-2073B	Supply	1185	1190	100%
	Return	1185	1188	100%
FCU-2081	Supply	605	610	100%
	Return	605	609	100%
FCU-3008	Supply	580	581	100%
	Return	580	578	99%
FCU-3037	Supply	980	937	95%
	Return	980	936	95%
FCU-3039	Supply	580	581	100%
	Return	580	578	99%
FCU-3094	Supply	980	932	95%
	Return	980	931	95%
FCU-4008	Supply	580	542	93%
	Return	580	542	93%
FCU-4033	Supply	580	556	95%
	Return	580	556	95%
FCU-1008	Supply	570	554	97%
	Return	570	552	96%

COMMISSIONING REPORT
NHB Renovation

TAB: Water

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:	1/23/18
A&R JOB #	9458
RE:	UIUC EPC 3 Project
	Loomis Laboratory
	Agreement 202-04383
	Proj. #U14076

TO: Jacob Scott
jacob.scott@bartonmalow.com
Barton Malow

ENCLOSED

COPIES	SPEC	DESCRIPTION
1	230593	Test and Balance Report Rev 2

COMMENTS: For approval

SUPPLIER: IL Certified Testing

Copy: file

Signed: Cathy Roelfs
Contracts Administrator

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: UIUC NATURAL HISTORY BUILDING

Contractor: A&R MECHANICAL

Architect: LCM ARCHITECTS

Engineer: KJWW ENGINEERING CONSULTANTS

Testing, Adjusting and Balancing Bureau

TABB ID # BB82196T

By:

Date: 11/29/2017

Project # 1464

UIUC NATURAL HISTORY BUILDING

Instrument Listing

	Device	Calibration Date
1	Shortridge ADM 860C Meter Serial # M14248	05/03/17
2	Shortridge Velgrid	05/03/17
3	Velometer with Pilot Tube	05/03/17
4	Digital Strobe	02/21/17
5	Digital Clamp on Meter	03/18/17
6	Model 3038 L Pressure Test fan	04/05/17
7	Alnor HM680 Water Meter Serial #70618258	05/23/17

(TABB) Pump Data Sheet (Smarta)

Job Name: NATURAL HISTORY **Date:**

System: HEATING WATER SYSTEM **By:**

Pump Number	HWP-1		HWP-2
Service	PERIMETER		PERIMETER
Pump Mfg	BELL & GOSSETT		BELL & GOSSETT
Model No.	e 1510 SSF 9.125		e 1510 SSF 9.125
GPM/Head	500/70		500/70
Pump RPM	1800		1800
Impeller Diam	9.125		9.125
Motor HP / RPM	15/1765		15/1765
Volts/Phase/Hertz	460/3/60		460/3/60
F.L. Amps / S.F.	18.1/1.15		18.1/1.15
Seal Type	SOFT		SOFT
Pump Off-Press			
Valve Shut Diff	84.77		83.47
Act Impeller Diam			
Valve Open Diff	60.5		57.8
Valve Open GPM	560		600
Final Discharge FT			
Final Suction FT			
Final Delta FT	62.0		61.8
Final GPM	520		530
Actual Voltage	482.4		481.7
Actual Amperage	16.9		17.4

Remarks:

COMMISSIONING REPORT
NHB Renovation

(TABB) Pump Data Sheet (Smarta)

Job Name: NATURAL HISTORY Date:

System: ERV-1 & 2 By:

Pump Number	ERP-1		ERP-2
Service	ERV		ERV
Pump Mfg	BELL & GOSSETT		BELL & GOSSETT
Model No.	3X2.5X10.25 e-1510 SSF 2EB		3X2.5X10.25 e-1510 SSF 2EB
GPM/Head	185/100		185/100
Pump RPM	1800		1800
Impeller Diam	10.25		10.25
Motor HP / RPM	10/1760		10/1760
Volts/Phase/Hertz	460/3/60		460/3/60
F.L. Amps / S.F.	12.2/1.15		12.2/1.15
Seal Type	SOFT		SOFT
Pump Off-Press	23		23
Valve Shut Diff	116		116
Act Impeller Diam	10.4		10.4
Valve Open Diff	102.7		101.6
Valve Open GPM	220		230
Final Discharge FT	152.46		154.77
Final Suction FT	46.2		48.51
Final Delta FT	106.26		106.26
Final GPM	187.8		187.8
Actual Voltage	487		487
Actual Amperage	9.3		9.3

Remarks:

(TABB) Circuit Setter Coil Test Sheet

Project: NATURAL HISTORY Date:

System: ERV SYSTEM By:

Unit #	Flow Meter Size	Flow Meter Set	Design Rating FT HD	Design Rating GPM	Flow Test Results: Terminal FT HD	Terminal GPM	Bypass FT HD	Bypass GPM	Remarks:
SUPPLY SIDE									
AHU-2	2.5"	4.0	7.8	41.9	7.89	43.0			TOP COIL
	2.5"	4.0	7.8	41.9	7.9	43.5			BOTTOM COIL
AHU-3	2"	5.5	7.6	30.9	7.59	30.9			
AHU-4	3"	4.25	19.2	70.2	19.31	70.22			
RETURN SIDE									
EHRC-1	1.5"	7.0	3.8	18	3.82	18.03			
EHRC-2	1.5"	7.0	3.8	18	3.81	18.01			
EHRC-3	1.5"	4.5	13.5	14	14.2	14.6			
EHRC-4	2.5"	4.0	17.5	65	19.01	68.5			TOP COIL
EHRC-4	2.5"	4.0	17.5	65	19.0	68.48			BOTTOM COIL

(TABB) Circuit Setter Coil Test Sheet (Smarta)

Project: NATURAL HISTORY Date:

System: CHILLED WATER By:

Unit #	Flow Meter Size	Flow Meter Set	Design Rating FT HD	Design Rating GPM	Flow Test Results: Terminal FT HD	Terminal GPM	Bypass FT HD	Bypass GPM	Remarks:
FCU-0032-1	4.2	35%	4.33	3.9	4.66	4.2			
FCU-0032-2	4.2	35%	4.33	3.9	4.46	4.02			
FCU-1008	2.5	35%	4.42	2	4.45	2.02			
FCU-1010A	2.5	30%	4.42	2	4.67	2.11			
FCU-1012	2.5	30%	4.42	2	4.57	2.06			
FCU-1034	4.2	30%	1.67	2.4	1.67	2.4			
FCU-1035A	7.0	40%	2.92	6.7	2.84	6.52			
FCU-1035B	7.0	40%	2.92	6.7	2.84	6.52			
FCU-1035C	7.0	40%	2.92	6.7	3.1	7.1			
FCU-1035D	7.0	40%	2.92	6.7	2.84	6 7			
FCU-1037	2.5	30%	4.42	2	4.51	2.05			
FCU-1039	2.5	30%	4.58	2.2	5	2.4			
FCU-1050	4.2	35%	4.33	3.9	4.45	4.02			
FCU-1082	4.2	25%	1.25	2.3	1.35	2.48			
FCU-1084	1.1	20%	1	1	.96	.97			
FCU-1086	4.2	100%	2	2.6	1.8	2.4			
FCU-1088A	4.2	25%	1.25	2.3	1.33	2.45			
FCU-1088B	4.2	25%	1.25	2.3	1.37	2.53			
FCU-2008	2.5	20%	4.42	2	4.5	2.03			
FCU-2025	2.5	20%	4.42	2	4.55	2.06			
FCU-2073B	4.2	30%	2.91	3.3	2.97	3.37			
FCU-2081	2.5	30%	3.5	1.7	3.75	1.83			
FCU-3008	2.5	20%	4.42	2	4.42	2			
FCU-3037	4.2	35%	1.67	2.4	1.76	2.53			

(TABB) Circuit Setter Coil Test Sheet (Smarta)

Project: NATURAL HISTORY Date:

System: CHILLED WATER By:

Unit #	Flow Meter Size	Flow Meter Set	Design Rating FT HD	Design Rating GPM	Flow Test Results: Terminal FT HD	Terminal GPM	Bypass FT HD	Bypass GPM	Remarks:
FCU-3039	2.5	20%	4.42	2	4.51	2.04			
FCU-3094	4.2	35%	1.67	2.4	1.67	2.4			
FCU-4008	2.5	20%	4.42	2	4.45	2.02			
FCU-4033	2.5	20%	4.42	2	4.42	2.02			

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

Thompson, Brea (Fa... NHB Renovation - #U13016 - 040120-07-00 – Maintenance of Unit Masonry (Rubble Face Stone Sample In...	Wed 11/4/2015 10:07 AM	39 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 051200-15-00 – Steel Calculations	Wed 11/4/2015 9:59 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 099123-02-02 (1.4D) – Interior Painting Samples (PT-1, PT-2, PT-7)	Wed 11/4/2015 9:58 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 051200-DWG-00 - Steel Reinforcement Shop Drawings	Wed 11/4/2015 9:49 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 263213-01-03 - Packaged Engine Generator Systems	Fri 10/30/2015 10:09 AM	39 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 051200-CALC-00 – Steel Calculations	Fri 10/30/2015 10:02 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 265100-02-00 (1.3A) – Lighting Product Data	Fri 10/30/2015 10:00 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 102113-01-00 – Solid Surface Toilet Compartments	Wed 9/16/2015 9:52 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 097513-01-00 – Interior Stone Cleaning and Repair	Wed 9/16/2015 9:49 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 096613-01-00 – Terrazzo Restoration	Wed 9/16/2015 9:45 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 096813-01-01 – Tile Carpeting CPT 6 Edge and Backing Sample	Wed 9/16/2015 9:41 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 102239-03-00 – Folding Panel Partition	Wed 9/16/2015 9:35 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 211300-04-00 – Fire Protection Systemd (Level 1 & 2 Shop Drawings & Calcs...	Wed 9/16/2015 9:34 AM	44 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 095113-01-02 – Acoustical Panel Ceilings	Fri 9/4/2015 10:42 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 033000-03-00 – Cast in Place Concrete Site	Fri 9/4/2015 10:41 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 233100-01-01 – Ductwork Shop Drawings	Fri 9/4/2015 10:40 AM	43 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 095621-03-01 – Recycled Rubber Flooring	Fri 9/4/2015 10:39 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 281300-01-00 – Electronic Access Control – Shop Drawings, Product Data, D...	Fri 9/4/2015 10:35 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 262726-02-02 – Bodine Electric PD Wiring Devices – Stainless Steel Plates	Fri 9/4/2015 10:34 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 260533-06-00 R2 Bodine Electric SD Conduit and Boxes – Shop Drawings Le...	Fri 9/4/2015 10:31 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 064600-01-00 – Wood Trim Stain Control Sample ; 064800-01-00 – Wood Fra...	Fri 9/4/2015 10:28 AM	39 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 018114-01-00 – Indoor Air Quality Requirements During Construction	Fri 9/4/2015 10:25 AM	38 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 232100-14-00 (1.4A) – Heating BIM Shop Drawings (Level 4)	Fri 8/28/2015 9:42 AM	40 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 232100-13-00 (1.4A) – Heating BIM Shop Drawings (Level 3)	Fri 8/28/2015 9:40 AM	40 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 232100-12-00 (1.4A) – Heating BIM Shop Drawings (Level 1)	Fri 8/28/2015 9:39 AM	40 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 230913-01-02 (1.4A) – HVAC Control Valves Resubmittal	Fri 8/28/2015 9:36 AM	41 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 221023-09-00 (1.4A) – Plumbing & Gas Piping BIM Drawings (Level 5)	Fri 8/28/2015 9:31 AM	40 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 260533-05-00 (1.3A) – R2 Bodine Electric SD Conduit and Boxes – Shop Dra...	Fri 8/28/2015 9:29 AM	35 KB
We have received submittals for the following:		
Thompson, Brea (Fa... NHB Renovation - #U13016 - 221123.13-01-02 (1.3A, C, E) – Domestic Water Pressure Boosting System (VFD)	Fri 8/28/2015 9:26 AM	41 KB
We have received submittals for the following:		

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Thompson, Brea (Fa...	NHB Renovation - #U13016 - 271700-01-00 (1.4A) – Bodine Electric TR Testing, Identification and Administr...	Wed 5/13/2015 12:08 PM	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 271500-01-02 (1.4A) – Bodine Electric PD Horizontal Cabling Requirements ...	Wed 5/13/2015 12:04 PM	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 265100-01-01 (1.3A) – Bodine Electric PD Lighting Color Samples – H6, H11, ...	Wed 5/13/2015 12:01 PM	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 264300-01-00 (1.4A, B; 1.6A, C) – Bodine Electric SD Surge Protection Device...	Wed 5/13/2015 11:58 A...	37 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 262713-01-01 (1.2A) – Bodine Electric SD Electrical Metering – Shop Drawin...	Wed 5/13/2015 11:55 A...	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 262816-01-02 (1.4B, C) – Bodine Electric PD Disconnect Switches – Product ...	Wed 5/13/2015 11:53 A...	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 262419-01-01 (1.4B, C, D) – Bodine Electric SD Motor Control – Shop Drawin...	Wed 5/13/2015 11:50 A...	37 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 262416-01-01 (1.4A) – Bodine Electric SD Panelboards – Shop Drawings	Wed 5/13/2015 11:45 A...	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 262413-02-00 (1.4C) – Bodine Electric PD Switchboards – Installation Instruc...	Wed 5/13/2015 11:38 A...	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 132113-01-00 (1.6A) – Clean Zone General Requirements ; 132114-01-00 (1.6...	Wed 5/13/2015 11:31 A...	39 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 102219-01-00 (1.4A,C; 1.5A, B, C, D) – Modular Hardwall Clean Room – Prod...	Wed 5/13/2015 11:25 A...	39 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 040120-04-00 (1.4 C) – Masonry Restoration – Cleaning Program	Wed 5/13/2015 11:22 A...	38 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 040120-03-01 (1.4 C) – Patching Mortar Samples	Wed 5/13/2015 11:17 A...	38 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 055313-02-00 (1.4 C) – Bar Grating Shop Drawings (West Platform)	Wed 5/13/2015 11:12 A...	38 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 230923-01-01 (1.4E) – Building Automation System for HVAC – DDC Control...	Wed 4/29/2015 11:52 A...	42 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 262923-02-01 – R2 Bodine Electric Variable Freq Motor Control – Harmonic F...	Wed 4/29/2015 11:48 AM	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 260533-04-00 – Electrical Coordinated BIM Shop Drawings (Level 1 & 2)	Mon 4/27/2015 3:15 PM	36 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 271500 (1.4A) – Horizontal Cabling Requirements – Product Data ; Horizont...	Mon 4/27/2015 1:14 PM	37 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 230913.34 (1.4A) – HVAC Control Valve Actuator - Shop Dwgs.	Mon 4/27/2015 1:11 PM	41 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 230913.33 (1.4A, B) – HVAC Control Valves – Shop Dwgs. ; HVAC Control Va...	Mon 4/27/2015 1:10 PM	42 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 210553 (1.3A) – Fire Suppression Identification	Mon 4/27/2015 1:06 PM	41 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 210529 (1.4A) – Fire Suppression – Supports and Anchors	Mon 4/27/2015 1:04 PM	41 KB
	We have received submittals for the following:		
Thompson, Brea (Fa...	NHB Renovation - #U13016 - 079200 (1.4A, B; 1.5A) – Joint Sealants Product Data; LEED; Product Test Re...	Mon 4/27/2015 1:02 PM	38 KB
	We have received submittals for the following:		

Example of Submittal Reviews

From: Keller, Thomas Jeffery
Sent: Friday, July 22, 2016 11:19 AM
To: Huckstep, Brian D <bdhuckst@illinois.edu>
Cc: FandS Shop Drawing Review <fandsshopdrawrev@mx.uillinois.edu>; Bales, Thaddeus Basel <tbales@illinois.edu>
Subject: RE: NHB Renovation - #U13016 - 237323-03-00 RHU-1 Shop Drawings

Brian,

Comments for NHB RHU Submittal:
REVIEWED WITH COMMENTS (resubmit pending consulting engineer review)

1. The construction set has the airflow as 4,500-cfm and the fan power at 5-hp. The submittal is for 3,000-cfm and 1.5-hp. Please confirm that this is correct.

Thanks

Tom

Thomas J. Keller, PE,
CxA, LEED-AP-BD+C
Mechanical Engineer
Facilities & Services
Physical Plant Services Building, MC-821
1501 South Oak Street
Champaign, IL 61820
p. 217.300.4002
tjkeller@illinois.edu

From: Keller, Thomas Jeffery
Sent: Thursday, June 2, 2016 9:14 AM
To: FandS Shop Drawing Review <fandsshopdrawrev@mx.uillinois.edu>
Cc: Huckstep, Brian D <bdhuckst@illinois.edu>; Bales, Thaddeus Basel <tbales@illinois.edu>
Subject: RE: NHB Renovation - #U13016 - 238200-01-02 Terminal Heat Transfer Units-CUH 3-4

Brian H.,

238200-01-02 Terminal Heat Transfer Units-CUH 3-4
REVIEWED WITH COMMENTS

1. It is understood that these two (2) units (CAB-3 and CAB-4) are substituted for cause since the design base units would not fit within the given space.
2. The submitted water pressure drop (11.9-ftwc) for CAB-3 is significantly greater than the basis of design (0.8-ftwc). Please confirm that this will not change the pump requirements.

Thanks,

Tom

Thomas J. Keller, PE,
CxA, LEED-AP-BD+C
Mechanical Engineer
Facilities & Services
Physical Plant Services Building, MC-821
1501 South Oak Street
Champaign, IL 61820
p. 217.300.4002
tjkeller@illinois.edu

From: Bales, Thaddeus Basel
Sent: Thursday, October 8, 2015 11:52 AM
To: Huckstep, Brian D <bdhuckst@illinois.edu>
Cc: Cope, Cynthia Fay <cfcope2@illinois.edu>
Subject: RE: NHB Renovation - #U13016 - 21 13 00 – Fire Protection Systems Shop Dwgs & Pipe Calculations (Level 3)

Brian,

I have reviewed Submittal **21 13 00 – Fire Protection Systems Shop Dwgs & Pipe Calculations (Level 3) 1.4A & 1.4E** and have the following comments:

1. Plan FP-3.0:
   a. **Toilet Rms.:** Please review sprinkler coverage between Toilet Rms. 3009 and 3093. It does not appear to be adequate.
   b. **Satellite Custodial Closet 3013:** Provide sprinkler head(s) – Ordinary Hazard Group 1.
   c. **Storage 3089 & Satellite Custodial Closet 3087:** Provide sprinkler head(s) – Ordinary Hazard Group 1.
   d. **Satellite Custodial Closet 3034:** Provide sprinkler head(s) – Ordinary Hazard Group 1.
   e. **Ultra Clean Mechanical 3035:** Provide sprinkler head(s) – Ordinary Hazard Group 1.
   f. **Electrical 3037 & Data 3039:** Provide sprinkler head(s) – Ordinary Hazard Group 1.
   g. **Ordinary Hazard Group 2 Areas:** Please make sure that these areas are adequately covered.
   h. **Ante Room Workstation 3077 A3 & Ultra Clean Room 3077 A3-a:** Please add more sprinkler heads so that room sprinkler systems meet Ordinary Hazard Group 2 requirements.
   i. **3077A1 & Clean Rm. – Wet 3077A:** Please review layout and adjust as required so that room sprinkler systems meet Ordinary Hazard Group 2 requirements.
   j. **Biogeochemistry Wet Lab 3041:** Please review layout and adjust as required so that room sprinkler system meets Ordinary Hazard Group 2 requirements.
   k. **Cloud Ceiling System in Corridor:** It looks like you have it covered , but please review the cloud ceiling system again and make sure you have adequate sprinkler coverage.

2. Calculations:
   a. I believe that the required hose streams for Ordinary Hazard Group 2 is 250 gpm, not 100 gpm.

Thanks,

Thad

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From: Halberstadt, Alan Dale
Sent: Friday, January 09, 2015 10:31 AM
To: Davis, Alaina; Eisenmann, David J; Huckstep, Brian D; Jakobsson, Jonathan H
Cc: Lancaster, Dave; Youakim, Joseph Y; Koric, Sanja
Subject: RE: NHB Renovation - #U13016 - 26 29 23 – VFD Motor Controllers

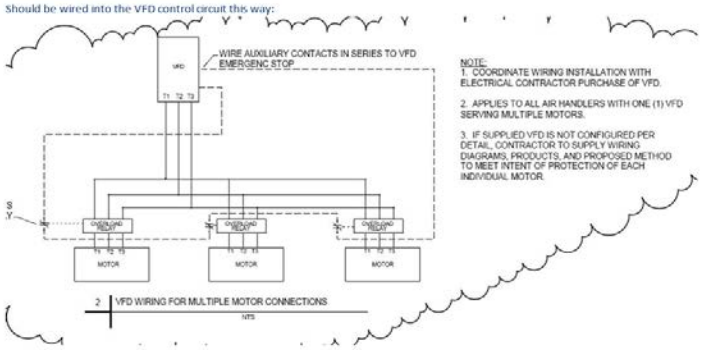
Brian,

The submittal does not show individual motor overload protection for the units supplying the fan arrays.
Individual protection is required by NEC 430.32.
Add individual overload/heaters for the number of motors on each fan array VFD.

AHU SCHEDULE - SUPPLY FAN

TAG NAME	CFM	EXT. S.P.	TYPE	RPM (NOTE D)	BHP (NOTE E)	MHP (NOTE E)	DISCONNECT BY (NOTE A)	CONTROLLER/ STARTER BY (NOTE A)	CONTROLLER/ STARTER TYPE (NOTE C)	VOLTAGE	PHASES	MINIMUM OUTSIDE AIR CFM
AHU1	33000	3.35	FAN ARRAY (1 ROW X 2 COLUMN)	2181	6.6	7.5	E.C.	E.C.	VFD	460 V	3	8,000 CFM
AHU2	22465	3.34	FAN ARRAY (2 ROW X 2 COLUMN)	2071	5.3	7.5	E.C.	E.C.	VFD	460 V	3	12,445 CFM
AHU3	8750	2.52	FAN ARRAY (1 ROW X 2 COLUMN)	1950	4.2	5	E.C.	E.C.	VFD	460 V	3	8,750 CFM
AHU4	18000	3.41	FAN ARRAY (1 ROW X 2 COLUMN)	2314	8.7	10	E.C.	E.C.	VFD	460 V	3	9,600 CFM
AHU5	22000	3.51	FAN ARRAY (1 ROW X 2 COLUMN)	2269	9.9	15	E.C.	E.C.	VFD	460 V	3	8,400 CFM
AHU6	12065	3.44	FAN ARRAY (1 ROW X 2 COLUMN)	2284	7.4	10	E.C.	E.C.	VFD	460 V	3	9,600 CFM
AHU7	6058	3.33	FAN ARRAY (1 ROW X 2 COLUMN)	2742	5.9	7.5	E.C.	E.C.	VFD	460 V	3	2,160 CFM
RHD1	4500	0.50	GRADE FAN	1821	1	1	E.C.	E.C.	VFD	460 V	3	0 CFM

Should be wired into the VFD control circuit this way:



Using a unit like this:

GV3P

Alan Halberstadt
Electrical Construction Superintendent
University of Illinois - Facilities & Services
Construction Division/Engineering Services
Physical Plant Service Building,MC-800
1501 South Oak Street
Champaign, Illinois 61820
Office: (217)244-6183
Cell: (217)714-5452
fax: (217)244-0660
email hlbrstdt@illinois.edu
url www.fs.uiuc.edu

From: Halberstadt, Alan Dale
Sent: Tuesday, December 02, 2014 11:46 AM
To: Huckstep, Brian D
Cc: Youakim, Joseph Y; Lancaster, Dave
Subject: RE: NHB Renovation - #U13016 - 263213 (1.3B, C, D, E; 1.9A; 1.11A) – Generator – Shop Drawings ; Generator – Product Data ; Generator – Cert of Compliance ; Generator – Installation Instructions ; Generator – O&M Maintenance Data ; Generator - Warranty

Brian,

Generator to come with maintenance tool set in metal box. None listed in material list. 263213 1.4(B) "Furnish one set of tools required for preventative maintenance of the engine generator system. Package tools in adequately sized metal toolbox."

Under "General Notes" submittal just says "Spare parts as specified" A reminder that the spare parts are to include the following from 2631131.4:
C. Provide two additional sets of each fuel, oil, and air filter element required for the engine generator system. Provide additional fuel polishing filters for one year of operation.
D. Provide one fuse for every type and rating used.

Could not find all of the following accessories listed in the submittal. Verify that they are included. 263213 2.3
Engine Accessories: Fuel filter, lube oil filter, intake air filter, lube oil cooler, fuel transfer pump, fuel priming pump, gear-driven water pump. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.

Circuit breakers submitted do not meet requirements of 263213 2.6(A):
Generator Circuit Breaker: Molded or insulated case, service-rated electronic trip type; 100% rated breaker complying with NEMA AB1 and UL 489.
Breakers submitted are no electronic-trip type, and are not NEMA rated.

Alan Halberstadt
Electrical Construction Superintendent
University of Illinois - Facilities & Services
Construction Division/Engineering Services
Physical Plant Service Building,MC-800
1501 South Oak Street
Champaign,Illinois 61820
Office: (217)244-6183
Cell: (217)714-5452
fax: (217)244-0660
email hlbrstdt@illinois.edu
url www.fs.uiuc.edu

Tue 12/9/2014 4:15 PM

Huckstep, Brian D

FW: NHB Renovation - #U13016 - 233416 – Centrifugal Fans – Shop Dwg.'s / Motor Data (General Exhaust)

To Wise, Michael Anthony

Cc 'Jonathan Lundeen'; 'Leung, Tim'; 'Matt.Richards@BartonMalow.com'; 'toubeenj@kjww.com'

Bcc Bachert, Randall L; Eisenmann, David J; Grace, Randall Scott; Halberstadt, Alan Dale; 'Jonathan Jakobsson (Facilities & Services) (E-mail)'; Lancaster, Dave; 'Stephen Osterbur (Facilities & Services) (E-mail)'

Mike,

Steve has some comments below regarding the NHB Renovation - #U13016 - 233416 – Centrifugal Fans – Shop Dwg.'s / Motor Data (General Exhaust) submittal.

Thank you,

Brian

From: Osterbur, Stephen M
Sent: Tuesday, December 09, 2014 2:04 PM
To: Huckstep, Brian D
Cc: Bales, Thaddeus Basel; Halberstadt, Alan Dale; Bachert, Randall L; Lancaster, Dave; Grace, Randall Scott
Subject: FW: NHB Renovation - #U13016 - 233416 – Centrifugal Fans – Shop Dwg.'s / Motor Data (General Exhaust)

EF-5
1. EF-5 isolation damper (MOD-12) is listed in MOD schedule R2-V5.2. Schedule requires motorized, thermally broke, opposed blade, etc. damper.

EF 6,7,8
1. Contract documents do not require discharge shutter.
2. Fan discharge arrangement should match detail 6 R2-V3.1

From: Davis, Alaina
Sent: Friday, December 05, 2014 10:55 AM
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; Kammin, Charles E; Koebel, Louise Ann; Lancaster, Dave; Martin, Jeffery Alan; Osterbur, Stephen M; Whittaker, Theresa K D; Thompson, Brea (Fand5); Welch, Ryan B; White, Roland W; Youakim, Joseph Y
Cc: Bales, Thaddeus Basel; Bryant, Robert W; Burgin, Tom E II; Grant, Guy R; Green, David Mark; Keaton, Bruce; Koric, Sanja; Prince, John M; Vollrath, James E
Subject: NHB Renovation - #U13016 - 233416 – Centrifugal Fans – Shop Dwg.'s / Motor Data (General Exhaust)

We have received submittals for the following:

233416 – Centrifugal Fans – Shop Dwg.'s / Motor Data (General Exhaust)

Please review and give comments if any, to **Brian Huckstep** by **Thursday, December 11, 2014**. The submittals are located in the Inspection Office, **room 148**. After the due date they will be placed in the appropriate file.

Appendix K - Commissioning Issues Log

NHB

Commissioning & Inspection Issues Log

Open	71
Awaiting Inspection	0
Closed	951
Monitoring	48
Total Items	1070

Issue Number	Location	Issue Description	Date Identified	Contractor Responsibility	Action Taken	Contractor Comments	UIUC C&I Comments	Issue Status	Resolution Date
191	Room 3094	Conduits thru floor & ceiling not sealed	2/24/2017	Bodine				Closed	8/25/2017
192	Room 3092	Light switch is behind the door?	2/24/2017	?				Closed	2/27/2018
261	Room 3079	Seal pipe penetrations	2/24/2017	?			Sprinkler piping is not seal & Head is covered up.	Closed	
269	Room 3089	Seal pipe penetrations	2/24/2017	?				Closed	8/25/2017
273	Room 3087	Seal penetrations	2/24/2017	?			Couldn't get in the room	Closed	
315	Room 3008	Seal pipe penetrations	2/24/2017	?				Closed	8/25/2017
333	Room 3011	Glycol stains on numerous tiles	2/24/2017	A&R				Closed	
371	Room 3035	Seal conduit and pipe penetrations	2/24/2017	?				Closed	8/25/2017
408	Room 3039	Seal holes in the floor and walls	2/24/2017	?				Closed	8/25/2017
433	Room 4069	Spinkler pipe penetration through the wall not sealed.	4/10/2017	Sprinkler Contractor				Closed	8/25/2017
436	Room 4067	Spinkler piping not sealed.	4/10/2017	Sprinkler Contractor				Closed	8/25/2017
438	Room 4065	Numerous ceiling tiles have glycol stains on them, need to be replaced.	4/10/2017	Core/A&R				Closed	8/25/2017
469	Room 4027	Seal penetrations through the walls and floor.	4/10/2017	?				Closed	8/25/2017
494	Room 1002	Patch holes in brick wall at sprinkler pipe penetration.	4/28/2017	Automatic				Closed	
509	Room 1061A	The light between the doors does not come on until the inside door is opened. This light should be tied to the hallway lighting.	4/28/2017	Bodine				Closed	8/25/2017
532	Room 1063	Door hits light.	4/28/2017	Bodine			Window stop missing at the top of the door	Closed	
542	Room 1060	Remove pipe hanger by windows.	4/28/2017	A&R				Closed	8/25/2017
554	Room 1052	Remove tin foil cover from sprinkler head.	4/28/2017	Automatic				Closed	8/25/2017
557	Room 1050 Elevator Room	Patch holes above FCU.	4/28/2017	King Lar				Closed	8/25/2017
563	Room 1040	Remove temporay cover from sprinkler head.	4/28/2017	Automatic				Closed	8/25/2017
564	Room 1040	Fire caulk sprinkler pipe penetration.	4/28/2017	Automatic				Closed	8/25/2017
592	1st Floor Emergency Showers	Room 1080 - mixing valve discharge 94 degrees at 64psi	1/17/2018	GA Fitch				Closed	
593	1st Floor Emergency Showers	Room 1071 - eyewash testing passed. No sign installed	1/17/2018	GA Fitch				Closed	
594	1st Floor Emergency Showers	Room 1063 – eyewash/shower testing passed. Shower 27gpm at 90 degrees. Floor drain high	1/17/2018	GA Fitch				Closed	
595	1st Floor Emergency Showers	Room 1063B1 – eyewash testing passed. No sign installed	1/17/2018	GA Fitch				Closed	
596	1st Floor Emergency Showers	Room 1057 – eyewash/shower passed. Shower 23gpm at 84 degrees. No wall bracket installed.	1/17/2018	GA Fitch				Closed	
597	1st Floor Emergency Showers	Room 1047 – eyewash testing passed. No sign installed	1/17/2018	GA Fitch				Closed	
598	1st Floor Emergency Showers	Room 1041 – eyewash/shower testing passed. Shower 26gpm at 74 degrees. Access to the unit is blocked by occupant's chemicals. No wall bracket installed.	1/17/2018	GA Fitch				Closed	
599	1st Floor Emergency Showers	Room 1023 – eyewash/shower testing passed. Shower 27gpm at 89 degrees. No wall bracket installed.	1/17/2018	GA Fitch				Closed	
600	1st Floor Emergency Showers	Room 1022 – eyewash testing passed. No sign installed	1/17/2018	GA Fitch				Closed	
601	1st Floor Emergency Showers	Room 1016 – eyewash/shower passed. Shower 26gpm at 78 degrees. Shower head cut down to 63" AFF because of low ceiling. No wall bracket installed.	1/17/2018	GA Fitch				Closed	

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602	**1st Floor Emergency Showers**	Room 1014 – eyewash/shower passed. Shower 27gpm at 79 degrees. Shower head cut down to 6'2 AFF because of low ceiling. No wall bracket installed.	1/17/2018	GA Rich				Closed	
603	**1st Floor Emergency Showers**	Room 1011 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
604	**1st Floor Emergency Showers**	Room 1093 – eyewash/shower passed. Shower 30gpm at 90 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
605	**2nd Floor Emergency Showers**	Room 2083A – mixing valve discharge 110 degrees at 57psi	1/17/2018	GA Rich				Closed	
606	**2nd Floor Emergency Showers**	Room 2080 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
607	**2nd Floor Emergency Showers**	Room 2073 – Recessed eyewash/shower testing passed. Shower 27gpm at 98 degrees.	1/17/2018	GA Rich				Closed	
608	**2nd Floor Emergency Showers**	Room 2090 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
609	**2nd Floor Emergency Showers**	Room 2088 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
610	**2nd Floor Emergency Showers**	Room 2084 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
611	**3rd floor Emergency Showers**	Room 3089 – mixing valve discharge 101 degrees at 43 psi	1/17/2018	GA Rich				Closed	
612	**3rd floor Emergency Showers**	Room 3041 – eyewash/shower testing passed. Shower 23gpm at 81 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
613	**3rd floor Emergency Showers**	Room 3077A3 – eyewash/shower in clean room has not been installed. Owner will install at a later date.	1/17/2018	GA Rich				Closed	
614	**3rd floor Emergency Showers**	Room 3006 – eyewash/shower testing passed. Shower 24gpm at 77 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
615	**3rd floor Emergency Showers**	Room 3004 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
616	**3rd floor Emergency Showers**	Room 3002 – eyewash/shower testing passed. Shower 26gpm at 83 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
617	**3rd floor Emergency Showers**	Room 3100 – eyewash/shower testing passed. Shower 22gpm at 79 degree. No wall bracket installed.	1/17/2018	GA Rich				Closed	
618	**3rd floor Emergency Showers**	Room 3098 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
619	**4th floor: Emergency Showers**	Room 4013 – mixing valve discharge 94 degrees at 39 psi. Pressure drops from 39psi to 7 when any emergency shower valve is pulled on the 4th floor. Not acceptable. Strainers may be plugged??	1/17/2018	GA Rich				Closed	
620	**4th floor: Emergency Showers**	Room 4041 – Both eyewash stations passed. No sign installed	1/17/2018	GA Rich				Closed	
621	**4th floor: Emergency Showers**	Room 4016 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
622	**4th floor: Emergency Showers**	Room 4014 – eyewash/shower testing "did not pass". Shower pressure drops from 44psi to 3psi and only flowed 7gpm at 81 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	
623	**4th floor: Emergency Showers**	Room 4012A – eyewash/shower testing "did not pass". Shower pressure drops from 44psi to 2psi and only flowed 7gpm at 80 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	

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602	**1st Floor Emergency Showers**	Room 1014 – eyewash/shower passed. Shower 27gpm at 79 degrees. Shower head cut down to 6'2 AFF because of low ceiling. No wall bracket installed.	1/17/2018	GA Rich				Closed	
603	**1st Floor Emergency Showers**	Room 1011 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
604	**1st Floor Emergency Showers**	Room 1093 – eyewash/shower passed. Shower 30gpm at 90 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
605	**2nd Floor Emergency Showers**	Room 2083A – mixing valve discharge 110 degrees at 57psi	1/17/2018	GA Rich				Closed	
606	**2nd Floor Emergency Showers**	Room 2080 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
607	**2nd Floor Emergency Showers**	Room 2073 – Recessed eyewash/shower testing passed. Shower 27gpm at 98 degrees.	1/17/2018	GA Rich				Closed	
608	**2nd Floor Emergency Showers**	Room 2090 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
609	**2nd Floor Emergency Showers**	Room 2088 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
610	**2nd Floor Emergency Showers**	Room 2084 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
611	**3rd floor Emergency Showers**	Room 3089 – mixing valve discharge 101 degrees at 43 psi	1/17/2018	GA Rich				Closed	
612	**3rd floor Emergency Showers**	Room 3041 – eyewash/shower testing passed. Shower 23gpm at 81 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
613	**3rd floor Emergency Showers**	Room 3077A3 – eyewash/shower in clean room has not been installed. Owner will install at a later date.	1/17/2018	GA Rich				Closed	
614	**3rd floor Emergency Showers**	Room 3006 – eyewash/shower testing passed. Shower 24gpm at 77 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
615	**3rd floor Emergency Showers**	Room 3004 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
616	**3rd floor Emergency Showers**	Room 3002 – eyewash/shower testing passed. Shower 26gpm at 83 degrees. No wall bracket installed.	1/17/2018	GA Rich				Closed	
617	**3rd floor Emergency Showers**	Room 3100 – eyewash/shower testing passed. Shower 22gpm at 79 degree. No wall bracket installed.	1/17/2018	GA Rich				Closed	
618	**3rd floor Emergency Showers**	Room 3098 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
619	**4th floor: Emergency Showers**	Room 4013 – mixing valve discharge 94 degrees at 39 psi. Pressure drops from 39psi to 7 when any emergency shower valve is pulled on the 4th floor. Not acceptable. Strainers may be plugged??	1/17/2018	GA Rich				Closed	
620	**4th floor: Emergency Showers**	Room 4041 – Both eyewash stations passed. No sign installed	1/17/2018	GA Rich				Closed	
621	**4th floor: Emergency Showers**	Room 4016 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
622	**4th floor: Emergency Showers**	Room 4014 – eyewash/shower testing "did not pass". Shower pressure drops from 44psi to 3psi and only flowed 7gpm at 81 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	
623	**4th floor: Emergency Showers**	Room 4012A – eyewash/shower testing "did not pass". Shower pressure drops from 44psi to 2psi and only flowed 7gpm at 80 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	

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624	**4th floor: Emergency Showers**	Room 4006 – eyewash/shower testing "did not pass". Shower pressure drops from 44psi to 2psi and only flows 14gpm at 79 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	
625	**4th floor: Emergency Showers**	Room 4002 – eyewash/shower testing "did not pass". Shower pressure drops from 44psi to 3psi and only flows 11gpm at 80 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	
626	**4th floor: Emergency Showers**	Room 4076 – eyewash/shower testing "did not pass". Shower pressure drops from 43psi to 2psi and only flows 12gpm at 79 degrees. No wall bracket installed	1/17/2018	GA Rich				Closed	
627	**4th floor: Emergency Showers**	Room 4074 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
628	**4th floor: Emergency Showers**	Room 4070 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
629	**4th floor: Emergency Showers**	Room 4073 – eyewash testing passed. No sign installed	1/17/2018	GA Rich				Closed	
630	**4th floor: Emergency Showers**	Note : 4th floor emergency showers do not meet the minimum flow per UIUC safety requirements (20gpm).	1/17/2018	GA Rich				Closed	
631	**Attic**	Insulation missing at hose bibb located at AHU-1	1/17/2018	GA Rich				Closed	
632	**Attic**	Repair insulation where 8" storm goes under cat walk north of AHU-1	1/17/2018	GA Rich				Closed	
633	**Attic**	Pipe ID missing on all plumbing piping in the attic. Storm, domestic cold water and pvc vents	1/17/2018	GA Rich				Closed	
634	**Mech Rm 1008**	Chilled water entrance piping is missing thermometers on supply and return where project connection was made.	1/25/2018	A&R				Closed	
635	**Mech Rm 1008**	Relief valve installed on chilled water supply is valved off??	1/25/2018	A&R				Closed	
637	**Mech Rm 1080**	Automatic air vents for both heating systems need to be piped individually to the floor drain	1/25/2018	A&R				Closed	
638	**Mech Rm 1080**	Missing make up water pressure gauge to re heat system	1/25/2018	A&R				Closed	
639	**Mech Rm 1080**	Missing make up water pressure gauge to heating water system	1/25/2018	A&R				Closed	
640	**Mech Rm 1080**	Insulate ¾" blow down piping from both air dirt separators	1/25/2018	A&R				Closed	
641	**Mech Rm 1080**	Isolation valves for the air dirt separators on both reheat and heating hot water systems are missing as per R2-H4.3	1/25/2018	A&R				Closed	
642	**Mech Rm 1080**	Reheat water is very dirty. Test for inhibitor and change bag filter	1/25/2018	A&R				Closed	
643	**Mech Rm 1080**	Heating hot water bag filter has a DP of 11 pounds and needs changed	1/25/2018	A&R				Closed	
644	**Mech Rm 1080**	Glycol for heating Hot water system is at 25% and meets document requirements	1/25/2018	A&R				Closed	
645	**Mech Rm 1078**	Missing insulation at high pressure steam pressure reducing valve	1/25/2018	A&R				Closed	
646	**Mech Rm 1074**	Steam condensate piping missing ID	1/25/2018	A&R				Closed	
647	**North 5th floor Mechanical Rm**	Install hangers and insulate 1" reheat pipe running across the northwest floor	1/25/2018	A&R				Closed	
648	**North 5th floor Mechanical Rm**	Insulate 1" reheat pipe continuous thru 1' wall penetration. Pipe is uninsulated and rubbing on the brick	1/25/2018	A&R				Closed	
649	**North 5th floor Mechanical Rm**	Isolation valves missing on both sides of the Heat Recovery air/dirt separator	1/25/2018	A&R				Closed	
650	**North 5th floor Mechanical Rm**	Provide supports (cush clamps) on ½" copper to the expansion tank	1/25/2018	A&R				Closed	
651	**North 5th floor Mechanical Rm**	Missing pressure gauge at makeup water connection	1/25/2018	A&R				Closed	
652	**North 5th floor Mechanical Rm**	Plug manual ½" vent (ball valve) on the top of air/dirt separator	1/25/2018	A&R				Closed	
653	**North 5th floor Mechanical Rm**	Missing pressure gauge at expansion tank	1/25/2018	A&R				Closed	
654	**North 5th floor Mechanical Rm**	Missing pressure gauge at circulation pump	1/25/2018	A&R				Closed	
655	**North 5th floor Mechanical Rm**	Small glycol leak at differential pressure station	1/25/2018	A&R				Closed	
656	**North 5th floor Mechanical Rm**	Heat recovery circulation pump is in a 6lb vacuum on the suction side. System low	1/25/2018	A&R				Closed	
657	**North 5th floor Mechanical Rm**	Glycol is at 32%. Adjust to the required 35%	1/25/2018	A&R				Closed	

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658	**North 5th floor Mechanical Rm**	Remove old pipe on the floor that was demoed during construction	1/25/2018	A&R				Closed	
659	**Attic AHU-1**	Insulate all petes plugs air tight on the chilled water piping	1/25/2018	A&R				Closed	
660	**Attic AHU-1**	Insulate support stand on the chilled water coil supply	1/25/2018	A&R				Closed	
661	**Attic AHU-1**	Insulate balance valves air tight with Armacell. Tyvek bags are not allowed on chilled water systems	1/25/2018	A&R				Closed	
662	**Attic AHU-1**	Insulate chilled water coil drains and vents	1/25/2018	A&R				Closed	
663	**Attic AHU-2**	Insulate chilled water coil drains and vents	1/25/2018	A&R				Closed	
664	**Attic AHU-2**	Insulate all petes plugs air tight on chilled water piping	1/25/2018	A&R				Closed	
665	**Attic AHU-3**	Insulate chilled water coil drains and vents	1/25/2018	A&R				Closed	
666	**Attic AHU-3**	Insulate all petes plugs air tight on chilled water piping	1/25/2018	A&R				Closed	
667		Insulate support stand on chilled water coil supply	1/25/2018	A&R				Closed	
668	**Attic AHU-4**	Missing pressure gauge at Energy Recovery DP station	1/25/2018	A&R				Closed	
669	**Attic AHU-4**	Insulate chilled water coil drains and vents	1/25/2018	A&R				Closed	
670	**Attic AHU-4**	Insulate all petes plugs air tight on chilled water system	1/25/2018	A&R				Closed	
671	**Attic AHU-5**	Repair insulation where a tee for a drain was cut into the heat recovery system above the AHU	1/25/2018	A&R				Closed	
672	**Attic AHU-5**	Insulate balance valves air tight with Armacell. Tyvek bags are not allowed on chilled water systems	1/25/2018	A&R				Closed	
673	**Attic AHU-6**	Insulate balance valves air tight with Armacell. Tyvek bags are not allowed on chilled water systems	1/25/2018	A&R				Closed	
674	**Attic AHU-6**	Locate and mark location of check valves in HCP-6 re-circ pump system and bypass	1/25/2018	A&R				Closed	
675	**Attic AHU-6**	Insulate chilled water coil drains and vents	1/25/2018	A&R				Closed	
676	**Attic AHU-6**	Small glycol leak on HCP-6 re-circ pump seal	1/25/2018	A&R				Closed	
677	**Attic AHU-7**	Insulate chilled water coil drains and vents	1/25/2018	A&R				Closed	
678	**Attic AHU-7**	Insulate balance valves air tight with Armacell. Tyvek bags are not allowed on chilled water systems	1/25/2018	A&R				Closed	
679	**Attic AHU-7**	Locate and mark location of check valves in HCP-7 re-circ pump system and bypass	1/25/2018	A&R				Closed	
680	**Ahu-7**	Doors on ahu are leaking air.	1/16/2018	King Lar				Closed	
681	**Ahu-7**	Repair damaged insulation on discharge.	1/16/2018	King Lar				Closed	
682	**Ahu-7**	Access door at a/f station	1/16/2018	King Lar				Closed	
683	**Ahu-6**	Repair latch on door.	1/16/2018	King Lar				Closed	
684	**Ahu-6**	Access doors at a/f stations.	1/16/2018	King Lar				Closed	
685	**General**	Cut excess rod length from hangers.	1/16/2018	King Lar				Closed	
686	**General**	Repairs duct insulation where damaged and torn.	1/16/2018	King Lar				Closed	
687	**Graphics/Controls**	AHU-05 VAVs (1of 4) ahu button directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/17/2018
688	**Graphics/Controls**	AHU-05 VAVs (2 of 4) ahu button directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/18/2018
689	**Graphics/Controls**	AHU-05 VAVs (3 of 4) ahu button directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/19/2018
690	**Graphics/Controls**	AHU-05 VAVs (4 of 4) ahu button directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/20/2018
691	**Graphics/Controls**	AHU-04 EABs (1 0f 1) page, AHU button directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/21/2018
692	**Graphics/Controls**	AHU-04 VAVs (2 of 2) directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/22/2018
693	**Graphics/Controls**	AHU-03 EABs (1 of 1) directs you to AHU 1.	1/16/2018	A&R/Alpha				Closed	1/23/2018
694	**Graphics/Controls**	AHU-02 EABs (1 0f 2) page, both pages are named this. Second should be (2 of 2).	1/16/2018	A&R/Alpha				Closed	1/24/2018
695	**Graphics/Controls**	AHU-02 EABs (1 OF 2) directs you to AHU 1	1/16/2018	A&R/Alpha				Closed	1/25/2018
696	**Graphics/Controls**	AHU-01 VAVs page (2 of 3) should be (2 of 4).	1/16/2018	A&R/Alpha				Closed	1/26/2018
697	**Graphics/Controls**	Table page AH-04 VAVs (2 of 2) the AHU button directs you to AHU 1 instead of AHU 4.	1/16/2018	A&R/Alpha				Closed	1/27/2018
698	**Graphics/Controls**	Room 3042 is blinking like its overridden.	1/16/2018	A&R/Alpha				Closed	1/28/2018
699	**Graphics/Controls**	All CO2 sensors need to be checked. The first three I went to check were reading over 720 ppm and actual was around 420 ppm. Room numbers I checked and quit after three were: 4047,1090,1071. (alpha)	1/8/2018	A&R/Alpha		I have a fix for the issue, will take a little time but should be completed by tomorrow (1/10/18)		Closed	1/10/2018
700	**Graphics/Controls**	On the floor plan 4SW it shows room 4025 and its actually room 4049. I could not room 4049 vav on the graphics. (alpha)	1/8/2018	A&R/Alpha		This has been corrected.		Closed	1/9/2018
701	**Graphics/Controls**	Room 4034 – occ sensor not working	1/8/2018	A&R/Alpha		This has been corrected.		Closed	1/9/2018
702	**Graphics/Controls**	Room 4036- occ sensor not working.	1/8/2018	A&R/Alpha		This has been corrected.		Closed	1/9/2018
703	**Graphics/Controls**	From the graphic vav page 4014. When you click on the vav table button you are directed to AHU 2 table, and it should be AHU 4 table. (alpha)	1/8/2018	A&R/Alpha		This has been corrected.		Closed	1/9/2018
704	**Graphics/Controls**	Occupancy status trends	1/8/2018	A&R/Alpha				Closed	
705	**Graphics/Controls**	Room 1071- occ sensor not working	1/8/2018	A&R/Alpha		This has been corrected.		Closed	1/9/2018
706	**Graphics/Controls**	1011- no occ sensor	1/8/2018	A&R/Alpha		Occ status has been removed from the table, and disabled at the VAV.		Closed	1/9/2018
707	**Graphics/Controls**	1004A- VAV cover missing	1/8/2018	A&R/Alpha		VAV cover has been put back on.		Closed	1/9/2018

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708	**Graphics/Controls**	CAB$- control valve needs rotated up and looks like its been leaking.	1/8/2018	A&R/Alpha					Closed	
709	**Graphics/Controls**	1093- no occ sensor take off graphics	1/8/2018	A&R/Alpha		Occ Status has been removed from the table, and disabled at the VAV.			Closed	1/9/2018
710	**Graphics/Controls**	1091- occ sensor wont switch to occ	1/8/2018	A&R/Alpha		We are not tied into the Occ sensor, I disabled the occ sensor at the VAV. Should we turn this into a constant flow VAV since the room can not make setpoint?			Closed	
711	**Graphics/Controls**	1090 – VAV in this room only serves room 1088,1086,1084. When one of these rooms goes occ then it should work.	1/8/2018	A&R/Alpha		I have programmed the stat to show average room temps from 1088, 1086, and 1084 and the VAV controls off of those values. I have also added that value to the graphic and re-labeled Rm 1090 temp to Rm Temp Monitor.			Closed	1/9/2018
712	**Graphics/Controls**	1088,1086,1084- where are the chilled water valves and setpoints?	1/8/2018	A&R/Alpha		Setpoints are controlled by the stats in the rooms, valves are located inside of the FCUs.			Closed	1/9/2018
713	**Graphics/Controls**	1084A- plastic still on tstat.	1/8/2018	A&R/Alpha		Plastic has been removed.			Closed	1/9/2018
714	**Graphics/Controls**	1065- no occ sensor in room, delete from graphic	1/9/2018	A&R/Alpha		Disabled Occ sensor in program.			Closed	1/26/2018
715	**Graphics/Controls**	1063- occ senor is not working	1/9/2018	A&R/Alpha		Cannot get room to go unoccupied.			Closed	
716	**Graphics/Controls**	1072- occ sensor not working	1/9/2018	A&R/Alpha		Room went occupied when I entered.			Closed	1/26/2018
717	**Graphics/Controls**	1075 – occ sensor not working	1/9/2018	A&R/Alpha		Room went occupied when I entered.			Closed	1/26/2018
718	**Graphics/Controls**	1047- occ sensor not working	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
719	**Graphics/Controls**	1057- occ sensor not working	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
720	**Graphics/Controls**	Floor plan pages, you have 2020A and 2020B swapped.	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
721	**Graphics/Controls**	2020B high CO2	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
722	**Graphics/Controls**	2083- high CO2	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
723	**Graphics/Controls**	2004 high co2	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
724	**Graphics/Controls**	2004- occ sensor not working	1/9/2018	A&R/Alpha		Fixed			Closed	1/26/2018
725	**Roof Exhaust**	Need rain collars on 4 inch exhaust at roof penetrations.	1/16/2018	King Lar					Closed	
726	**Roof Exhaust**	Small leak inside unit appears to be coming around duct.	1/16/2018	King Lar					Closed	
727	**Roof Exhaust**	Patch around coil piping needs to be stainless and have upturned edge to keep water from penetrations.	1/16/2018	King Lar					Closed	
728	**Roof Exhaust**	Install removable counter flashing on exhaust fan roof curbs.	1/16/2018	King Lar					Closed	
729	**Mech 5012**	No unit id on any ahu.	1/10/2018	King Lar					Closed	
730	**Mech 5012**	Duct collapsed above ahu. Replace damaged joints and add stiffeners as required.	1/10/2018	King Lar					Closed	
731	**Mech 5012**	Holes in unit on upper trim leaking air.	1/10/2018	King Lar					Closed	
732	**Mech 5012**	Holes in unit behind electrical box leaking air.	1/10/2018	A&R/Alpha					Closed	
733	**Mech 5012**	Remove tape residue from doors and ahu.	1/10/2018	King Lar					Closed	
734	**Mech 5012**	Need access door at A/F stations for maintenance.	1/10/2018	King Lar					Closed	
735	**Mech 5012**	Cut excess rod length from all duct hangers.	1/10/2018	King Lar					Closed	
736	**Mech 5012**	Tighten lock nuts on all duct hangers.	1/10/2018	King Lar					Closed	
737	**Mech 5012**	Heat pipe sagging unsupported.	1/10/2018	A&R					Closed	
738	**Mech 5012**	Filters in all units are falling out. Will require a new filter restraining system.	1/10/2018	King Lar					Closed	
739	**Mech 5012**	Seal west end hole on ahu-3 with metal patch inside and out not just tape.	1/10/2018	King Lar					Closed	
740	**Mech 5012**	Chilled water line laying on top of unit needs supported from steel above.	1/10/2018	A&R					Closed	
741	**Mech 5012**	Several door on nits leaking air or whistling –adjust doors or install new seals	1/10/2018	King Lar					Closed	
742	**Mech 5012**	Patch hole in concrete floor in corner.	1/10/2018	?					Closed	
743	**AHU-1 area**	Remove tape residue from doors o and ahu.	1/10/2018	King Lar					Closed	
744	**AHU-1 area**	Repair insulation from traverse readings.	1/10/2018	King Lar					Closed	
745	**AHU-1 area**	Seal screw holes from electrical box mounting	1/10/2018	A&R/Alpha					Closed	
746	**AHU-1 area**	Patch extra hole in unit with metal inside and out not just tape.	1/10/2018	King Lar					Closed	
747	**AHU-1 area**	Unit doors are leaking and whistling -adjust or replace gasket	1/10/2018	King Lar					Closed	
748	**AHU-1 area**	Cut excessive rod from duct hangers	1/10/2018	King Lar					Closed	
749	**AHU-1 area**	Remove excessive trash and left over material (pick boards, material on cat walk)	1/10/2018	?					Closed	
750	**AHU-1 area**	Repair damaged duct insulation.	1/10/2018	King Lar					Closed	
751	**AHU-1 area**	Adjust hanger on s.s duct by stairway to support duct.	1/10/2018	King Lar					Closed	
752	**Mech 5014**	Remove tape residue from doors and ahu	1/10/2018	King Lar					Closed	
753	**Mech 5014**	Clean area behind unit from construction material	1/10/2018	?					Closed	

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754	**Mech 5014**	Screw hole leaking behind electrical box.	1/10/2018	A&R/Alpha				Closed	
755	**Mech 5014**	Door on discharge od fan leaking.	1/10/2018	King Lar				Closed	
756	**Mech 5014**	Tighten lock nuts on duct hangers	1/10/2018	King Lar				Closed	
757	**Mech 5014**	Ahu5 filter restraints not acceptable. Filters must be removable without drills or tools.	1/10/2018	King Lar				Closed	
758	**Room 5000**	Cut excess rod length from ss duct hangers.	1/10/2018	King Lar				Closed	
759	**Room 5000**	Cut duct hangers excess rod length.	1/10/2018	King Lar				Closed	
760	**Room 5000**	Repair insulation on elbow going into shaft by ahu-2 fire damper.	1/10/2018	King Lar				Closed	
761	**Room 5000**	Repair holes in duct from hanger relocation.	1/10/2018	King Lar				Closed	
762	**Room 5000**	Doors on ef-4 leak. Adjust-replace seals as needed to repair.	1/10/2018	King Lar				Closed	
763	**Room 5000**	Trim on top ef-4 is has big air leak into unit.	1/10/2018	King Lar				Closed	
764	**Room 5000**	Trap on ef-4 dry and pulling air into unit. These will not see much condensate and need to be filled with non-evaporating fluids.	1/10/2018	King Lar				Closed	
765	**Room 5000**	Remove 2x4 from handrail attached to wall by discharge of ef-4.	1/10/2018	?				Closed	
766	**Roof**	Primary and secondary roof drains not pitched properly to drain water out of sump areas	12/29/2017	GA Rich				Closed	
767	**Roof**	All pipe penetrations through roof and curbs require rubber boot and not just caulked	12/29/2017	GA Rich				Closed	
768	**Roof**	Clean up all construction debris off roof	12/29/2017	?				Closed	
769	**Attic**	I am concerned floor drains will not receive condensate from AHU's and sprinkler drain. Condensate will spill on to the floor and leak down through the cracks in the concrete	12/29/2017	GA Rich				Closed	
770	**Attic**	Floor drains with the tops covered. No access to the drains for future maintenance	12/29/2017	GA Rich				Closed	
771	**Attic**	Seal all pipe penetrations through the floor	12/29/2017	GA Rich				Closed	
772	**Lab 4002**	Chrome traps with no CO plugs	12/29/2017	GA Rich				Closed	
773	**Lab 4002**	No signage for emergency manual gas shut off valve	12/29/2017	GA Rich				Closed	
774	**Lab 4002**	No wall bracing on emergency shower/eyewash unit	12/29/2017	GA Rich				Closed	
775	**Lab 4002**	No escusion on ceiling pipe penetration for emergency shower/eyewash unit	12/29/2017	GA Rich				Closed	
776	**Lab 4002**	No pipe ID above ceiling for tempered water piping	12/29/2017	GA Rich				Closed	
777	**Lab 4002**	Insulation missing from domestic hot water return line in ceiling above FH-2	12/29/2017	GA Rich				Closed	
778	**Lab 4006**	Several pipe penetrations not fire caulked at west ceiling	12/29/2017	GA Rich				Closed	
779	**Lab 4006**	No pipe ID above ceiling for tempered water piping	12/29/2017	GA Rich				Closed	
780	**Lab 4006**	RPZ backflow devices mounted in cabinet not accessible for annual testing and maintenance	12/29/2017	GA Rich				Closed	
781	**Lab 4010**	Seal all floor pipe penetrations	12/29/2017	GA Rich				Closed	
782	**Lab 4010**	Seal all pipe penetrations above ceiling	12/29/2017	GA Rich				Closed	
783	**Women's restroom 4011**	No water hammer arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
784	**Lab 4012**	RPZ backflow devices mounted in cabinet not accessible for annual testing and maintenance	12/29/2017	GA Rich				Closed	
785	**Lab 4012**	Seal steam condensate pipe penetrations behind Autoclave unit (heating contractor)	12/29/2017	A&R				Closed	
786	**Lab 4012**	No funnel for floor drain. Autoclave drains will splash onto floor	12/29/2017	GA Rich				Closed	
787	**Lab 4012**	LS-3 has rust stains from metal filing left in it	12/29/2017	GA Rich				Closed	
788	**Lab 4012A**	Ice Maker not on. Unable to commission	12/29/2017	GA Rich				Closed	
789	**Lab 4012A**	No wall brace on emergency shower/eyewash unit	12/29/2017	GA Rich				Closed	
790	**Lab 4012A**	No escusion on emergency shower/eyewash pipe penetration though ceiling	12/29/2017	GA Rich				Closed	
791	**Lab 4012A**	Tempered water piping not ID'd and reduced to ¾"	12/29/2017	GA Rich				Closed	
792	**BSW 4013**	Insulate mop basin cold and hot water feeds	12/29/2017	GA Rich				Closed	
793	**BSW 4013**	Mop hanger is a potential safety hazard. (Head banger)	12/29/2017	GA Rich				Closed	
794	**BSW 4013**	Seal 2" pvc vent at floor penetration	12/29/2017	GA Rich				Closed	
795	**BSW 4013**	Calk mop basin at wall and floor	12/29/2017	GA Rich				Closed	
796	**Lab 4014**	No signage on manual emergency gas shut off valve	12/29/2017	GA Rich				Closed	
797	**Lab 4014**	No wall brace on emergency shower/eyewash unit	12/29/2017	GA Rich				Closed	
798	**Lab 4014**	No escusion on emergency shower/ eyewash piping at ceiling penetration	12/29/2017	GA Rich				Closed	
799	**Lab 4014**	FH-1 2" vent missing nohubb adaptor at piping transition	12/29/2017	GA Rich				Closed	
800	**Lab 4014**	Fume hood FH-1 - no isolation valves for natural gas, vacuum and air supplies	12/29/2017	GA Rich				Closed	
801	**Lab 4014**	No pipe ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	

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802	**Lab 4014**	Domestic hot water recirc valve left off above ceiling	12/29/2017	GA Rich				Closed	
803	**Lab 4016**	No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
804	**Lab 4016**	No pipe ID for tempered water above ceiling	12/29/2017	GA Rich				Closed	
805	**Room 4027**	Seal 3" pvc vent at floor penetration	12/29/2017	GA Rich				Closed	
806	**Room 4027**	No pipe ID on 3" vent	12/29/2017	GA Rich				Closed	
807	**Lab 4041**	Tempered water supply not at the correct temperature (cold)	12/29/2017	GA Rich				Closed	
808	**Lab 4041**	No ID on Tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
809	**Lab 4041**	Replace stained ceiling tile from previous leak	12/29/2017	GA Rich				Closed	
810	**Lab 4041**	Repair insulation at domestic hot water balancing valve above east LS-1 sink	12/29/2017	GA Rich				Closed	
811	**Lab 4041**	No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
812	**Room 4047**	Repair insulation on domestic hot water isolation valve	12/29/2017	GA Rich				Closed	
813	**Room 4068**	No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
814	**Room 4068**	Tempered water supply not at correct temperature (cold)	12/29/2017	GA Rich				Closed	
815	**Room 4068**	No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
816	**Lab 4070**	No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
817	**Lab 4070**	No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
818	**Lab 4070**	Tempered water supply not at proper temperature (cold)	12/29/2017	GA Rich				Closed	
819	**Lab 4072**	No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
820	**Lab 4072**	Tempered water supply not at proper temperature (cold)	12/29/2017	GA Rich				Closed	
821	**Lab 4072**	No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
822	**Lab 4074**	No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
823	**Lab 4074**	Tempered water supply not at proper temperature (cold)	12/29/2017	GA Rich				Closed	
824	**Lab 4074**	No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
825	**Lab 4076**	Seal all pipe penetrations thru floor	12/29/2017	GA Rich				Closed	
826	**Lab 4076**	Repair ceiling tile and install pipe escusions at pipe penetrations thru ceiling	12/29/2017	GA Rich				Closed	
827	**Lab 4076**	Missing stainless trim at 2 compartment sink	12/29/2017	GA Rich				Closed	
828	**Lab 4076**	No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
829	**4th floor Mens Restroom**	Sewer gas smell. Dry floor drain ?	12/29/2017	GA Rich				Closed	
830	**4th floor Mens Restroom**	No water hammer arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
831	**4th floor hallways**	Several hanger rods need to be trimmed	12/29/2017	?				Closed	
832	**4th floor hallways**	Seal all pipe penetrations through walls and ceiling	12/29/2017	?				Closed	
833	**Lab 3002**	1) East sink top field cut – raw unfinished edge and no drip edge to contain spills (see pic)	12/29/2017	GA Rich				Closed	
834	**Lab 3002**	2) No signage on manual emergency natural gas shut off valve	12/29/2017	A&R				Closed	
835	**Lab 3002**	3) No wall bracing off emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
836	**Lab 3002**	4) No escusion on emergency shower/eyewash station piping at ceiling penetration	12/29/2017	GA Rich				Closed	
837	**Lab 3002**	5) No pipe ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
838	**Lab 3002**	6) No isolation valve on hot water recirc	12/29/2017	GA Rich				Closed	
839	**Lab 3002**	7) Tempered water not at proper temperature (cold)	12/29/2017	GA Rich				Closed	
840	**Lab 3004**	1) No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
841	**Lab 3004**	2) Tempered water not at proper temperature (cold)	12/29/2017	GA Rich				Closed	
842	**Lab 3004**	3) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
843	**Lab 3006**	1) No isolation valves for Fume Hood vacuum and compressed air	12/29/2017	GA Rich				Closed	
844	**Lab 3006**	2) No signage for emergency shower/eyewash station	12/29/2017	GA Rich				Closed	
845	**Lab 3006**	3) No wall bracing for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
846	**Lab 3006**	4) No escusion on emergency shower/eyewash station piping at ceiling	12/29/2017	GA Rich				Closed	
847	**Lab 3006**	5) RPZ backflow devices mounted in cabinet not readily accessible for annual testing and maintenance	12/29/2017	GA Rich				Closed	
848	**Lab 3006**	6) Leak in ceiling above north sink. 4th flr floor drain area?	12/29/2017	GA Rich				Closed	
849	**Women's restroom 3009**	1) No water hammer arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
850	**Lab 3011**	1) No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
851	**Lab 3011**	2) Tempered water not at proper temperature (cold)	12/29/2017	GA Rich				Closed	
852	**Lab 3011**	3) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
853	**Lab 3011**	4) No balancing valve on tempered water line above ceiling as per the drawing	12/29/2017	GA Rich				Closed	
854	**Room 3013**	1) Seal all pipe penetrations	12/29/2017	GA Rich				Closed	

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855	**BSW 3034**	1) Mop basin faucet not centered on mop basin (see pic)	12/29/2017	GA Rich				Closed	
856	**BSW 3034**	2) Seal mop basin at floor and wall	12/29/2017	GA Rich				Closed	
857	**Clean Room 3037**	1) No backflow device at fume hood	12/29/2017	GA Rich				Closed	
858	**Clean Room 3037**	2) No wall support for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
859	**Clean Room 3037**	3) No signage for emergency shower/eyewash station	12/29/2017	GA Rich				Closed	
860	**Clean Room 3037**	4) No escusion for emergency shower/eyewash pipe ceiling penetration	12/29/2017	GA Rich				Closed	
861	**Clean Room 3037**	5) No pipeID on tempered water above ceiling	12/29/2017	GA Rich				Closed	
862	**Clean Room 3037**	6) Patch holes in fume hood next to waste line penetrations	12/29/2017	GA Rich				Closed	
863	**Clean Room 3037**	7) 2 emergency shower/eyewash stations not completed in clean room yet	12/29/2017	GA Rich				Closed	
864	**Lab 3041**	1) No piping to nitrogen or helium lab table outlets	12/29/2017	GA Rich				Closed	
865	**Lab 3041**	2) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
866	**Lab 3041**	3) No wall bracing for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
867	**Lab 3041**	4) No escusion for emergency shower/eyewash station piping at ceiling	12/29/2017	GA Rich				Closed	
868	**Lab 3041**	5) No signage for manual emergency natural gas shut off valve	12/29/2017	GA Rich				Closed	
869	**Lab 3073**	1) Fire calk gas pipe penetration	12/29/2017	GA Rich				Closed	
870	**Lab 3075**	1) Missing eyewash at LS-1 location	12/29/2017	GA Rich				Closed	
871	**Lab 3075**	2) No ID on Tempered water above ceiling	12/29/2017	GA Rich				Closed	
872	**Lab 3075**	3) No tempered water flow at balance valve	12/29/2017	GA Rich				Closed	
873	**Lab 3075**	4) Compressed air line on south wall incomplete	12/29/2017	GA Rich				Closed	
874	**Lab 3077A2**	1) Missing eyewash	12/29/2017	GA Rich				Closed	
875	**BSW 3087**	1) Mop basin faucet not centered	12/29/2017	GA Rich				Closed	
876	**BSW 3087**	2) Calk mop basin at wall and floor	12/29/2017	GA Rich				Closed	
877	**Room 3089**	1) No pipe ID on tempered water piping	12/29/2017	GA Rich				Closed	
878	**All Gender restroom 3091**	1) Floor drain top low	12/29/2017	GA Rich				Closed	
879	**All Gender restroom 3092**	2) Remove clear tape from flushometer	12/29/2017	GA Rich				Closed	
880	**All Gender restroom 3093**	3) No water hammer arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
881	**Mens restroom 3093**	1) No water hammer arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
882	**Lab 3096**	1) 1 ½" pvc vent not fire calked	12/29/2017	GA Rich				Closed	
883	**Lab 3096**	2) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
884	**Lab 3096**	3) Insulation missing at domestic HW recirc balancing valve	12/29/2017	GA Rich				Closed	
885	**Lab 3096**	4) Leak at sinks 1 ½" trap connection	12/29/2017	GA Rich				Closed	
886	**Lab 3096**	5) RPZ backflow devices mounted in cabinet not readily accessible for annual testing and maintenance	12/29/2017	GA Rich				Closed	
887	**Lab 3096**	6) No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
888	**Lab 3096**	7) Sink drain stopper missing	12/29/2017	GA Rich				Closed	
889	**Lab 3096**	8) Seal floor pipe penetrations behind sink	12/29/2017	GA Rich				Closed	
890	**Lab 3098**	1) Pipe penetrations not fire calked in ceiling	12/29/2017	GA Rich				Closed	
891	**Lab 3098**	2) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
892	**Lab 3098**	3) Galvanized hangers on copper tempered water piping. Dissimilar metals	12/29/2017	GA Rich				Closed	
893	**Lab 3100**	1) West sink top field cut. Raw edge and no drip edge to contain spills (see pic)	12/29/2017	GA Rich				Closed	
894	**Lab 3100**	2) No signage for emergency natural gas manual valve	12/29/2017	GA Rich				Closed	
895	**Lab 3100**	3) Pipe penetrations in ceiling not fire caulked	12/29/2017	GA Rich				Closed	
896	**Lab 3100**	4) No pipe ID on Tempered water piping	12/29/2017	GA Rich				Closed	
897	**Lab 3100**	5) Galvanized hangers on copper tempered water piping. Dissimilar metals	12/29/2017	GA Rich				Closed	
898	**Lab 3100**	6) No wall bracket for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
899	**Lab 3100**	7) East sink stopper missing	12/29/2017	GA Rich				Closed	
900	**Lab 3102**	1) No signage for deck mounted eyewash	12/29/2017	GA Rich				Closed	
901	**Lab 3102**	2) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
902	**3rd floor East Corridor**	1) No lower sprinkler head outside of rm 3037	12/29/2017	Automatic				Closed	
903	**3rd floor East Corridor**	2) No ID on tempered water piping	12/29/2017	GA Rich				Closed	

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904	**3rd floor East Corridor**	3) Paint natural gas piping where repairs were made	12/29/2017	A&R				Closed	
905	**3rd floor North Corridor**	1) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
906	**3rd floor North Corridor**	2) 3" galvanized hangers on 1 ½" copper tempered water line. Dissimilar metals	12/29/2017	GA Rich				Closed	
907	**3rd floor West Corridor**	No ID on Tempered water piping. Wrong ID on it in front of elevator	12/29/2017	GA Rich				Closed	
908	**Lab 2021 Gas Cylinder storage**	1) Piping soft soldered not brazed?	12/29/2017	GA Rich				Closed	
909	**Lab 2073**	1) No wall bracing for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
910	**Lab 2073**	2) No signage for emergency shower/eyewash station	12/29/2017	GA Rich				Closed	
911	**Lab 2073**	3) No ID for tempered water piping in ceiling	12/29/2017	GA Rich				Closed	
912	**Lab 2073**	4) No signage on manual emergency natural gas valve	12/29/2017	GA Rich				Closed	
913	**Lab 2073**	5) Emergency natural gas valve handle has been bent to allow it to open 100%. Handle is pressed against panel. Relocate valve to allow user to shut valve off unobstructed in an emergency (see pic)	12/29/2017	A&R				Closed	
914	**Lab 2073**	6) No CO2-He or Nitrogen at Lab table outlets	12/29/2017	GA Rich				Closed	
915	**Lab 2073D**	1) No HyD,CO2,Air,Heor Nitrogen at lab tables	12/29/2017	GA Rich				Closed	
916	**Lab 2073A**	1) Leak under sink or dishwasher	12/29/2017	GA Rich				Closed	
917	**Lab 2073A**	2) RO water being discharged into a chrome P-trap	12/29/2017	GA Rich				Closed	
918	**Lab 2073A**	3) Patch hole in wall at sanitary pipe penetration	12/29/2017	GA Rich				Closed	
919	**Second Floor Restrooms**	1) No water hammer arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
920	**Lab 2082**	1) No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
921	**Lab 2082**	2) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
922	**Lab 2084**	1) No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
923	**Lab 2084**	2) No ID on tempered water piping above ceiling	12/29/2017	GA Rich				Closed	
924	Lab 2088	1) No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
925	**Lab 2088**	2) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
926	**2nd floor Hallway**	1) Water cooler counter display not functioning	12/29/2017	GA Rich				Closed	
927	**Plant Biology rm 1002**	1) No signage for deck mounted eyewash	12/29/2017	GA Rich				Closed	
928	**Plant Biology rm 1002**	2) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
929	**Room 1003**	1) No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
930	**Room 1003**	2) Seal west wall pipe penetrations	12/29/2017	GA Rich				Closed	
931	**Lab 1016**	1) No signage on emergency shower/eyewash unit	12/29/2017	GA Rich				Closed	
932	**Lab 1016**	2) No wall bracing off emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
933	**Lab 1016**	3) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
934	**Lab 1022**	1) No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
935	**Lab 1022**	2) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
936	**Rock Sample rm 1023**	1) No wall bracing for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
937	**Rock Sample rm 1023**	2) No ID for tempered water piping	12/29/2017	GA Rich				Closed	
938	**Rock Sample rm 1023**	3) Water supply on south wall not dropped to SE034 with isolation valve as per R2-P2 detail 2	12/29/2017	GA Rich				Closed	
939	**Rock Sample rm 1023**	4) PVC drains drilled thru counter top not sealed water tight	12/29/2017	GA Rich				Closed	
940	**Lab 1047**	1) No wall bracing on emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
941	**Lab 1047**	2) Tempered water not at required temperature (cold)	12/29/2017	GA Rich				Closed	
942	**Lab 1041**	1) No signage for deck mounted eyewash station	12/29/2017	GA Rich				Closed	
943	**Lab 1041**	2) Tempered water not at required temperature (cold)	12/29/2017	GA Rich				Closed	
944	**Lab 1041**	3) No ID on tempered water piping	12/29/2017	GA Rich				Closed	
945	**Lab 1041**	4) Materials in the room (acetone etc) will react with chrome P-trap that is installed (see pic) Good example that acid resistant p-traps need to be installed in "all" labs	12/29/2017	GA Rich				Closed	
946	**Lab 1041**	5) Fume Hood VAC, Air and cold water dropped from ceiling exposed and unsupported	12/29/2017	GA Rich				Closed	
947	**Lab 1041**	6) Small leak in west sink water supply	12/29/2017	GA Rich				Closed	
948	**Lab 1057**	1) Air leak in owner supplied air piping. North closet	12/29/2017	GA Rich				Closed	
949	**Lab 1057**	2) No wall bracing on emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	

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950	**Lab 1057**	3) No signage on emergency manual natural gas shut off valve	12/29/2017	GA Rich				Closed	
951	**Lab 1057**	4) Potential Cross connection on domestic water cooling piping with owner supplied unit. East wall	12/29/2017	GA Rich				Closed	
952	**Lab 1063**	1) No wall bracing on emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
953	**Lab 1063**	2) No tempered water pipe ID	12/29/2017	GA Rich				Closed	
954	**Lab 1063**	3) Floor drain high	12/29/2017	GA Rich				Closed	
955	**Lab 1063B1**	1) No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
956	**Lab 1063B1**	2) Brass p-trap on sink. Acetone in the room and will react to the metal.	12/29/2017	GA Rich				Closed	
957	**Lab 1063B1**	3) No tempered water ID	12/29/2017	GA Rich				Closed	
958	**Lab 1063B1**	4) Tempered water to eyewash not at required temperature (cold and ran it for 5 minutes)	12/29/2017	GA Rich				Closed	
959	**Lab 1065**	1) No signage on deck mounted eyewash	12/29/2017	GA Rich				Closed	
960	**Lab 1065**	2) No tempered water pipe ID	12/29/2017	GA Rich				Closed	
961	**Lab 1071**	1) No signage on deck mounted eyewash station	12/29/2017	GA Rich				Closed	
962	**Lab 1071**	2) No tempered water pipe ID	12/29/2017	GA Rich				Closed	
963	**Hallway in front of rm 1073**	1) CO brass cover damaged	12/29/2017	GA Rich				Closed	
964	**Room 1092**	1) Severe water hammer when operating faucet	12/29/2017	GA Rich				Closed	
965	**Room 1092**	2) Patch wall at faucet connection	12/29/2017	GA Rich				Closed	
966	**Machine Shop rm 1093**	1) No wall bracing on emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
967	**Machine Shop rm 1093**	2) No tempered water piping ID	12/29/2017	GA Rich				Closed	
968	**Machine Shop rm 1093**	3) Tempered water not at required temperature (cold)	12/29/2017	GA Rich				Closed	
969	**Machine Shop rm 1093**	4) No signage for emergency shower/eyewash station piping	12/29/2017	GA Rich				Closed	
971	**Mechanical 1074**	1) Install cap or plug on ¾" ball valve drain	12/29/2017	GA Rich				Closed	
972	**Mechanical 1074**	2) Insufficient pipe id and arrows	12/29/2017	GA Rich				Closed	
973	**Mechanical 1074**	3) Pipe water heater steam relief port to drain. Both ports are dripping when heater cycles	12/29/2017	GA Rich				Closed	
974	**Mechanical 1074**	4) Re install floor drain grates. Laying loose next to drains	12/29/2017	GA Rich				Closed	
975	**Mechanical 1078**	1) Clean sump pit from construction debris	12/29/2017	GA Rich				Closed	
976	**Mechanical 1080**	1) Insufficient pipe ID and arrows on tempered water, CW and HW piping	12/29/2017	GA Rich				Closed	
977	**Basement Hallways**	1) Confirm all pipe penetrations and damaged wall openings have been sealed or patched	12/29/2017	GA Rich				Closed	
978	**1st floor restrooms**	1) No shock arrestors or access panels to service them??	12/29/2017	GA Rich				Closed	
979	**Site**	1) Install adaptors from SDR storm piping to gutter downspouts	12/29/2017	GA Rich				Closed	
980	**Site**	2) Splash block missing from secondary storm piping lambs tongue outlets	12/29/2017	GA Rich				Closed	
981	**Site**	3) Storm piping Clean Outs not installed.	12/29/2017	GA Rich				Closed	
982	**Site**	4) East sill cock leaking	12/29/2017	GA Rich				Closed	
983	**Site**	5) Storm Clean out risers filled with leaves and debris. Clean and confirm piping is not plugged.	12/29/2017	?				Closed	
984	**Site**	6) Clean all debris from trench drain at northeast loading dock	12/29/2017	?				Closed	
985	**Site**	7) Aluminum cover at chilled water entrance on northeast corner of building has been damaged during construction	12/29/2017	?				Closed	
986	**Site**	8) Seal west natural gas service piping wall penetration	12/29/2017	GA Rich				Closed	
987	**Site**	9) Confirm if all outside storm and sanitary clean outs are to be poured into a concrete pad… AE?	12/29/2017	GA Rich				Closed	
988	**Room 1008**	Dist Panel PP1008 -Breakers do not have engraved labels.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
989	**Room 1008**	DDC panels: Not labeled	8/25/2017	A&R/Alpha				Closed	
990	**Room 1008**	DDC panels: No Arc-Flash Warning Label	8/25/2017	A&R/Alpha				Closed	
991	**Room 1008**	DDC panels: Disconnect does not have circuit number label	8/25/2017	A&R/Alpha				Closed	
992	**Room 1008**	Junction box for compressor circuits has too many wires for the size of box. This 4" square box is only allowed 9 total conductors. This box has at least 13, or more, per 314.16. Add extension ring to box.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017

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993	**Room 1008**	Fuses in the disconnects are not approved Class RK-1. They are only Class RK-5. Replace with RK-1 fuses, per 262813 2.2D	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
994	**ROOM 1035**	Distribution Panel DP1035E does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
995	**ROOM 1035**	Distribution Panel DP1035C does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
996	**ROOM 1035**	Switchboard USS-1035B does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
997	**ROOM 1035**	Switchboard USS-1035B does not have Available Fault Current label at the Main Switch which is required by NEC 110.24(A)	8/25/2017	Bodine		Complete	Should be calculated available fault current with calc date, not current rating of uss- DL	Closed	
998	**ROOM 1035**	Switchboard USS1035B bolted switch has NO ENGRAVED LABEL to indicate it's function	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
999	**ROOM 1035**	Distribution Panel DP1035A does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1000	**ROOM 1035**	Is the crimp lug on Listed for a solid conductor?	8/25/2017	Bodine		Complete		Closed	
1001	**ROOM 1035**	Switchboard USS1035A metering has temporary tape labeling	8/25/2017	Bodine		University Installed	Closed-DL	Closed	11/20/2017
1002	**ROOM 1035**	Switchboard USS1035A has two bolted switches with NO ENGRAVED LABEL	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1003	**ROOM 1035**	Switchboard USS1035A does not have Available Fault Current label at the Main Switch which is required by NEC 110.24(A)	8/25/2017	Bodine		Complete	Should be calculated available fault current with calc date, not current rating of uss- DL	Closed	
1004	**ROOM 1035**	Switchboard USS1035A Surge Protection is not energized.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1005	**ROOM 1035**	Switchboard USS1035A does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1006	**ROOM 1034**	Fire alarm breakers should have breaker locks per NFPA72	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1007	**ROOM 1034**	Fire Alarm breakers must be labeled "FIRE ALARM CIRCUIT" per NEC 760.121(B)	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1008	**ROOM 1034**	Grounding Electrode conductor for the transformer is exposed to physical damage. Violation of NEC 250. Enclose in conduit. (there are others like this, but are not subject to physical damage in my opinion)	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1009	**ROOM 1034**	Distribution Panel EDP1034A does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1010	**ROOM 1034**	Distribution Panel EDP1034A Surge Protection is not energized.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1011	**ROOM 1034**	Distribution Panel EDP1034B does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1012	**ROOM 1034**	Distribution Panel EDP1034B Surge Protection is not energized.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1013	**ROOM 1034**	Control (Metering?) panel missing engraved label. Also incomplete work.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1014	**ROOM 1034**	Generator Annunciator panel has no label. Toggle switch is not labeled as to the function it performs.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1015	**ROOM 1039**	Distribution Panel DP1039 does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1016	**ROOM 1052**	DDC controller missing label. Also has wire pinched under the cover	8/25/2017	A&R/Alpha				Closed	
1017	**ROOM 1074**	Manual Motor missing label. Also missing Pilot light required by 262419 2.1(B)	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1018	**ROOM 1074**	Two motors missing Manual Motor starter/Disconnecting means required by spec and NEC. Where are they?	8/25/2017	Bodine	Control Pump 1 installed; Water Heater is factory mount	Complete	Closed-DL	Closed	11/20/2017
1019	**ROOM 1078**	Pump Controller missing Arc Flash Warning Label. Missing engraved label describing it's function. Missing Circuit number label.	8/25/2017	Bodine		Complete	Not done- DL 1/30/18	Closed	
1020	**ROOM 1080**	VFD's missing Arc Flash Warning label.	8/25/2017	Bodine		Complete	Not done- DL 1/30/19	Closed	
1021	**ROOM 1080**	DDC Controller missing label and circuit number.	8/25/2017	A&R/Alpha				Closed	
1022	**ROOM 1080**	Manual motor starter on unit is missing label and pilot light.	8/25/2017	Bodine		Complete		Closed	
1023	**ROOM 1080**	Distribution Panel 1080 does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1024	**ROOM 1080**	DDC disconnect missing circuit label	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1025	**ROOM 1080**	Booster Pump VFDs are missing Arc Flash Warning labels.	8/25/2017	Bodine		Complete	Label does not meet job spec- DL 1/30/18	Closed	
1026	**ROOM 1080**	Distribution Panel EPP1080 does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1027	**ROOM 1080**	Manual motor starter on west wall is missing label.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017

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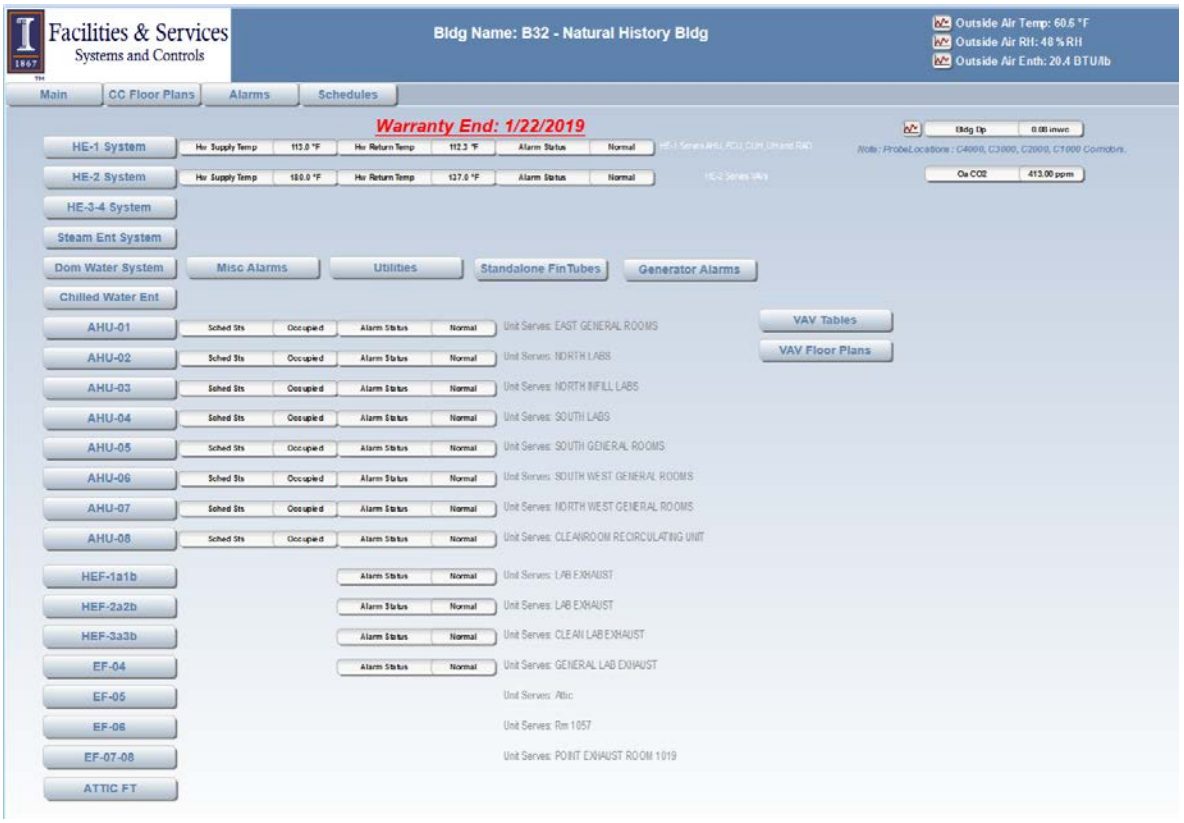
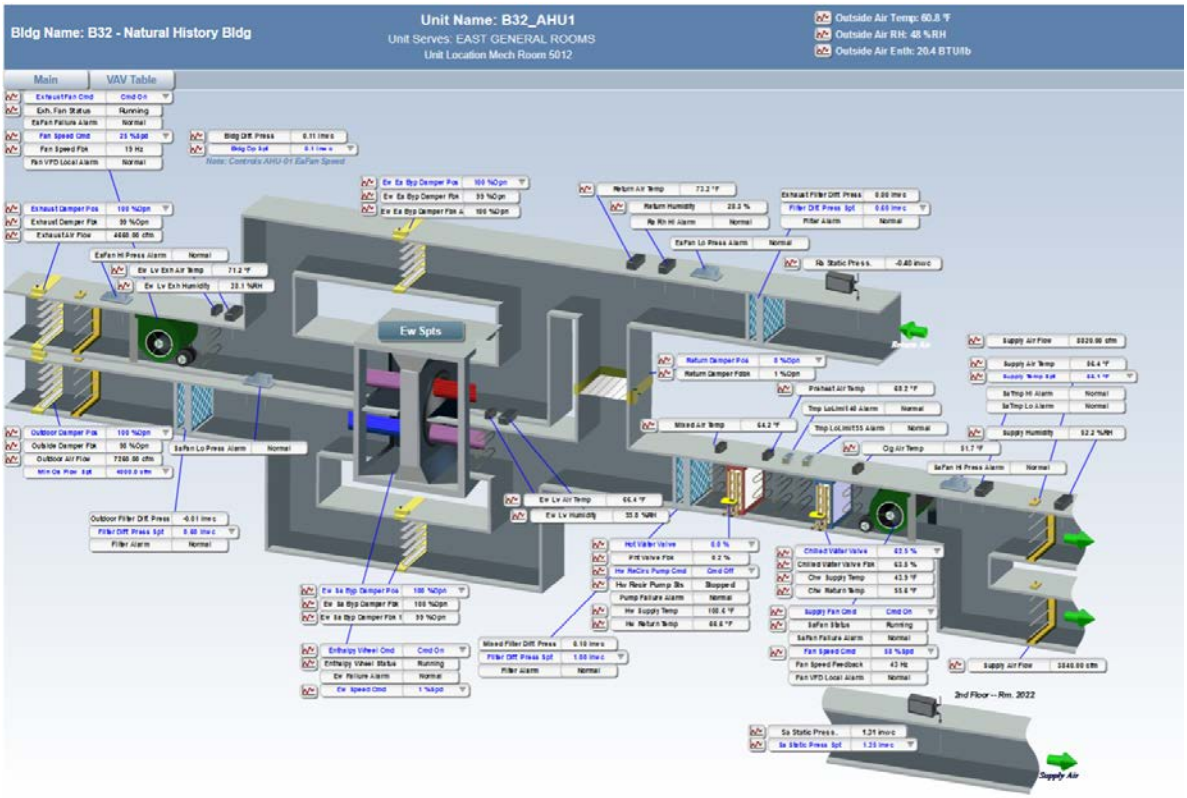
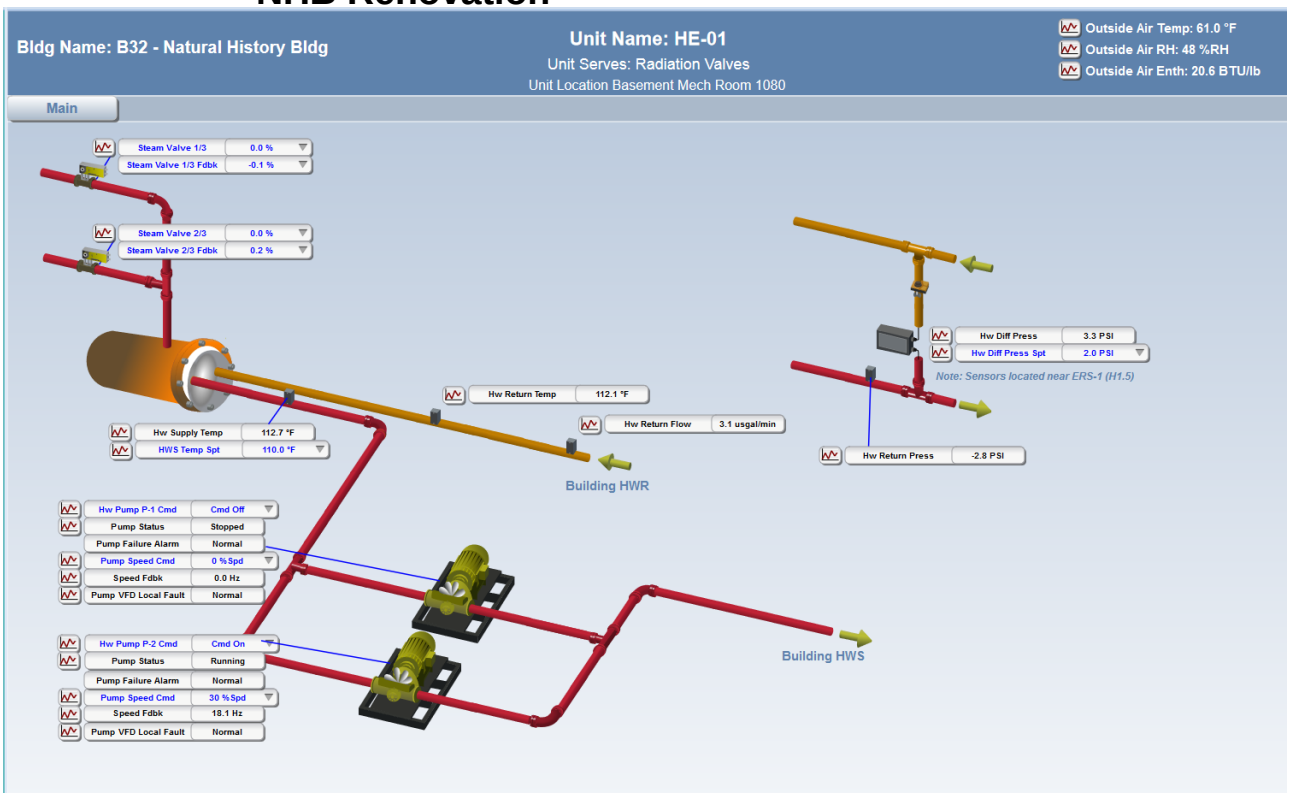
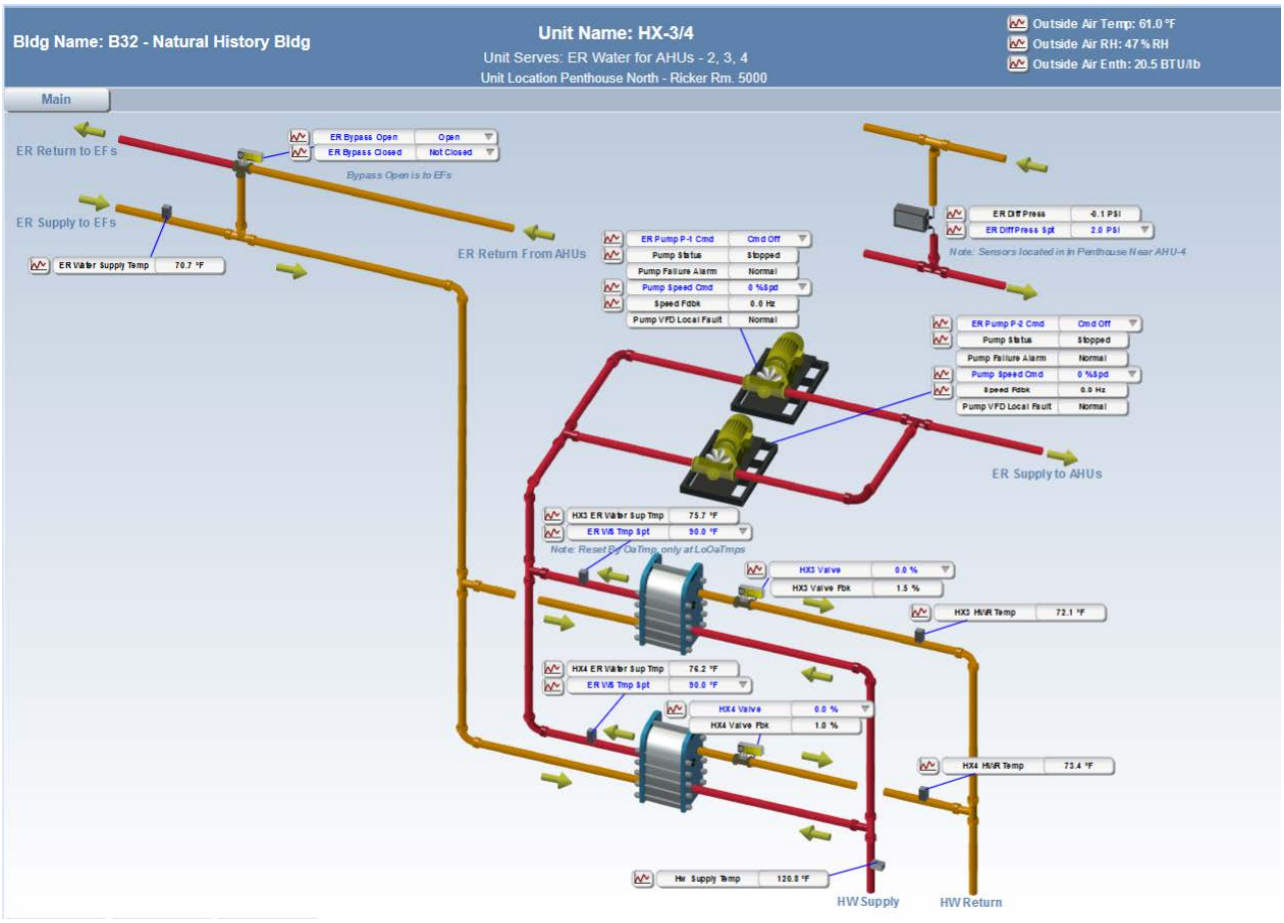
1028	**ROOM 1080**	DDC disconnect on west wall is missing circuit labelROOM	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1029	**ROOM 1082**	Distribution Panel DP1082 does not have engraved labels for circuit breakers	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1030	**ROOM 1082**	Box has opening that needs to be filled per NEC.	8/25/2017	Bodine		Complete	Not done-DL	Closed	
1031	**Main Electrical Room**	I did not see a Spare Fuse Panel or the spare fuses required to be stocked inside the cabinet. There should be three fuses of the type/size used in the Bolted-Pressure switches, motor starters, etc.	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1032	**Throughout the building**	ALL Panelboards, Switchboards, etc., have incorrect Arc Flash Warning Labels.	8/25/2017	Bodine		Complete		Closed	
1033	**Throughout the building**	None of the panelboards or switchboards have the Branch Circuit wire Color Code which is required in NEC 210.5(C).	8/25/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1034	**Throughout the building**	A/E and Contractor need to verify that the panelboards have the correct breakers installed, specifically that the AIC rating is correct.	8/25/2017	Bodine		Complete		Closed	
1035	**Throughout the building**	Disconnects for DDC panels do not show the circuit number feeding them.	8/25/2017	A&R/Alpha		Complete		Closed	
1036	**Site**	There is a PVC conduit sticking up from the ground near the generator. Is this incomplete work, or does it need to be removed?	8/31/2017	Bodine		Complete		Closed	
1037	**ROOM 3094**	Distribution Panel DP3094 breakers missing engraved labels	8/31/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1038	**ROOM 3037**	Distribution Panel DP3037 breakers missing engraved labels	8/31/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1039	**ROOM 3037**	Fire Alarm panel missing label and circuit ID.	8/31/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1040	**Room 3035**	DDC disconnect missing circuit ID	8/31/2017	A&R/Alpha				Closed	
1041	**ROOM 4031**	Fire Alarm panel missing Nameplate and circuit ID.	8/31/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1044	**Rm 1047**	Receptacle within six feet of sink is not GFCI protected-NEC 210.8 violation.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1045	**Room 1057**	Wire mold receptacle cover plate next to sink is bent.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1046	**Rm 1039**	BSW Closet-Conduit penetrations not sealed on north wall between 1061 and 1059.	6/30/2017	Bodine		Complete		Closed	
1047	**RM 1061**	Conduit penetration in east wall not sealed. Also unpatched hole in E wall.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1048	**Rm 1040**	missing wall switch. I assume Bodine is waiting for an occupancy sensor.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1049	**Rm 2079**	Can lights at front of room do not dim evenly.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1050	**Rm 2079**	dimmer buttons by NW door do not work.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1051	**Rm 2027**	Light switch was installed behind the door.	6/30/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1052	**Rm 2060**	Drawings show a receptacle by door but it did not get installed.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1053	**Rm 2078**	Drawing shows duplex receptacle on S wall, but none were installed.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1054	**Rm 2078**	Drawings show quad receptacle for A/V rack, but none were installed.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1055	**Rm 2084**	Occupancy sensor hanging loose from ceiling	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1056	**Rm 2084**	Hole in drywall cut too large for receptacle, cover plate does not cover it.	6/30/2017	Bodine		Complete	Not Bodine; open- couldn't access room	Closed	
1057	**Rm 2028**	VAV controller and BAS j-box missing covers	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1058	**Rm 2028**	Occupancy sensor loose.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1059	**Rm 2073**	Several non-GFCI receptacles within six feet of sink-NEC 210.8 violation.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1060	**Rm 2073A**	receptacle below counter within six feet of sink not GFCI protected-NEC 210.8 violation.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1061	**Rm 2006A**	Occupancy sensor loose	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1062	**Rm 2002**	Switch controlled EM light does not turn off as required by lighting control sequence.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1063	**Rm 2002A**	Occupancy sensor loose	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1064	**Misc Locations**	2-gang receptacles for furniture were not rough in on same wall as furniture is located	6/30/2017	Bodine		Complete	Closed-DL	Closed	11/20/2017
1065	**Rm 3100**	3 receptacles located within 6' of sink that are non-GFCI protected. NEC 210.8 violation	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1066	**Room 3004-**	Non GFCI protected receptacle within 6' of sink; NEC 210.8 violation	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1067	**3008 Data closet**	PVC conduit not supported per NEC (every 3')	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1068	**Corridor C3015**	sagging (unsupported?) conduit exposed between clouds.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1069	**Room 3083**	Sections of cove lighting not working, plus will not dim.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017
1070	**Room 3083**	Window light fixtures not dimming.	6/30/2017	Bodine		Complete	Closed-DL	Closed	7/28/2017

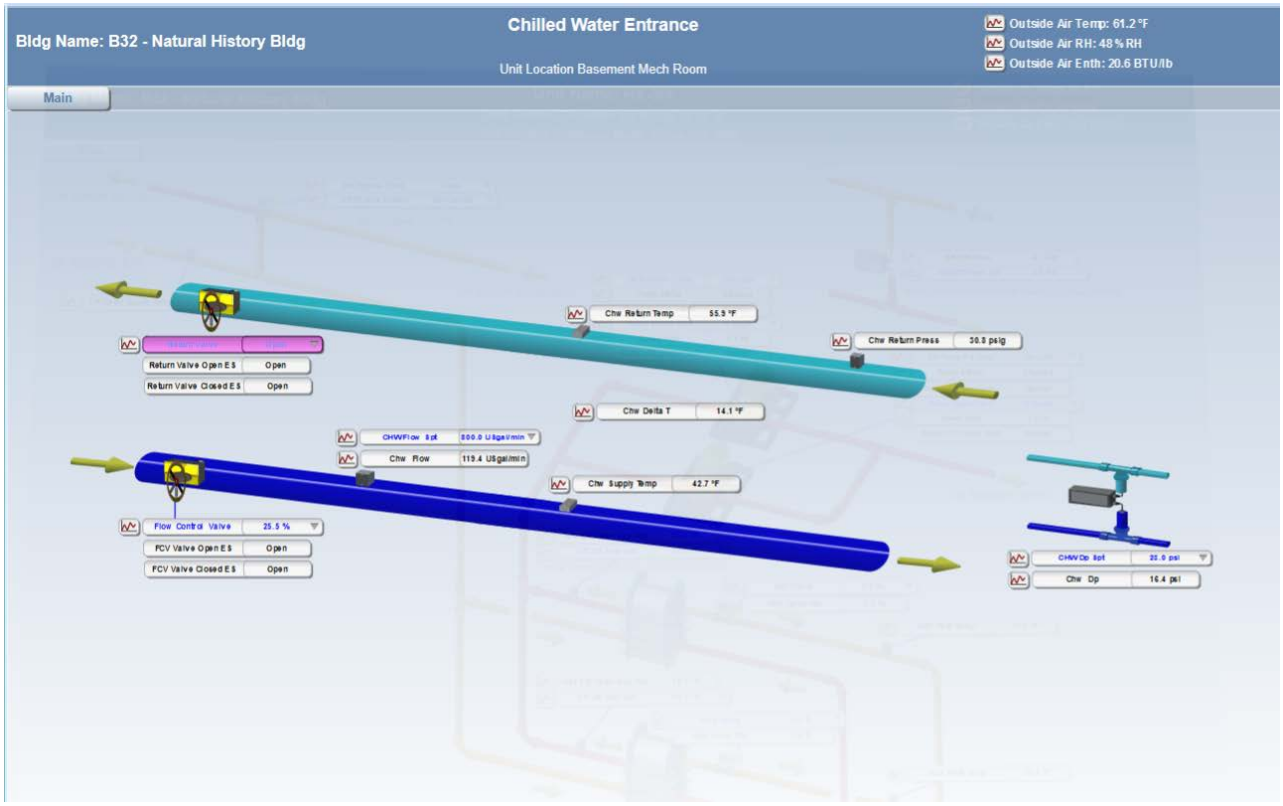
APPENDIX L - E x a m p l e BAS Graphics Verification

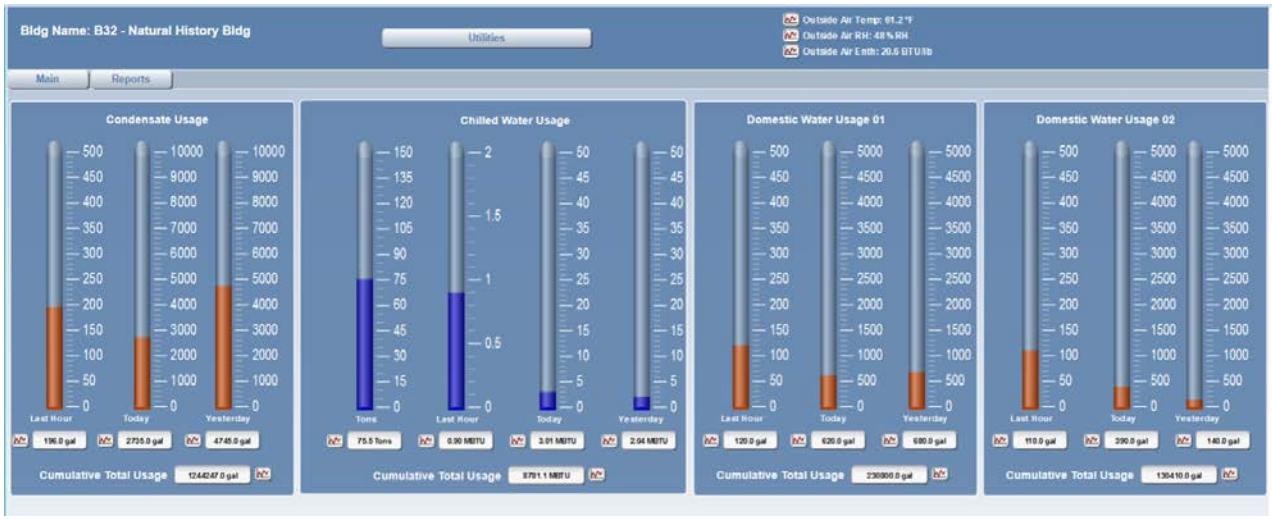


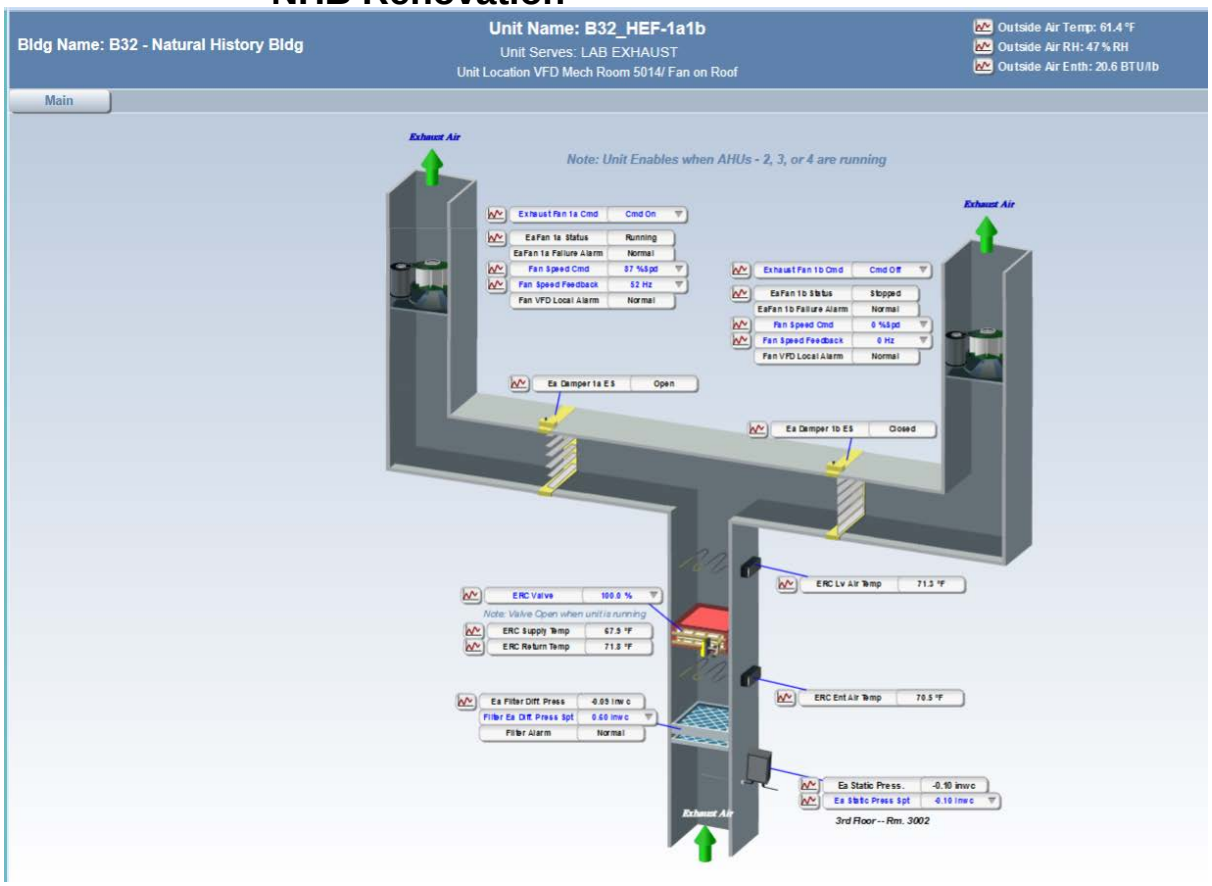


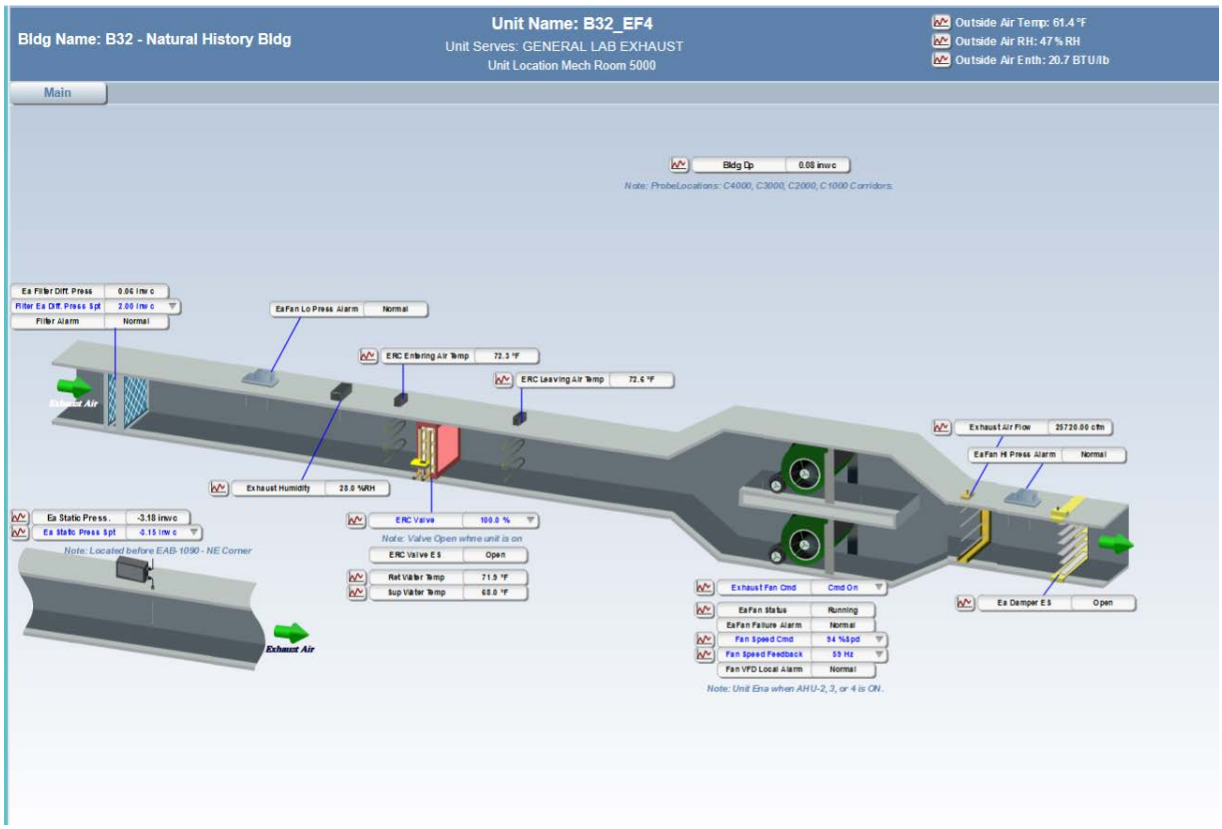

Bldg Name: B32 - Natural History Bldg
Unit Name: HE-01
Unit Serves: Radiation Valves
Unit Location Basement Mech Room 1080
Outside Air Temp: 61.0 °F
Outside Air RH: 48 %RH
Outside Air Enth: 20.6 BTU/lb
Main
Steam Valve 1/3 0.0 %
Steam Valve 1/3 Fdbk -0.1 %
Steam Valve 2/3 0.0 %
Steam Valve 2/3 Fdbk 0.2 %
Hw Diff Press 3.3 PSI
Hw Diff Press Spt 2.0 PSI
Note: Sensors located near ERS-1 (H1.5)
Hw Return Temp 112.1 °F
Hw Return Flow 3.1 usgal/min
Hw Return Press -2.8 PSI
Hw Supply Temp 112.7 °F
HWS Temp Spt 110.0 °F
Building HWR
Hw Pump P-1 Cmd Cmd Off
Pump Status Stopped
Pump Failure Alarm Normal
Pump Speed Cmd 0 % Spd
Speed Fdbk 0.0 Hz
Pump VFD Local Fault Normal
Hw Pump P-2 Cmd Cmd On
Pump Status Running
Pump Failure Alarm Normal
Pump Speed Cmd 30 % Spd
Speed Fdbk 18.1 Hz
Pump VFD Local Fault Normal
Building HWS


Bldg Name: B32 - Natural History Bldg
Unit Name: HX-3/4
Unit Serves: ER Water for AHUs - 2, 3, 4
Unit Location Penthouse North - Ricker Rm. 5000
Outside Air Temp: 61.0 °F
Outside Air RH: 47 % RH
Outside Air Enth: 20.5 BTU/lb
Main
ER Return to EFs
ER Supply to EFs
ER Bypass Open Open
ER Bypass Closed Not Closed
Bypass Open is to EFs
ER Water Supply Temp 70.7 °F
ER Return From AHUs
ER Diff Press 4.1 PSI
ER Diff Press Spt 2.8 PSI
Note: Sensors located in In Penthouse Near AHU-4
ER Pump P-1 Cmd Cmd Off
Pump Status Stopped
Pump Failure Alarm Normal
Pump Speed Cmd 0 %Spd
Speed Fdbk 0.0 Hz
Pump VFD Local Fault Normal
ER Pump P-2 Cmd Cmd Off
Pump Status Stopped
Pump Failure Alarm Normal
Pump Speed Cmd 0 %Spd
Speed Fdbk 0.0 Hz
Pump VFD Local Fault Normal
ER Supply to AHUs
HX3 ER Water Sup Tmp 75.7 °F
ER V/S Tmp Spt 90.0 °F
Note: Reset By OaTmp only at LoOaTmps
HX3 Valve 0.0 %
HX3 Valve Fbk 1.5 %
HX3 HWR Temp 72.1 °F
HX4 ER Water Sup Tmp 76.2 °F
ER V/S Tmp Spt 90.0 °F
HX4 Valve 0.0 %
HX4 Valve Fbk 1.0 %
HX4 HWR Temp 73.4 °F
Hw Supply Temp 120.8 °F
HW Supply
HW Return


Bldg Name: B32 - Natural History Bldg
Chilled Water Entrance
Unit Location Basement Mech Room
Outside Air Temp: 61.2 °F
Outside Air RH: 48 % RH
Outside Air Enth: 20.6 BTU/lb
Main
Chw Return Temp 55.9 °F
Chw Return Press 30.8 psig
Return Valve Open ES Open
Return Valve Closed ES Open
Chw Delta T 14.1 °F
CHWFlow 8pt 800.0 USgal/min
Chw Flow 119.4 USgal/min
Chw Supply Temp 42.7 °F
Flow Control Valve 25.5 %
FCV Valve Open ES Open
FCV Valve Closed ES Open
CHWDp 8pt 20.0 psi
Chw Dp 16.4 psi

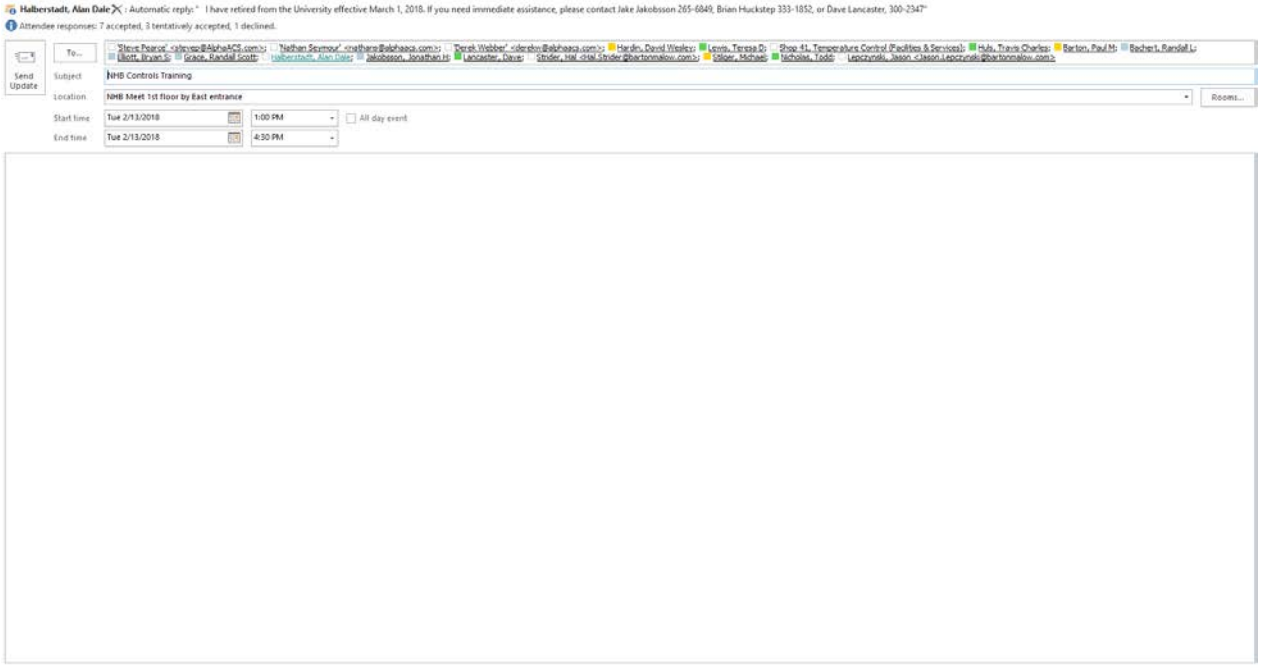

Bldg Name: B32 - Natural History Bldg
Utilities
Outside Air Temp: 61.2 °F
Outside Air RH: 48 % RH
Outside Air Enth: 20.6 BTU/lb
Main
Reports
Condensate Usage
Last Hour
Today
Yesterday
196.0 gal
2735.0 gal
4745.0 gal
Cumulative Total Usage 1244247.0 gal
Chilled Water Usage
Tons
Last Hour
Today
Yesterday
75.5 Tons
0.90 MBTU
3.01 MBTU
2.04 MBTU
Cumulative Total Usage 8781.1 MBTU
Domestic Water Usage 01
Last Hour
Today
Yesterday
120.0 gal
620.0 gal
680.0 gal
Cumulative Total Usage 230800.0 gal
Domestic Water Usage 02
Last Hour
Today
Yesterday
110.0 gal
290.0 gal
140.0 gal
Cumulative Total Usage 130410.0 gal

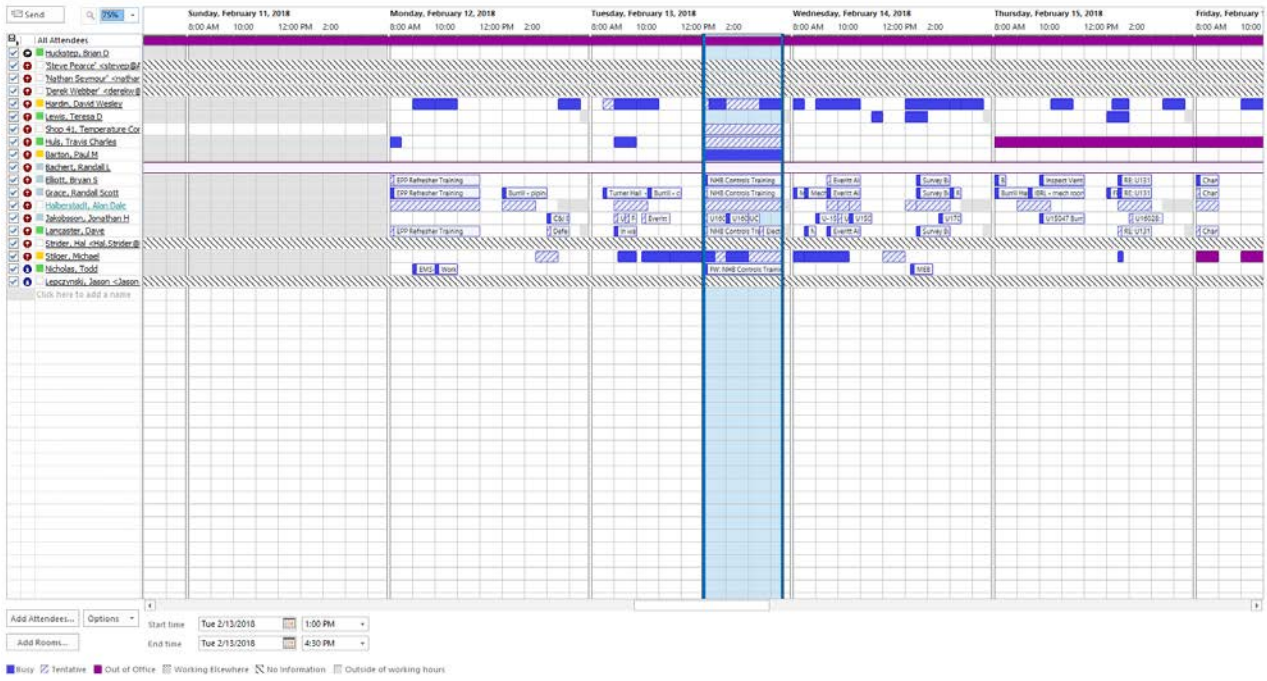

Bldg Name: B32 - Natural History Bldg
Unit Name: B32_HEF-1a1b
Unit Serves: LAB EXHAUST
Unit Location VFD Mech Room 5014/ Fan on Roof
Outside Air Temp: 61.4 °F
Outside Air RH: 47 % RH
Outside Air Enth: 20.6 BTU/lb
Main
Exhaust Air
Note: Unit Enables when AHUs - 2, 3, or 4 are running
Exhaust Fan 1a Cmd
Cmd On
EaFan 1a Status
Running
EaFan 1a Failure Alarm
Normal
Fan Speed Cmd
97 %Spd
Fan Speed Feedback
52 Hz
Fan VFD Local Alarm
Normal
Exhaust Fan 1b Cmd
Cmd Off
EaFan 1b Status
Stopped
EaFan 1b Failure Alarm
Normal
Fan Speed Cmd
0 %Spd
Fan Speed Feedback
0 Hz
Fan VFD Local Alarm
Normal
Ea Damper 1a ES
Open
Ea Damper 1b ES
Closed
ERC Valve
100.0 %
Note: Valve Open when unit is running
ERC Supply Temp
67.9 °F
ERC Return Temp
71.8 °F
ERC Lv Air Temp
71.3 °F
Ea Filter Diff Press
-0.05 inw c
Filter Ea Diff Press Spt
0.50 inw c
Filter Alarm
Normal
ERC Ent Air Temp
70.5 °F
Ea Static Press.
-0.10 inw c
Ea Static Press Spt
-0.10 inw c
3rd Floor -- Rm. 3002


Bldg Name: B32 - Natural History Bldg
Unit Name: B32_EF4
Unit Serves: GENERAL LAB EXHAUST
Unit Location Mech Room 5000
Outside Air Temp: 61.4 °F
Outside Air RH: 47 % RH
Outside Air Enth: 20.7 BTU/lb
Main
Bldg Dp
0.08 inw c
Note: ProbeLocations: C4000, C3000, C2000, C1000 Corridors
Ea Filter Diff Press
0.06 inw c
Filter Ea Diff Press Spt
2.00 inw c
Filter Alarm
Normal
EaFan Lo Press Alarm
Normal
ERC Entering Air Temp
72.3 °F
ERC Leaving Air Temp
72.6 °F
Exhaust Air
Exhaust Humidity
28.0 %RH
Ea Static Press.
-3.18 inw c
Ea Static Press Spt
-0.15 inw c
Note: Located before EAB-1090 - NE Corner
ERC Valve
100.0 %
Note: Valve Open whne unit is on
ERC Valve ES
Open
Ret Water Temp
71.9 °F
Sup Water Temp
68.0 °F
Exhaust Air Flow
25720.00 cfm
EaFan Hi Press Alarm
Normal
Exhaust Fan Cmd
Cmd On
EaFan Status
Running
EaFan Failure Alarm
Normal
Fan Speed Cmd
94 %Spd
Fan Speed Feedback
59 Hz
Fan VFD Local Alarm
Normal
Note: Unit Ena when AHU-2, 3, or 4 is ON.
Ea Damper ES
Open

COMMISSIONING REPORT
NHB Renovation

Appendix M –Owner Training





Appendix N – O&M Manuals

OPERATION & MAINTENANCE MANUAL

(O & M's)

1 OF

UNIVERSITY OF ILLINOIS
URBANA-CHAMPAIGN

NATURAL HISTORY BUILDING
UIUC PROJECT#
13016

Submitted and Installed by:

Bodine Electric of Decatur
1845 North 22nd Street
Decatur, Illinois 62526

217.423.2593 phone
217.423.4658 fax

Subcontractor / Supplier List

Civil and Concrete:
Dunn Construction Company
Austin Dunn
417 Wilbur Avenue
Champaign IL 61822
217-355-0222

Fire Detection and Alarm:
Getz Fire Equipment Co.
John Pedersen
1809 Industrial Park Dr.
Normal, IL 61761
309-454-2400

Lightning Protection:
HLP System, Inc.
Justin Harger
426 North Avenue
Libertyville, IL 60048
847-362-4777

Access Control:
Schneider Electric Buildings Business
Jerry Lanfear
17475 Palmer Blvd
Homewood, Illinois 60430
708-271-4753

Professional Audio Video:
Tech Electronics
Dale Johnson
417 Olympia Drive
Bloomington, Illinois 61704
309-874-2700

SQD Distribution Equipment:
Springfield Electric
901 North Mattis Avenue
Champaign, Illinois 61821
217-351-7600

Clock System:
Graybar
301 East Mercury Drive, Bay #1
Champaign, Illinois 61822
217-560-1000

Generator and Transfer Switches:
Gordon Electric Supply
1290 N. Hobbie Avenue
Kankakee, Illinois 60901
800-892-1866

Lighting:
Gordon Electric Supply
1290 N. Hobbie Avenue
Kankakee, Illinois 60901
800-892-1866

Variable Frequency Drives:
Gordon Electric Supply
1290 N. Hobbie Avenue
Kankakee, Illinois 60901
800-892-1866

S&C MV Switches:
Gordon Electric Supply
1290 N. Hobbie Avenue
Kankakee, Illinois 60901
800-892-1866

TABLE OF CONTENTS

MURPHY ELEVATOR COMPANY

UIUC Natural History
UIUC Project No. U13016

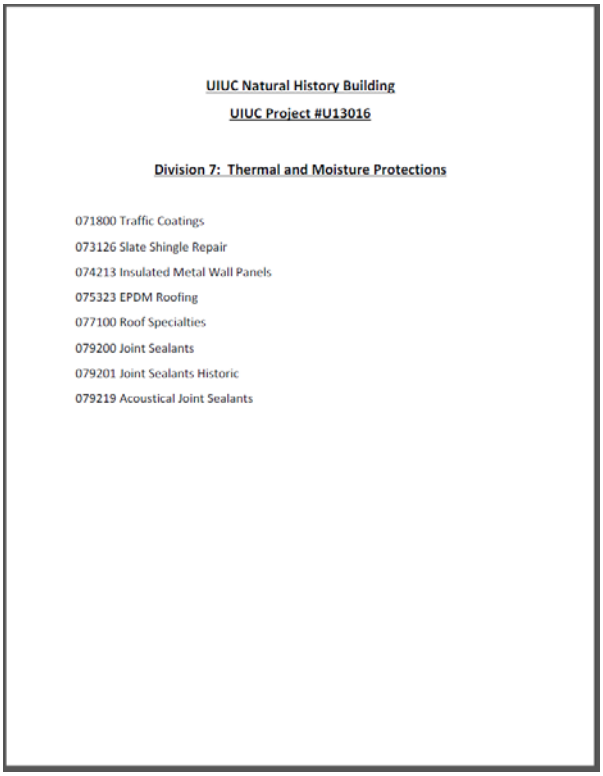
Elev. #1 - #T002254

Operation & Maintenance Manual

Book 1 of 1

The Murphy Elevator Company, Inc.
Job #C14234

February 2017



UIUC Natural History Building

UIUC Project #U13016

Division 7: Thermal and Moisture Protections

071800 Traffic Coatings
073126 Slate Shingle Repair
074213 Insulated Metal Wall Panels
075323 EPDM Roofing
077100 Roof Specialties
079200 Joint Sealants
079201 Joint Sealants Historic
079219 Acoustical Joint Sealants

Facilities Information Resources Project Submittal Log

U13016/U140	Natural History Building Renovation - Design and Construction		
Project #	*Project Name (as entered in FCPWeb)*		
Mike Stilger		32	LCM Architects
PM:		*Bldg # / Utility:*	*PSC:*
yellow =	*issues need resolving*		facility manager Derek Fultz only wants electronic O&Ms
			mailing address on next tab

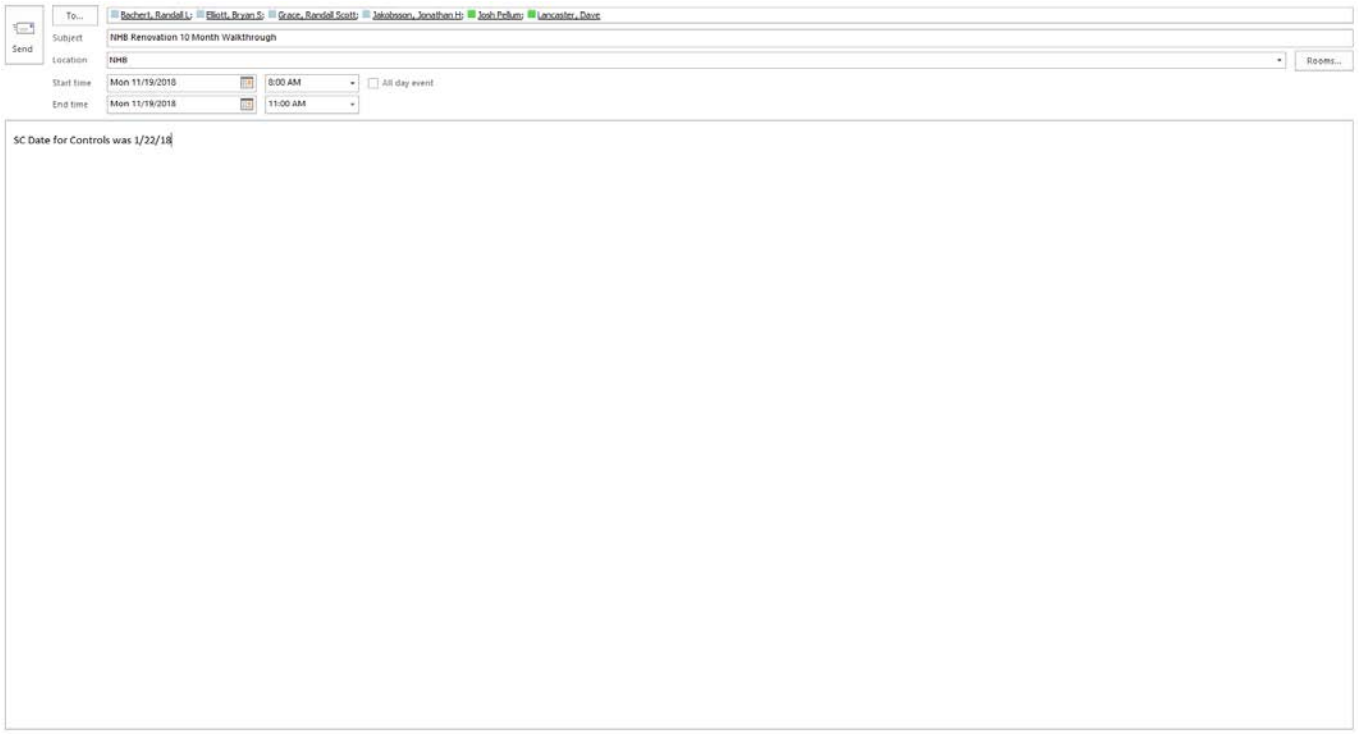
Operations & Maintenance Manuals

Rcvd Date	Division	Company	# Copies	CD	Notes
10/17/2016	R-2 Division 01, 07	Automatic Fire Sprinkler	0	0	*emailed file from Barton Malow Company (Clarissa Rogg), a download link sent to the F&S Shop Drawing Review emal. Includes O&M, warranties, Record Drawings. Placed in "Construction" folder*
9/28/2017	R-2	Core Construction	3	0	*As-built drawings (3 sets of each volume 1, 2, 3, 5)*
9/28/2017	R-2	Core Construction	3	0	*Contract submittals (1 of each volume, Div 3-6, 7, 8, 9, 10 & 11, 12-32) - 6 volumes total*
10/18/2017	R- 2 Electric - O&Ms	Bodine Electric	3	3	*O&M submittal is 3 sets of 8 volumes.*
10/18/2017	R-2 Electric - Approved Submittals	Bodine Electric	3	3	*Approved submittals is 3 sets of 1 volume.*
10/18/2017	R-2 Electric - Training Videos & Testing	Bodine Electric	0	3	*Flash drive.*
11/1/2017	R-2	Core Construction	0	3	*These are the electronics for the paper that came in 9/28. Extra two sets of CDs given to the PM for offering to the campus customer.*
11/1/2017	R-2	Core Construction	0	3	*These are the electronics for the paper that came in 9/28. Extra two sets of CDs given to the PM for offering to the campus customer.*
10/19/2017	R-1 Structural Steel	Ben Hur	3	3	
12/19/2017	R-2 General	Core Construction	2	0	
12/19/2017	R-2 General - Warranties	Core Construction	2	0	
12/19/2017	R-2 Elevator	Core Construction	6	2	*3 sets of manuals each for elevators 1 and 3, plus 1 CD for each elevator, plus 1 set of laminated drawings for each elevator*
1/12/2018	R-2 General	Core Construction	0	2	*One set will go to Mike Stilger for Derek Fultz.*
1/12/2018	R-2 General - Warranties	Core Construction	0	2	*One set will go to Mike Stilger for Derek Fultz.*
2/15/2018	R-2? Fire Protection	Automatic Fire Sprinkler	3	1	*One copy will go to Mike Stilger for Derek Fultz.*

ELECTRONIC RECORD DRAWINGS

In process; under contract with Architect to provide

Appendix O – 10 Month Warranty Walkthrough



COMMISSIONING & INSPECTION PROPOSAL

APPENDIX P – PROPOSAL FOR BUILDING INSPECTION AND COMMISSIONING

Subject: University of Illinois at Urbana-Champaign Natural History Building Design & Construction, UIUC Building # 32
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.

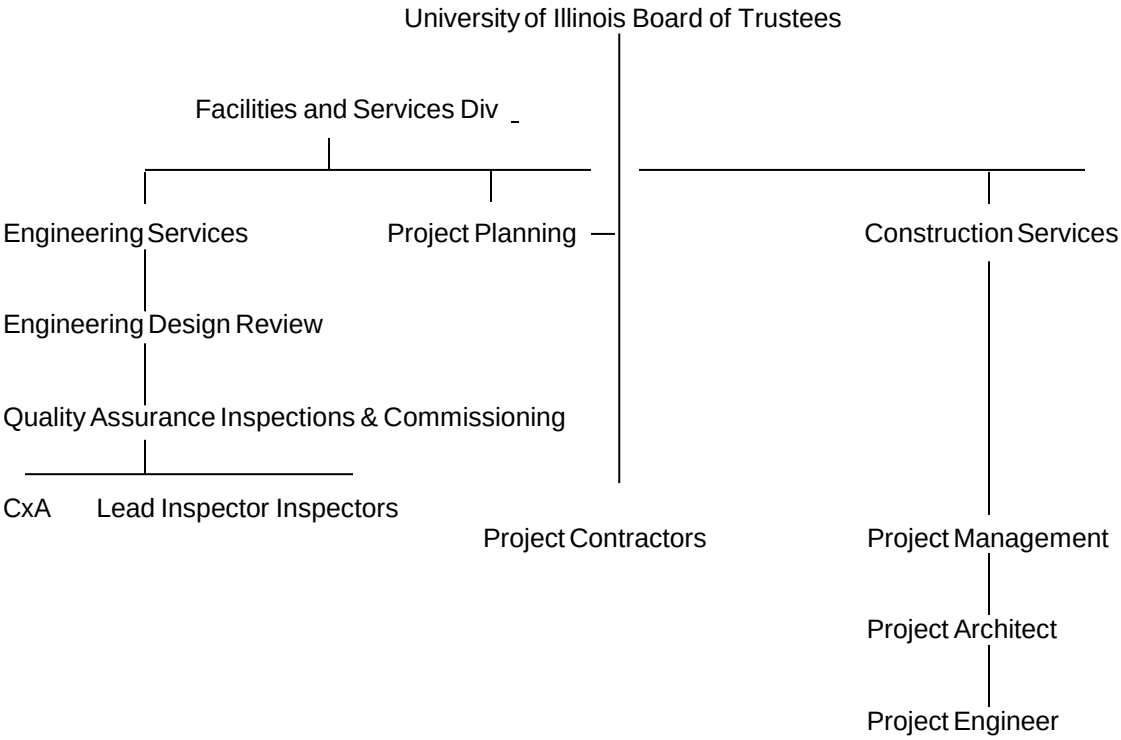
5. Review shop drawings, submittals and change order proposals for technical coordination of all components.
6. Observe all pre-functional / testing procedures and equipment start-up and activations which are required by the contract documents. Provide written reports of results. Require tests to be 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