Farnsworth GROUP

Owner's Project Requirements

Health Sciences Building

Southern Illinois University Edwardsville

Illinois Capital Development Board

Date: 3/18/2022

Version: 4.3

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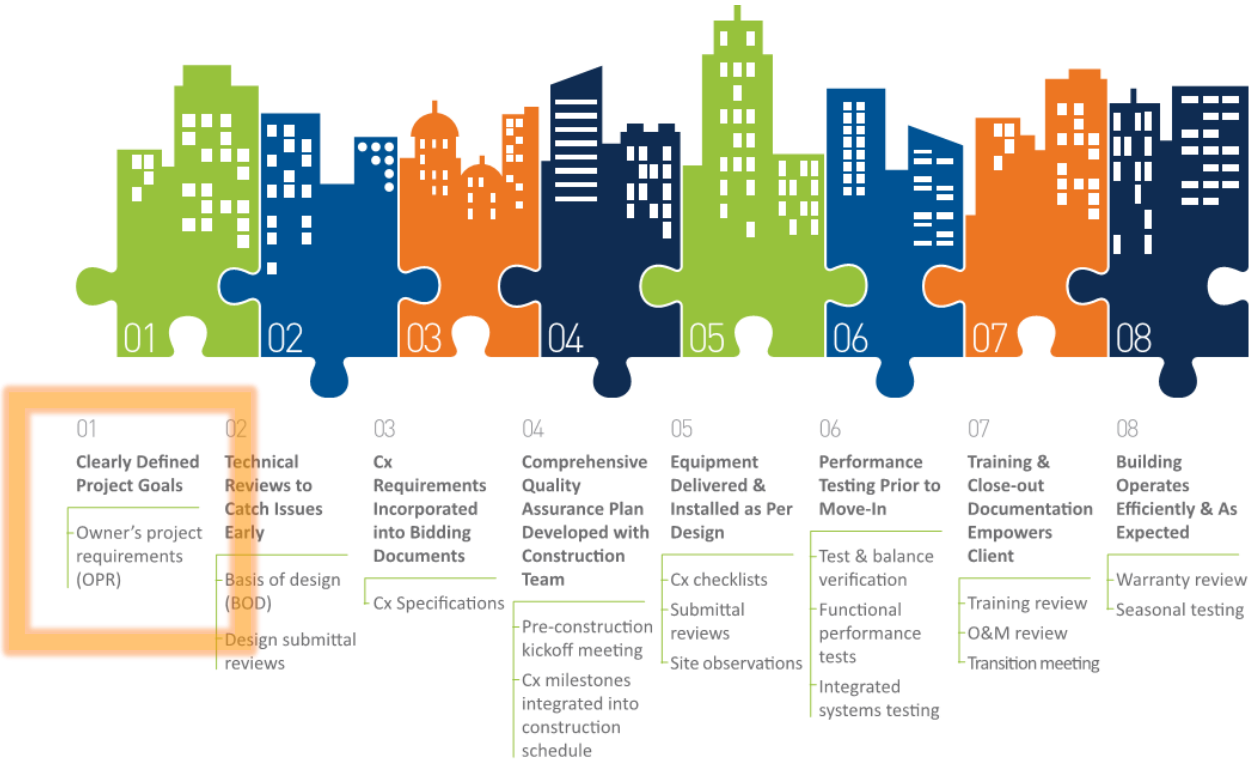
Owner's Project Requirements Overview

Figure 1: In the context of the overall commissioning process, the OPR sets the tone for the entire project.



Purpose

The commissioning process verifies quality at very specific points throughout the project timeline, as shown in the graphic above. The Owner's Project Requirements (OPR) document is among of the first documents created at the start of a new design/construction project. It informs and guides design, commissioning and construction processes, as well as provides an ongoing reference ensuring that the intents of the owner are met.

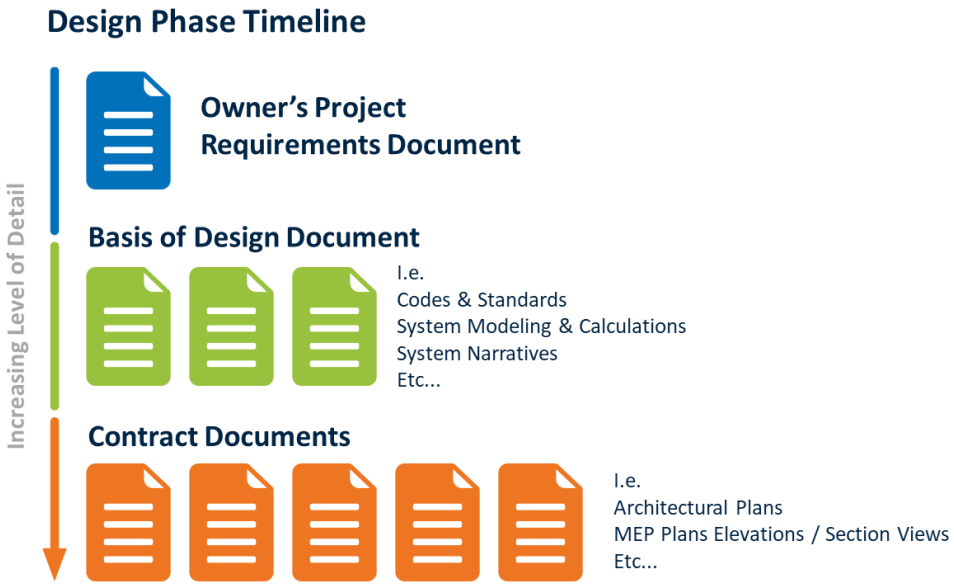
The OPR is a tool that summarizes the key goals of project, working in tandem with other tools and documentation developed and used by the project team. The OPR should answer the question: ***At the end of the project, how will we know this project is a success?***

In addition to articulating overarching goals of the project, the OPR identifies measurable criteria that further define these goals. For example, the main goal of "energy efficiency" could be further defined and measured by linking it to a Code or Standard. In this case, a measurable criterion for "energy efficiency" might be "performs 30% better than ASHRAE 90.1-2013".

The OPR Document is derived with input from a group of diverse project stakeholders, including representatives from SIUE, CDB, the bridging team, and the commissioning authority. These

stakeholders each have different organizational affiliations and personal experiences and thus distinct perspectives. Guided by the owner's expectations and needs, the stakeholders come together to discuss main goals of the project, how they will be documented and ultimately accomplished.

The OPR Document will inform the technical elements of the Basis of Design (produced by the Design-Build team) and construction documents, as these documents progress with increasing levels of detail.



Tying the OPR to the Basis of Design

The OPR Document is not a substitute for architectural programming by the Design-Build team. While it often contains some programming information, its primary contents identify the owner's overarching goals, expectations, and performance/success criteria. Also, unlike programming submittals, the OPR is updated throughout the entire project.

The OPR Document informs the development of the Basis of Design by the Design-Build team and continues as a companion with the Basis of Design Document. The Basis of Design document is created to demonstrate how the OPR is achieved through the development of the design documents, its implementation during construction, and later for operation/maintenance of the facility.

Throughout the design process, OPR goals are then expressed in greater detail within the Basis of Design and contract documents. Consistency among these documents is critical.

Version History and Owner Acceptance

As major decisions are made during the project, the OPR Document is updated to reflect changes. The OPR Document can be later amended to include any renovations or changes to the building even after its completion. The OPR is provided to the building owner and operations and maintenance staff upon completion of the project to serve as a permanent record of the project's progression.

Table 1: Summary of Revisions and Owner Acceptance

Version:	Date:	Revision Notes	SIUE Acceptance	CDB Acceptance
1.0	1/11/22	Initial OPR Draft / Example Prepared		
2.0	2/4/22	Revised draft based on SIUE / CDB feedback		
3.0	2/10/22	OPR prepared to incorporate into Bridging Documents		
4.0	2/25/2022	OPR incorporated into Final Bridging Documents		
4.1, .2, .3	3/18/2022	Minor updates	X	X

Related Documents

The following chart lists documentation and/ or meetings that involve the OPR directly or indirectly (i.e. OPR development materials, programmatic requirements, Owner warranty requirements, etc.).

Document	Location/ Appendix	Produced by	Date Issued	Notes
Appendix A – Reference Documents and Standards	A	SIUE	3/2/2016	The University's Standards Manual
Appendix B: Draft Commissioning Requirements	B	Farnsworth	3/2022	General commissioning standards
Appendix C: LEED Requirements	C	Farnsworth	3/18/2022	LEED requirements for the DB Firm

Background and Project Description

Southern Illinois University Edwardsville (SIUE) is a significant public institution in the state of Illinois, founded in 1965, and currently with an enrollment of over 13,000 students. SIUE has a recognized Health Sciences program that focuses on three areas: Nursing, Pharmacy, and Applied Health. The programs incorporate simulation, experiential learning, collaboration with other areas of the University, community outreach, and research.

This project proposes a new facility that would bring together all Health Sciences programs (Nursing, Pharmacy, Occupational Therapy, and Public Health).

More information will be added as the project design evolves.

Owner/User Requirements:

1. Program:
   a. Project Budget:
      i. Refer to CDB documentation

   b. Project Schedule:
      i. Refer to CDB documentation

   c. Occupancy Schedule: to be developed by the Design Build team in the format below.

      i. Spaces Not Accessible to Public (incl spaces:):
         1. Monday – Friday: 7am – 11pm
         2. Saturday: 7am – 5:30pm
         3. Sunday: 12pm – 5:30pm
         4. Holidays: Closed
         5. Break Periods: 7am – 7pm

      ii. Spaces Accessible to Public (incl spaces:):
         1. Monday – Friday: 7am – 11pm
         2. Saturday: 7am – 5:30pm
         3. Sunday: Closed
         4. Holidays: Closed
         5. Break Periods: Closed

2. Owner specific design criteria:
   a. SIUE Standards Manual 3-2-2016 Update – Material Standards for Architects and Engineers – See Appendix A-02.

Commissioning & Quality Verification

a. The project shall undergo a thorough quality assurance process utilizing sampling methodology. This process focuses on verifying and documenting that the systems being commissioned are implemented into the design, installed, and perform correctly by meeting the Owner's Project Requirements. The commissioned systems will include renewable energy, ventilation, heating and cooling, electrical, plumbing, building controls, fire alarm, fire protection, rescue assistance, campus emergency phones, and building enclosure.
b. Acceptance testing, system/ equipment start-up, and test and balance – shall be specified in the contract documents and the responsibility of the installing contractor.

c. Sampling rates – upon identifying more than 10% major deficiencies (i.e. leakage, failures, non-functioning equipment, etc) the sampling rate will be increased to 50%. If a further deficiency is found in the sample, 100% of all units in the sample will be reviewed and tested. All costs for retesting labor and expenses for the Owner and commissioning authority will be the contractor's responsibility.
d. Commissioning specifications have been attached in Appendix B. This is to define the level of detail for the scope of commissioning that will be required on this project. The specifications shall be edited as the project design is developed to capture the relevant systems used in the design.
e. All design and construction entities will need to work with the CxA (hired by CDB) and LEED consultant (hired by CDB) by promptly responding to requests and issues identified during the project.
f. The Commissioning Scope includes LEED Cx pre-requisite, Enhanced Cx & Monitoring-Based Cx (Option 1, Path 2), and Building Enclosure Cx (Option 2). The CxA (hired by CDB) will lead and direct the commissioning process and be responsible for Cx documentation. The Design-Build firm must provide enclosure testing as directed by the CxA.

3. Building Enclosure
   a. Design Build firm to provide a detailed analysis showing the location of the dew point for each unique wall type in the Basis of Design.
   b. 100% continuous insulation shall be on the outside of the building. The dewpoint modeling must show the dew point to be in the middle of the continuous insulation.
   c. Design Builder to provide building enclosure testing for the following tests at a minimum:

	Test	System	Test Required by ASTM 2813	Specification Section	Lab System Testing	Field Mockup Testing	In-Situ Field Testing	Recommended Sampling Rate		Notes
								Location	Quantity	
1	ASTM C 1715 – "Standard Test Method for Evaluation of Water Leakage Performance of Masonry Wall Drainage Systems"	Unit Masonary	No			Yes	Yes	TBD	1/600SF	If Masonry included in final design. Alternative option - functional performance testing weeps after veneer construction installed to 3 courses above cavity drainage material. Can be completed by contractor with documentation
2	ASTM E1186 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems	Fluid Applied Membrane Air Barriers	Yes			Yes	Yes	TBD	1/600SF	
3	ASTM D4541 Test Method for Pull-off Strength for Coatings Us-ing PortableAdhesion Testers	Modified Bituminous Sheet Air/Weather Barriers	Yes			Yes	No	TBD	1/600SF	
5	ASTM C1193 Standard Guide for Use of Joint Sealants, Appendix X1-Method A, Field Applied Sealant Joint Hand Pull Tab	Joint Sealants	Yes			No	Yes	TBD	1/500 LF, per different joint type	
4	ASTM D7877: Standard Guide for Electronic Methods for Detecting and Locating Leaks in Waterproof Membranes	Waterproofing and Roofing	No			No	Yes	TBD	Final by phase	
6	ASTM E783 Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors	Glazed Aluminum Curtain Wall and Glazed Aluminum Curtain Walls	Yes			No	Yes	TBD	2 samples per system per installation condition	
7	ASTM E1105: Water Penetration of Installed exterior Windows, Skylights, Doors and Curtian Walls	Glazed Aluminum Curtain Wall and Glazed Aluminum Curtain Walls	Yes			No	Yes	TBD	2 samples per system per installation condition	
8	AAMA 501.2: Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems	Glazed Aluminum Curtain Wall and Glazed Aluminum Curtain Walls	Yes			No	Yes	TBD	2 samples per system per installation condition	
9	ASTM E779 - Test Method for Determining Air Leakage Rate by Fan Pressurization / ASTM E1827 - Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door	Whole building pressuization test							Whole building - by phase (at least 2 tests)	

Sustainability:

1. Achieve LEEDv4 Silver Certification through building and site design, without reliance on Owner policy or purchases. Develop a LEED strategy that delivers LEED Silver with adequate points to allow for a minimum 5-point buffer over the LEED Silver 50-point threshold.

2. Utilize an Integrative Design process as required by LEED and communicate results throughout design to the project team for iterative decision-making.
3. Utilize energy modeling as a design tool to pursue a target site EUI of 45 kBtu/ft2/ yr.
4. Align with letter and intent of IL SB 2408, particularly with respect to building infrastructure and systems which will support IL goal to move toward 100% clean energy by 2050. Design should anticipate the building will be fully electric (no fossil fuels) within 25 years.
5. Prioritize energy demand reduction over gross energy savings to reduce equipment costs and sizing.
6. Use passive and permanent building features to minimize heating and cooling energy use ie:
   a. Basic envelope attributes: Envelope material and form; Envelope performance;
   b. Solar shading elements to control solar heat gain
   c. Building massing and orientation
7. Use passive and permanent building features to optimize occupant comfort.
   a. Control solar gain to avoid overly hot areas of building
   b. Control allowable glare while admitting and utilizing daylight.
8. Optimize use of daylight to meet Code and provide an excellent indoor environmental quality
9. Treat all water as a resource, whether potable or rainwater.
   a. Exceed Water Sense requirements.
   b. Reduce potable water demand by 30% for indoor use
   c. Eliminate potable water use for landscaping.
   d. Review opportunities to use rainwater for irrigation or other non-potable water use
   e. Select landscaping that does not require irrigation beyond establishment.
10. Submeter loads in the building including base utilities and major end use categories (HVAC, interior lighting, exterior lighting, plug loads, domestic hot water, process loads); align with campus energy reporting and standards.
11. Coordinate design to maximize available incentives.

Indoor Environmental Quality Requirements:

1. Indoor Conditions:
   a. Temperature, Humidity, and Air Speed to be outlined in Basis of Design and follow current ASHRAE 55 Standards.
   b. Occupant control of heating and cooling, thermostat adjustments, displays, etc. Users will have +/- 2°F control via zone thermostats and the ability to override unoccupied zones (i.e. during night or holidays) to occupied mode for 2 hours.

2. Ventilation:
    a. Ventilation rates to follow current ASHRAE 62.1 Standards.
    b. Building pressurization shall be designed and constructed for a positively pressurized building during all non-emergency modes of operation.
    c. Occupancy sensors shall be tied to HVAC system to save energy during the day by reducing airflow for vacant spaces during occupied hours.

3. Lighting and Controls:
    a. Interior color palette should be modeled against illuminance levels during Integrative Design to maximize daylight harvesting and minimize energy use. Results to be provided to Owner for review and documented in the Basis of Design.
    b. Multiple levels of controllability shall be provided to coincide with the usage of the space.
    c. Maximize daylight harvesting and control
    d. Building Automation Tie-in to allow adjusting lighting control settings via BAS
    e. Minimum exterior lighting levels to be achieved include the following:

	General Parking & Pedestrian Areas		**Enhanced Security Areas**			
	Minimum Horizontal Illuminance (lux)*	**Uniformity Ratio (Maximum to Minimum)****	**Minimum Vertical Illuminance*****	**Minimum Horizontal Illuminance (lux)***	**Uniformity Ratio (Maximum to Minimum)****	**Minimum Vertical Illuminance*****
General parking and pedestrian areas	10 lux/1.0 fc	10:1	5 lux/0.5 fc	10 lux/1.0 fc	10:1	5 lux/0.5 fc

Exterior lighting should comply with LEED requirements and conflicts should be brought to the attention of the Owner for further discussion.

4. Natural Lighting
    a. A daylight simulation done during design must show compliance with LEED Environmental Quality – Daylight, Options 1 or 2 (Spatial daylight autonomy and annual sunlight exposure; or simulation: illuminance calculations). Results should be provided to the Owner for review and used for final glazing and wall selection to maximize passive solar design and daylighting.

5. Acoustics – all new and existing/ reused spaces should be modeled for compliance with the acoustical requirements stated in the Bridging Documents, specifically related to:
    a. Acoustical separation
    b. Vertical sound transmission control
    c. Speech privacy

d. Speech intelligibility
e. Reverberation Time
f. Background noise control

6. Vibration - should be modeled for compliance with the acoustical requirements stated in the Bridging Documents.

Operation and Maintenance

1. Produce building data in format accepted by Maintenance Management System, TMA Systems. Fields captured should include the following:
   a. Manufacturer
   b. Model #
   c. Serial #
   d. Filter size
   e. Motor size
   f. Warranty start date
   g. Warranty end date

2. Maintenance access is defined by the following:
   a. Adequate clearance shall be provided around equipment and systems requiring maintenance or replacement. The design shall incorporate and specify access panels, walkways, stairs, and ample space to remove components requiring basic and extensive maintenance (i.e. filter replacement, coil pull, belt tensioning).
   b. Electrical panels should be in dedicated electrical rooms accessible from public spaces and that do not require entering a teaching space to access.
   c. Removal and future replacement of equipment must be possible with minimal effort. "Minimal effort" is defined by use of existing owner equipment. Exception: large rooftop equipment will require replacement by crane.
   d. All equipment that will eventually need to be replaced must have a location specified in the drawings, along with provisions (i.e. access doors) for ease of replacement. This includes equipment such as valves, water hammer arresters, transformers for automatic flush/ sink valves, etc.
   e. Roof mounted equipment must be accessible via stairway.
   f. Building enclosure maintenance should be limited to
      i. sealant and joint maintenance,
      ii. roof repair/ replacement, and
      iii. window & door repair/ replacement.

3. Minimization of Stock & Spare Parts:
   a. Systems, especially lighting, should be designed as to minimize the number of materials and spare parts that the Owner is required to keep in inventory.

b. The number of unique replacement parts in any category shall not exceed 10 (belts, filters, etc).

4. Training:
   a. Adequate training of O&M staff shall include, at a minimum, basic operating principles, preventative maintenance program, steps to ensuring sustained system performance, and minimization of emergency repair and replacement costs.
   b. Training sessions shall take place in a classroom or Microsoft Teams setting.
   c. Design engineer, contractor, and building staff shall be present.
   d. Training program shall be functionality-based rather than hours-based with training topics provided to the Owner in an agenda in advance of the training.
   e. Training should include an open discussion with the designer and contractor on the basis of design and how each system operates.
   f. Training shall occur in conjunction with each phase of construction to ensure O&M staff understand equipment operation prior to occupancy.
   g. Training videos shall be made of major training activities. These videos shall be organized and archived as part of the construction scope of work.

5. Central Placement of Major Equipment:
   a. Placement of equipment is centralized within specified mechanical rooms or easily accessible areas so that routine and emergency maintenance work will not greatly disrupt the typical day.
   b. The Basis of Design shall outline a narrative and show clearances and pathways for performing typical and emergency maintenance scenarios for all building systems. At a minimum address the following: re-fueling generator, replacing HVAC filters, filling salt in softeners, pulling chiller tubes, cleaning condenser coils, replacing exterior and interior lighting, accessing plumbing clean-outs, replacing AHU coils, replacing fan and pump motors.

6. Building Automation System: The following requirements apply:
   a. The graphical interface must be intuitive and include all high-level information on the main screen. Trending must be easily accessible from the main screen. Trending shall include 36 months' worth of data before archiving.

   b. Interconnections to other systems should include:
      - Lighting controls (monitoring and changing settings)
      - Fire Alarm (monitoring to shut down ventilation)
      - Plumbing (monitoring alarms)
      - Emergency power (monitoring alarms)

- Utility and submetering of energy and water (monitoring for energy use)

c. Capability of predictive diagnostics and reliability indicators. Ability to integrate with 3rd-party monitoring-based commissioning software.
d. Secure against network hacking and data corruption.

7. Warranty Requirements:
   a. Warranty requirements stated by the owner must be incorporated into the contract documents. It is unacceptable to use permanently installed equipment before substantial completion if it activates the warranty period early.
   b. Warranty period to be a minimum 2-year warranty on all HVAC work, with 5 years on any compressors.

8. Documentation:
   a. Documentation shall have adequate detail and organization to easily operate the building.
   b. The design and construction process shall utilize electronic source documents such as to minimize file size and facilitate archiving of project information.
   c. All construction submittals shall be electronic and provisions for project documentation and archival stated explicitly in the contract documents.
   d. Design decisions and assumptions shall be completely documented in the Basis of Design and reflect the most current design.
   e. Construction changes must be clearly documented in electronic record documents.
   f. Draft O&Ms must be provided to facility operating staff for review no later than 50% construction progress for each phase.

Future Expansion

1. Expansion must be shown in the Basis of Design and designed for the following areas:
   a. Building expansion
   b. Department expansion and possible space reconfiguration
   c. IT/ server
   d. Renewable energy

Resiliency & Emergency Preparedness

1. Emergency Scenarios: in addition to code-required life safety systems, the building should be designed to respond to the emergency situations listed in the Emergency Management Plan and Procedures, found at: https://www.siue.edu/emergencymanagement/

Appendix A –

Appendix:	Name	Date Issued	Notes
Appendix-A-01	SIUe Standards Manual	March 2016	Material Standards for Architects and Engineers

Appendix B –

DRAFT COMMISSIONING SPECIFICATIONS:

SECTION 01 9113 – GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Submittals, Demonstration and Training, and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Contractor's Cx Submittal Requirements
2. Contractor's Cx Responsibilities
3. Commissioning Team
4. Commissioning Meetings
5. Commissioning Plan
6. Documentation
7. Notifications
8. Submittal Reviews
9. Construction Checklist Overview
10. Field Observation and Issues Log
11. Start-Up
12. O&M Manuals
13. Training
14. Control System Verification
15. Test, Adjust, and Balance Review
16. Functional Performance Testing
17. Seasonal Testing
18. Warranty Review
19. Record Drawings

B. Related Sections

1. Division 01, Closeout Procedures
2. Division 01, Indoor Air Quality During Construction
3. Division 01, 21, 22, 23, 25, 26 and 27 specifications as determined by the “Included Systems” section of this specification.
4. Section 23 0593, Testing, Adjusting, and Balancing For HVAC

1.3 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Construction IAQ Plan

C. TAB Plan, Initial TAB report (prior to TAB verification), Final TAB report. As indicated in section 3, “Test, Adjust, and Balance Verification” of this specification.

D. Systems and Equipment Submittals: as identified in section 1, “Included Systems” of this specification.

E. Contractor’s Construction Schedule: Submit to team with regular updates, incorporating Cx procedures as indicated in section 1, “Schedule” of this specification.

F. Contractor must complete and submit the Construction Checklists to the CxA for backcheck. Submittal and Review required prior to initiation of FPT’s. See section 3, “Construction Checklist Overview” of this specification.

G. Submit response to CxA’s issues log within 7 days of receipt (occurs concurrent with CxA’s field observations through-out Construction and Acceptance phase). See section 3, “Field Observation and Issues Log” of this specification.

H. Manufacturer’s start-up reports: Submit as required by the respective equipment specifications. See section 3, “Start-Up” of this specification

I. O&M Manuals: Contractor shall submit an O&M Manual outline at 50% construction and must have this outline approved by the Owner and CxA. O&M Manual shall be submitted a minimum of 90 days prior to scheduled Owner Training to allow for review and correction prior to Owner training. O&M manual shall include all requirements from equipment and division 01 specifications plus the items identified herein section 3, “O&M Manuals” of this specification.

J. Owner Training: Submit training agendas as outlined in section 3, “Training” of this specification.

K. Control System Verification: Submit contractor’s verification that controls work is complete, include point to point verification, calibration report, and valve and damper stroke report as indicated in section 3, “System Control Verification” of this specification.

L. Emergency Power System Verification: Submit contractor’s verification that generators, automatic transfer switches and controls have tested individually and as a system to meet the requirements of the specifications. Verification to include settings of generator and automatic transfer switch control and alarm devices.

M. Record Drawings: In accordance with Division 01, 22, 23, 25, and 26 specifications.

1.4 DEFINITIONS

A. BoD: Basis of Design. A document, prepared by the Architect and Engineers, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

B. Commissioning Plan: A document, prepared by CxA, that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.

C. CxA: Commissioning Authority. Owner will contract with CxA directly.

D. OPR: Owner's Project Requirements. A document, prepared by Owner that details the functional requirements of a Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

E. Systems, Assemblies, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, assemblies, equipment, and components.

F. TAB: Testing, Adjusting, and Balancing.

1.5 DESCRIPTION

A. Owner has elected to use the Commissioning Process as part of their quality assurance process to design, construct, and operate this building. As with any quality process, Commissioning provides tools to enable everyone involved in the construction of a building to ensure the final building meets the original intent of the Owner. A primary tool used is the completion of pre-functional checklists by individual workers. The checklists will be provided by the sub-contractors with CxA approval. The checklists can easily track the current state of work by providing the key criteria in the specifications the Owner has defined as important for the successful installation and long-term operation of systems and equipment.

B. The Commissioning Process and procedures shall meet current LEED requirements for:

1. Fundamental Commissioning
2. Enhanced Commissioning
3. Monitoring-Based Commissioning
4. Building Envelope Commissioning

C. A key component of Commissioning is the verification of the operation of heating and cooling systems in all modes of operation to ensure the building is ready for year-round occupancy.

D. A key component of Commissioning is the verification of the operation of the emergency power system in all modes of operation and the integration with other building systems to ensure the emergency power system is ready for occupancy.

E. Commissioning provides verification of training of operation and maintenance personnel by ensuring that detailed training agendas are utilized and requiring detailed submittal requirements from Contractors prior to accomplishing any training.

F. The commissioning scope of work shall encompass systems indicated in “Included Systems”.

1.6 INCLUDED SYSTEMS

A. The following systems and their components are the focus of the Commissioning Process due to their complexity and the need to have coordination among the various subcontractors:

1. Divisions 3-8 – Building Envelope
    a. Slab on Grade Concrete
    b. Unit Masonry
    c. Thermal Barrier
    d. Air Barrier
    e. Moisture Barrier
    f. Metal Wall Panels
    g. Standing Seam Metal Roofing
    h. SBS Modified Bituminous Membrane Roofing
    i. Exterior Joints and Sealants
    j. Exterior Hollow Metal Door Frames
    k. Aluminum Entrance Doors
    l. Aluminum Storefront Framing
    m. Aluminum Curtain Walls
    n. Aluminum Windows
    o. Steel Windows
    p. Skylights
    q. Roofing
2. Division 14 – Conveying Equipment
    a. Vertical Transport
3. Division 21 and 28 – Fire Protection and Fire Alarm
    a. Fire Alarm
    b. Sprinkler and Standpipes
    c. Fire Pumps
    d. Atrium Smoke Control
    e. Smoke Evacuation / Purge
    f. Interlocks with Vertical Transport
4. Division 22 - Plumbing
    a. Domestic Hot Water System and Controls

b. Circulation Pumps
c. Booster Pump
d. Temperature Mixing Valves
e. Water Softener
f. Elevator Pit Sump Pumps
g. Irrigation
h. Sanitary and Storm Water Systems
i. Medical Gas

5. Division 23 – Heating, Ventilating and Air Conditioning
   a. Heating Hot Water System
   b. Chilled Water System
   c. Solar Hot Water System
   d. Hot Water Circulator Pumps
   e. Air Cooled Chillers
   f. Cooling Towers
   g. CHW Variable Primary Pumps
   h. Process CHW Pumps
   i. Air Handling Units
   j. Variable Volume Boxes
   k. Fan Powered Terminal Units
   l. Fan Coil Units
   m. Unit Heaters / Cabinet Unit Heaters
   n. Dedicated Outdoor Air Units
   o. Variable Frequency Drives
   p. Expansion and Buffer Tanks, Air Separators
   q. Water Treatment
   r. Piping and Insulation
   s. Ductwork and Sound Attenuation
   t. Dedicated Cooling / Computer Room AC
   u. Refrigeration Systems
   v. General Exhaust Fans
   w. Kitchen Exhaust Fans
   x. Specialty Exhaust

y. Make Up Fume Hood

z. Air Compressor

aa. Ductless Split Systems

bb. CRAH's

cc. Heat Exchangers

dd. Snowmelt System

ee. Integrated Automated Facility Controls

ff. Components of a Geothermal System

6. Division 26 - Electrical

a. Interior Lighting and Controls

b. Exterior Lighting and Controls

c. Egress and Emergency Lighting

d. Power Systems and Distribution

e. Generators

f. ATS (Automatic Transfer Switch)

g. UPS (Uninterruptable Power Supply)

h. Grounding

i. Photovoltaics

7. Division 28 – Fire Alarm

1) Rescue Assistance

1.7 SCHEDULE

A. The Contractor shall provide the Commissioning Authority (CxA) with a detailed construction schedule within 30 days of the commencement of work. The Contractor shall also provide the Commissioning Authority (CxA) with construction schedule updates throughout the construction period. Schedules shall include all submittals; equipment start-up activities; ductwork testing; pipe flushing; Test, Adjust, and Balance; and Owner training. The CxA will provide the Contractor with commissioning activities into the overall project schedule.

B. Contractor shall notify CxA 14-days minimum prior to equipment startup, ductwork testing, pipe testing and flushing, water treatment certification, and AHJ inspections. All documentation shall be sent to CxA for record.

C. Contractor shall complete pre-functional checklists and installation checklists daily.

D. Contractor shall submit proposed startup procedures for review 14-days minimum prior to startup.

E. Contractor shall submit Certificate of Readiness Forms to CxA prior to scheduling functional testing.

F. Controls contractor shall submit trending for review to CxA 14-days minimum prior to functional performance testing. Trending duration shall be for 7-days on 30-minute intervals and shall include all points as requested by CxA. Functional testing will not be scheduled prior to CxA and Owner approving trends.

G. TAB contractor shall be responsible for 20% TAB Verification with CxA and Cx Team. TAB contractor shall provide final report for review to CxA prior TAB Verification.

H. FPT (Functional Performance Test) procedures will be developed by the CxA (see item 3.13). The contractor shall return consolidated comments from all subcontractors within 14 days of receipt from the CxA.

I. Contractor shall be responsible for participating in and performing functional performance testing at end of construction, and as necessary for seasonal testing, and at 10-month warranty review.

J. Contractor shall submit O&M Manuals and warranties within 30 days of receiving approved product submittals and shop drawings. O&M Manuals to be submitted to CxA a minimum of 90 days prior to training.

K. The Contractor shall submit Training Materials and Agendas 30 days prior to scheduled training.

L. Seasonal testing will be performed during the opposite season of the original Functional Testing.

M. Warranty Review will be conducted 10-months after substantial completion.

PART 2 - PRODUCTS

2.1 Not used

PART 3 - EXECUTION

3.1 COMMISSIONING TEAM

A. The General Contractor and each subcontractor shall designate a single individual to be responsible for coordinating CX activities with Owner and CxA.

B. The members of the commissioning team consist of Owner, Owner O&M personnel, General Contractor (GC), Heating Contractor (HC), Ventilation Contractor (VC), Electrical Contractor(s) (EC), Lighting Controls Contractor (LC), Testing Adjusting and Balancing (TAB) subcontractor, Controls Contractor (CS), Fire Alarm Contractor (FC), and Commissioning Authority (CxA).

3.2 COMMISSIONING MEETINGS

A. All commissioning team members shall attend preconstruction Cx meeting. The meeting will be to discuss the Cx process, scheduled activities, and Cx team responsibilities.

B. Commissioning meetings/discussions will be held throughout the duration of construction and will typically be part of or follow a scheduled project coordination meeting. Commissioning meetings may be separate from other meetings and will have their own agenda and meeting minutes. The CxA will

lead, distribute agendas, and record meeting minutes for specific Cx meetings, otherwise these items will be completed by parties responsible for leading the meetings.

3.3 COMMISSIONING PLAN

A. A detailed commissioning plan will be provided and reviewed with the subcontractors during the pre-construction meeting.

B. The commissioning plan is intended only as a guide for commissioning activities on the project. The specifications are the contract requirements and shall be considered the extent of the subcontractor's responsibilities.

C. The commissioning plan will be updated periodically throughout the project process, will become the depository for the commissioning documentation, and ultimately will become the basis for the final commissioning report

3.4 DOCUMENTATION

A. All documentation shall be sent to the Architect of Record for review and distribution.

3.5 NOTIFICATION

A. Contractor shall notify CxA 14-days minimum prior to equipment startup, ductwork testing, pipe testing and flushing, water treatment certification, and AHJ inspections. All documentation shall be sent to CxA for record.

3.6 SUBMITTAL REVIEWS

A. The Commissioning Authority (CxA) shall review submittals concurrent to A/E and Owner. The intent of this review is to identify long-term issues of submitted equipment and to ensure the original design intent is maintained throughout the design and construction phases. Comments of the CxA will be coordinated through A/E.

B. The CxA will send comments directly to the A/E and Owner within 7-days of receipt. The A/E will receive the CxA comments and return a combined or collective list of comments to the Contractor.

1. Submittals reviewed by the CxA will be returned to the A/E for final disposition.
2. The A/E will review and incorporate the comments, or attach them to their comments, and return a single comment list to the Contractor. A/E is the designer of record; therefore, comments from CxA are only recommendations.
3. A/E will respond to the CxA comments that are not included with reason or acceptance of comment in order to maintain and close out CxA issues in the issues log.

3.7 CONSTRUCTION CHECKLIST OVERVIEW

A. The intent of the construction checklist is to provide a formalized means to easily track construction progress.

1. Pre-functional checklists are described in detail below. These are equipment-specific.

2. Checklists for piping, ductwork, cable trays, wiring, etc. are different from the pre-functional checklists. Although they are not formally tracked, they will be used by the CxA during periodic field observations. These checklist items are reminders to the contractors of some common items that have been problematic on other projects.

B. Construction checklists for all pieces of equipment typically follow the same format, yet are tailored to the specific equipment being installed.

C. Construction checklists are developed for each individual piece of equipment to track and verify equipment from when they are delivered, installed, and during start-up. The CxA will develop and provide all checklists for each piece of equipment or system and the following:

1. Instructions and Checklist Procedures.

2. Checklists with the following sections:

a. Pre-Installation Checks: Includes several yes/no or short answer questions to document the condition of the equipment prior to installation and several blank columns to compare delivery items such as manufacturer, model, serial no., etc. to the corresponding submitted/approved items.

b. Installation and Startup: Includes several yes/no or short answer questions to document that the equipment is installed, electrically wired, controlled and started up and balanced according to the specified requirements. A Negative Responses section is included at the end of the checklist to document the reasons for any "no" responses or discrepancies in the various sections.

D. The checklist shall be completed by the individual actually completing the work. Prior to any work, the checklist shall be reviewed by the individual contractor for pertinent information. Any negative responses on the checklist shall be explained and documented at the end of the checklist.

E. The completion of the checklist does not eliminate the contractor's responsibility for meeting other requirements in the specifications and drawings.

F. The CxA will periodically verify the accuracy, completeness and tracking of the checklists. If consistent errors are found, the responsible contractor shall re-validate 100% of the checklists for the problem equipment or system type.

G. The Checklists are designed to detect and eliminate delivery, installation and startup problems, and problems with miscommunication. This process also serves as a convenient way to document the progress of the work.

H. CxA can provide a web based system for use by the contractors to complete the checklists.

3.8 FIELD OBSERVATION AND ISSUES LOG

A. The CxA will perform routine field observations during the construction period.

B. The CxA will maintain an Issues Log that will include construction issues, access and maintenance issues, or other issues. Each observation is intended to improve the project quality and achieve the OPR.

C. The CxA Issue Logs are not “punch lists” in that they focus on systemic problems. Where an issue is identified, not all of the same components will have been verified by the CxA.

D. Issue Logs shall be responded to within 7-days of issuance by CxA.

3.9 START-UP

A. Startup reports shall be created by the Contractor and prepared prior to start-up and submitted to A/E, Owner, and CxA to review.

B. Startup documentation shall contain a minimum of all startup procedures recommended by manufacturer and shall encompass all accessories and sensor calibration.

C. Completed start-up reports shall be submitted 7-days prior to scheduled functional performance testing. Start-up reports will be tracked as part of the pre-functional checklists to indicated readiness for functional testing.

D. Start-up reports shall be per requirements listed in equipment or referenced documentation section of this specification.

3.10 O&M MANUALS

A. CxA will review O&M Manuals and Warranties concurrent with Owner and A/E as per any submittal.

B. O&M Manuals shall contain:

1. All requirements from other sections of Contract Documents.
2. 2018 IECC Chapter 8 Section 503.2.9.3 “Manuals”.
3. Warranty Procedures: Provide a comprehensive procedure for warranty procedures.
4. Filter Schedule: One comprehensive schedule indicating all equipment on the project with filters and their associated filter size, quantity, and MERV rating.
5. Belt Schedule: One comprehensive schedule indicating all equipment on the project with belts and their associated belt size, type, and quantity.
6. Lamp Schedule: One comprehensive schedule indicating lamps for all luminaires on the project and their types and quantities, manufacturers, and order codes.
7. Warranty Schedule: One comprehensive schedule listing all equipment on project and their parts, labor, and extended warranties.
8. Maintenance Schedule: One comprehensive schedule indicating routine maintenance frequencies. Schedule shall indicate maintenance requirements for 2-calendar years starting from date of Owner acceptance.

C. Distribution process shall be the same as Submittal Review.

3.11 TRAINING

A. The lead subcontractor for the respective system is responsible for the development of the training material for the system. The lead subcontractor shall utilize the Operations and Maintenance Manual as

a basis for instruction. Any coordination of training between different subcontractors is the responsibility of the lead subcontractor.

B. The training agendas and material shall be submitted to the CxA 30 days prior to the originally scheduled system training for review and acceptance for review. The CxA shall provide comments to supplement the training material for operations and maintenance personnel where appropriate. Training Agendas shall include:

1. Instructors Name
2. Date of training
3. Duration
4. General purpose of the system
5. Use of the O&M manuals
6. Review of control drawings and schematics
7. Start-up, normal operation, shutdown, unoccupied operation, seasonal changeover, manual operation, controls set-up and programming, troubleshooting, and alarms
8. Interactions with other systems, adjustments and optimizing methods for energy conservation, relevant health and safety issues
9. Preventative maintenance procedures and schedules. Schedule should be broken out by system and individual component requiring maintenance.
10. Special maintenance and replacement sources
11. Tenant interaction issues
12. Discussion of how the feature or system is environmentally responsive
13. The trainer shall verify that the training agenda is covered and shall obtain signatures and names of persons attending the training.

C. CxA will review training agenda and materials concurrent with Owner and A/E.

D. Distribution process shall be the same as Submittal Review.

E. Training shall be videotaped by the Contractor, unless specified otherwise in the design documents.

F. All training sessions shall be scheduled and coordinated by the General Contractor through Owner.

G. Major component training shall be completed and accepted by Owner prior to substantial completion and occupancy.

3.12 CONTROL SYSTEM VERIFICATION:

A. Included in this work will be sample-based verification of instrument calibration, access to components, labeling of devices, clear sequences and shop drawings.

B. The verification of the control system will be accomplished as an on-going task during construction to identify and resolve systemic issues early in the project. This on-going task will involve work that occurs offsite and throughout the construction phase including the closeout phase.

C. The control system operation must be sufficiently operational prior to the TAB of the system. It is understood that a portion of the final control system startup occurs in conjunction with the TAB work. The intent of this requirement is for the TAB work to be productive and not be hampered by a control system that is not sufficiently functional.

D. The control system testing will utilize the controls system instrumentation for testing. Therefore, the first portion of the control system testing will be verification of the sensors, inputs and outputs.

E. Point-to-Point Verification: All wiring shall be checked out by the Control Contractor from end to end, point to point, from field to computer screen to ensure correct connection and a system free from wiring defects.

F. CxA verification of sensors will be made using the sampling method; an exhaustive re-test of the control system inputs and outputs will not be conducted by the CxA. Prior to CxA verification, the Control Contractor shall be responsible for complete input/output checkout quality assurance.

1. Sensor and Actuator Calibration, General:

    a. This section is included to emphasize the importance of the Control Contractor calibrating the instrumentation and to make clear the requirement for same; and that "factory calibration" or "calibration by exception" is not acceptable.

    b. All field-installed temperature, relative humidity, CO, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described below. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

    c. All procedures used shall be fully documented with documentation of initial, intermediate and final results.

2. Sensor Calibration Methods

    a. All Sensors and Transducers. Verify that all sensor and transducer locations are appropriate and away from causes of erratic operation. Verify that sensors and transducers with shielded cable are grounded only at one end.

    b. Sensors without Transmitters. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor is within the specified tolerances. If not, install offset in BAS, calibrate or replace sensor.

    c. Sensors with Transmitters. Connect a signal generator. Adjust transmitter zero and span to match the signal generator until the ammeter reads 4 mA. Make a reading with a calibrated test instrument within 6 inches of the site sensor. Verify that the sensor reading is within the specified tolerances. If not, replace sensor and repeat.

    d. Sensor Tolerances. The following are the tolerances of the actual sensors in the system. Unless noted differently on the CxA test procedures or specifications, use the following:
        1) Temperature (space or room): +/- 1.0 degF.
        2) Temperature (duct):+/- 0.5 degF.
        3) Pressure (duct static):+/- 0.05 in. w.c.
        4) Pressure (other):+/- 5.0 pct of reading.
        5) Flow rates for air:+/- 5.0 pct of reading.
        6) Flow rates for water:+/- 5.0 pct of reading.
        7) Relative Humidity:+/- 5.0 pct of reading.
        8) Oxygen or CO2 monitor: +/- 1.0 pct of span.

e. Valve and Damper Stroke Setup and Check as follows:
   1) For all valve and damper actuator positions checked, verify the actual position against the BAS readout.
   2) Set pumps or fans to normal operating mode (If the system could be affected by this, then shut down the system). Command valve or damper closed, visually verify that valve or damper is closed and adjust output zero signal as required. Command valve or damper open, verify position is full open and adjust output signal as required. Command valve or damper to a few intermediate positions. If actual valve or damper position doesn't reasonably correspond, replace actuator.
   3) Closure for normally closed valves and dampers (spring-loaded only). Disconnect power to the actuator motor, and verify the valve or damper moves to full closed position. If not spring-loaded, conduct verification by disconnecting the signal wire. Restore to normal.
   4) Closure for normally open valves and dampers (spring-loaded only). Disconnect power to the actuator motor, and verify the valve or damper moves to full open position. If not spring-loaded, conduct verification by disconnecting the signal wire. Restore to normal.

3.13 TEST, ADJUST, AND BALANCE REVIEW

A. The CxA witness the TAB activities performed by the Contractor/subcontractors to document achievement of the OPR. The specific activities expected include:

1. CxA will review TAB deficiencies report with Owner to evaluate existing conditions and repairs that may be required.

2. Review of TAB procedures documented in TAB Plan. TAB Contractor shall verify accessibility of equipment and components required for TAB work, adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces, adequate number and placement of balancing valves to allow proper balancing and recording of water flow, adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both tab and commissioning testing.

3. Review of TAB report after TAB work is complete. See submittal review section for review process.

4. The TAB verification will be done while the system is under the same conditions and control setup as the original readings.

3.14 FUNCTIONAL PERFORMANCE TESTING

A. The CxA will witness tests performed by the Contractor that are intended to document achievement of the OPR. The specific activities expected include:

1. The CxA will provide to all commissioning team members, and others as required, the functional performance test plan 14 days prior to the scheduled testing.

2. Review of test procedures: the contractor shall review the FPT procedures developed by the CxA. The contractor shall return consolidated comments from all subcontractors within 14 days of receipt from the CxA.

3. FPT's shall be accomplished prior to submitting the initial request for substantial completion and after all construction checklists have been accepted by the CxA and after acceptance of all startup and performance test reports (e.g., TAB report) by the CxA.

4. Contractor shall assign adequate personnel and tools for the following FPT's and any required retests:

    a. HVAC Systems – all modes of operation, including emergency, efficiency, performance, and consistency tests – expected duration to be <> days of hands on tests. This does not include setup, preparation recording, or data downloading time.

    b. Electrical – Review of HVAC equipment electrical connections to validate power quality within specified tolerances in all modes of operation, including emergency, efficiency, performance, and consistency tests – expected duration to be <> day of hands on tests. This does not include setup, preparation recording, or data downloading time.

    c. Plumbing Systems – Review of HVAC equipment plumbing connections (hot water, chilled water, condensate drainage, etc.) in all modes of operation, including emergency, efficiency, performance, and consistency tests – expected duration to be <> day of hands on tests. This does not include setup, preparation recording, or data downloading time.

B. Each subcontractor will be responsible, as required, to assist the CxA by witnessing the testing, putting the system in various modes of operation, and fixing minor problems found during the test. Manufacturer's representatives may be required to access and override controls as necessary to conduct the testing if control is not provided by the controls contractor.

C. Control system set-up, calibration and operation shall be completed and verified prior to system Adjusting and Balancing as defined in Section 23 05 93. System functional performance testing shall not be completed until the Adjusting and Balancing report has been verified and accepted by the A/E.

D. Skilled technicians shall be provided by the appropriate Contractor familiar with the system and building to execute the functional performance testing of the control system and perform functional performance testing of equipment. The Owner reserves the right to reject any technician who is not qualified to perform the required testing. Qualifications of technicians include site-specific expert knowledge relative to tested equipment and adequate documentation and tools to service and operate the systems.

E. If major problems are discovered during the test, the responsible subcontractors and General Contractor will fix the problem and the test shall be redone. If more than one functional performance test is required, the responsible subcontractor will be back-charged for the CxA's time and expenses.

F. Re-testing Procedure:

1. Any requirement for a re-test for a given test shall constitute the back charge to the responsible Contractor by the Owner for the attendance of CxP. A re-test shall be defined in this context as any time where a test defined under this section for the project cannot be fully executed due to any of the following conditions:

    a. Date and time of test changed without a minimum of 14 days notice to CxP.

    b. Improper or insufficient personnel and/or tools on site at time of test.

    c. Deficiencies or discrepancies present at time of test that have been previously noted by CxP and remain unresolved.

    d. Any issues that require a re-test or stoppage of tests in progress.

e. Failure of test for reason under responsibility of Contractor and/or Contractor responsible for sub or feed system (i.e. controls, electrical, etc.).

f. Failure due to manufacturer defect.

2. The Contractor is responsible for all costs associated with re-testing, including costs incurred by Owner.

3. Re-testing by Contractor shall not be considered a reason for a claim of delay or for a time extension by the Contractor.

4. If any sample selected has more than a 10% failure rate an additional sample equal to the number of units that failed shall be selected and treated as a re-test in accordance with re-testing guidelines provided under this section and in the OPR. This shall be in addition to the requirement to re-test the failed units.

3.15 SEASONAL TEST

A. Contractor shall be responsible to participate in seasonal testing. Seasonal testing will be at the opposite season, within 10-months after substantial completion. Seasonal testing is to verify the system operation is stable during the opposite season.

3.16 WARRANTY REVIEW

A. Contract shall be responsible for participating in warranty review process near the end of warranty period to verify all warranty items have been resolved. This may include site visits, meetings, Systems Manual, trending reports, and issues log comments and follow up.

END OF SECTION

Appendix C - LEED Certification

LEED Certification – The design-build team is required to achieve the project LEED Silver certification target in accordance with the requirements established in the LEED Rating System for LEED v.4. The goal in achieving LEED Silver certification is to deliver a facility that provides an excellent work and educational environment for students, employees and visitors, and also delivers long-term energy and water resource savings.

It is anticipated that the design-build team will utilize an integrative design process and sustainability best practices to develop a facility that achieves the Owner's project LEED goals. This will require early and collaborative goal setting, early energy modeling and water budgeting, and using updates to this modeling and other technical analyses throughout design, as well as an integrative analysis and process, to guide design decisions. LEED Silver should be achieved without reliance on SIUE policy for points.

Specific Design-Builder responsibilities shall include:

- Provide qualified LEED Coordinator during design and construction.
- Develop LEEDv4 scorecard that complies with Owners Project Requirements (OPR) document. Scorecard is to be developed as outcome of Goal Setting meeting. Scorecard is not accepted until reviewed and approved by Owner.
- Provide Plans, procedures and calculations, procure materials, and provide documentation necessary to develop the design to meet Owner Sustainability and LEED goals, and to obtain Prerequisites and credits required for LEED certification.
- Respond to questions and requests for additional information from Owner and project LEED Administrator, and the USGBC, regarding LEED Prerequisites and credits until the USGBC has made its determination on the project's LEED certification application. Respond in format acceptable to Owner, project LEED Administrator and USGBC.
- LEED Online Submittals: Upload project LEED documentation submittal data directly to USGBC "LEED Online" website.
- Completed LEED certification process. Work is not complete until Owner has accepted USGBC's final review of LEED certification, and LEED plaque is procured and installed.
- Include all costs associated with LEED review, and with purchase and installation of plaque upon project certification. Include Appeals should they be required to earn the LEED prerequisites and necessary credits.

Meetings:

- LEED Goal Setting meeting: Coordinate with Owner, LEED AP and CxA and Stakeholders as identified by Owner, to schedule, participate in, and document a LEED Goal Setting meeting within 14 days of award, and prior to further commitment of design direction, to set direction for design and ensure Owner goals are met.

- A LEED Scorecard with targeted credits to achieve project LEED goals will be produced from this meeting.

- Develop a LEED Action Plan to support the Scorecard that describes how each targeted credit will be achieved by the project's design and construction.

- LEED Progress meetings: Facilitate and document monthly LEED progress meetings, which will be conducted throughout design and construction to ensure progress in meeting LEED goals. For each meeting, provide updates to design and calculations, and documentation and reporting as appropriate by project phase.LEED Action Plan updates may be used to provide design phase updates.

- LEED Construction Kick-off meeting: Coordinate with Owner and LEED AP to schedule and conduct and document meeting prior to mobilization to the site. Review LEED requirements as outlined in the LEED scorecard and Action Plan. Review construction phase LEED Plans for compliance with LEED requirements.

- Attendees: Authorized representatives of Owner, LEED Administrator, Commissioning Authority, A&E, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend meetings. Participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.

Submittals:

- Basis of Design (BOD): Provide a BOD for review by the LEED consultant and Commissioning Authority that shows in detail how the requirements of the OPR are met in the design. The BOD content and format should follow requirements in the LEED Fundamental Commissioning at a minimum.

- Energy modeling iterations, site assessment, and water budgeting calculations.

  - Initial modeling and calculations must be undertaken as soon as possible and before commitment to design direction, to inform design decision-making and to provide evidence of compliance with the Integrative Design process. In this way, they will provide value in informing decision-making in the design process.

  - Provide iterations of modeling and calculations to support LEED Action Plan updates at each design milestone.

- Commissioning and LEED review of plans and specifications shall be undertaken in conjunction with the Owner project milestone reviews. Per LEED requirements, Cx reviews must be undertaken no less than the equivalent of mid-construction documents and in a back-check set with review comments addressed / incorporated. Provide complete drawings and specifications for these reviews.

- LEED Action Plan: Provide initial Plan for review as a product of the LEED Goal Setting Meeting. Refine and provide with each milestone design submittal. . Updates to Plan shall be provided monthly for the duration of the project.

  - Plan shall be electronic and accessible at all times for review of progress.

  - LEED Action Plan shall indicate how each targeted LEED credit and prerequisite will be met, including a listing of all required submittals and calculations, percentage complete, progress update notes, applicable product data for material selection, certifications for construction practices, procurement data, cumulative calculations, final calculations, information needed from Owner, and action items with name of individuals responsible.

- Construction phase LEED Plans will be required for specific LEED Prerequisites and credits. These Plans must be provided as project submittals.

- LEED Progress Reports: Throughout project duration, concurrent with each Application or Payment, or as directed by Owner, submit monthly reports in format as directed by Owner and project LEED Administrator, documenting compliance with approved LEED Action Plan, and comparing actual design and construction and procurement activities with LEED Action Plans, and to track progress across all targeted LEED Prerequisites and credits.

- Construction phase LEED product or material submittals are in addition to other technical submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as separate submittals to verify compliance with indicated LEED requirements.