

Draft Owner's Project Requirements

ASHRAE HEADQUARTERS

Atlanta, GA

Date: January 3, 2019

Approved By: 



Executive Summary:

The Draft Owner's Project Requirements (OPR) is a document that establishes ASHRAE's goals for the New ASHRAE Headquarters ahead of the selection of the Design and Construction Management Teams. It is a tool that will be used to help evaluate the selection of the teams to provide these services and their ability to meet the goals defined herein. The OPR is considered a "living" document during the design phase of the project, and as such is subject to change as the design progresses, although every effort possible has been put into the completion of this document in order to minimize future changes. By establishing the goals of the New ASHRAE Headquarters in a single document, the OPR becomes a record by which ASHRAE, and other parties involved in the project, can judge the degree of success in meeting the owner's defined objectives and criteria. In part, the success of the project will be tracked by the minimization of the need to change core tenets of this document.

An existing building will be renovated into the new ASHRAE Headquarters. The facility will have administrative offices, publication development areas, reference library and document archive, website and IT support, computer server room, shipping and receiving, a staging area for ASHRAE off-site activities, meeting, conference, and learning center. This document prioritizes a list of programmatic and performance goals from concept through construction and operation.

This document represents the Headquarters Technical Advisory Subcommittee's (HQ TASC) understanding of the project and was approved as a draft for review and comment by the Ad Hoc building committee and ASHRAE senior staff. The draft will be modified based on the results of the Integrated Design Process (IDP), client engagement and programming processes. as will form the framework for the design team to develop the Basis of Design (BOD) document throughout the Integrated Design Process.

This document may, however, require updating and minor modification upon the completion, by the design team, of the programming exercises with the owner.

Table of Contents

- 1. Introduction..... 4
- 2. Key Owner's Project Requirements..... 4
- 3. General Project Description..... 7
- 4. Objectives 8
- 5. Functional Uses..... 13
- 6. Occupancy Requirements 15
- 7. Budget Considerations and Limitations..... 16
- 8. Performance Criteria..... 17
- 9. Commissioning..... 30

1. Introduction

This Owner's Project Requirements (OPR) document has been developed to provide direction to the Design and Construction teams, through the IDP, from project programming through construction and final occupancy and even through the post occupancy warranty period.

The ultimately selected design and construction teams shall use this OPR as requirements as the BOD is developed and finalized for review by the owner and commissioning authority.

2. Key Owner's Project Requirements

2.1. Overview

Owner's Project Requirements (OPR) is a written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, owner's directives, and supporting information.

Owner's Project Requirements (OPR) is typically developed in the pre-design phase of a project. Information about the project is gathered from the users and supplements the designers programming efforts. The OPR forms the basis from which all design, construction, acceptance, and operation decisions are made. The OPR is often modified during the design process as the owner's objectives and criteria are refined. In this case the HQ TASC and Ad Hoc building committees have attempted to finalize, to the extent possible, this document in an effort to minimize changes in the future.

This document is designed to systematically and clearly communicate the expectations of the ASHRAE HQ Technical Advisory Subcommittee (HQ TASC) to the owner's representative, designers, contractors, and commissioning authority to help communicate the owner's goals and priorities of the project. Additionally, the OPR provides a mechanism by which designers can respond to and describe how they are meeting ASHRAE's requirements. As the design progresses additional information will be added to the OPR as needed until the development of the Basis of Design (BOD) and subsequent establishment of the project scope and final approved construction cost. The Commissioning Authority (CxA) will maintain the OPR through the design process for the owner and modify it as directed by HQ TASC through the Owner's Representative.

The information contained in the OPR supplements the pre-design programming data which is contained herein. Programming finalization is to be led by the design team through the IDP process, identifying additional owner objectives and criteria. Information provided by the designers is also captured and used to define the owner's objectives and criteria. Information received from the designers and IDP workshop participants is distilled down to the most salient concepts considered important by the owner to be documented and explicitly tracked through the project delivery process. Supplemental information used by designers such as siting facts, permitting details, history or policy issues do not become part of the OPR.

2.2. OPR Content

The Owner's Project Requirements are prepared using the following hierarchy:

- (a) Objectives and functional requirements of the facility
- (b) System and assembly requirements

Objectives and functional requirements expected to be in the final OPR once completed by the commissioning agent (CxA) include the following:

- (a) Project schedule and budget
- (b) Commissioning process scope and budget
- (c) Project documentation requirements, including the Systems Manual
- (d) Owner directives
- (e) Restrictions and limitations
- (f) User requirements
- (g) Occupancy requirements and schedules
- (h) Training requirements for Owner's personnel
- (i) Warranty requirements
- (j) Benchmarking requirements
- (k) Operation and maintenance criteria for the facility that reflect the Owner's expectations and capabilities and the realities of the facility type
- (l) Equipment and system maintainability expectations, including limitations of operating and maintenance personnel
- (m) Quality requirements of materials and construction
- (n) Allowable tolerance in facility system operations
- (o) Energy efficiency
- (p) Water and waste efficiency
- (q) Environmental sustainability goals
- (r) Community and wellness requirements
- (s) Resiliency and expansion
- (t) Systems integration requirements, especially across disciplines
- (u) Health, hygiene, and indoor environment requirements
- (v) Acoustical requirements
- (w) Vibration requirements
- (x) Seismic requirements
- (y) Accessibility requirements
- (z) Security requirements
- (aa) Aesthetics requirements
- (bb) Constructability requirements
- (cc) Communication requirements
- (dd) Applicable codes and standards

2.3. Developing the OPR

As decisions are made during the Design, Construction, Occupancy and Operations Phases, this OPR document is updated to reflect the current project requirements of the Owner. It is the primary tool for benchmarking success and quality at all phases of the project delivery and throughout the life of the facility.

The OPR is available to the project team as “supplemental information available to bidders.” The OPR is not considered to be a "Contract Document" to avoid the possibility of conflicting contract requirements.

During the Design Phase of the project delivery process, the Owner's Project Requirements are conveyed in the construction documents by the design team and verified by the CxA. As the design progresses, the assumptions made by the designers are documented in the designer's developed Basis of Design (BOD). The CxA provides a format for the designers to use in documenting their BOD. The BOD document conveys the designers' assumptions in developing a design solution that fulfills the OPR objectives and criteria. Narrative descriptions of facility systems and assemblies developed during schematic design are included in the Basis of Design and compared against the OPR objectives and criteria by CxA. Divisions between design and OPR are discussed and either the design or the OPR is revised based on guidance from the TASC.

2.4. Basis of Design

Basis of Design: A document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and specific assumptions made by the designers during design development phase. The BOD document is updated throughout the design and construction process by the Design Team, as is the OPR document, as design changes and change directives during construction may alter the means by which the OPR requirements are met.

The Basis of Design documents the assumptions made by the design team and the reasoning behind these assumptions for the design to meet the OPR. For example, a design team may have conducted a study of which type of glazing characteristics will be specified in the project. The study then becomes part of the Basis of Design and substantiates the OPR. For any criterion that could not be met, documentation detailing what was done, its impact on the Owner's Project Requirements, and how the Owner's Project Requirements was modified shall be included. The BOD includes, but is not limited to, the following:

- Specific codes, standards, and guidelines considered during design of the facility and designer interpretations of such requirements.
- Information regarding ambient conditions (climatic, geologic, structural, existing construction) used during design.

3. General Project Description

3.1. Description

The project involves the renovation of an existing 65,000 gross square foot 2-story (including partial basement) office at 180 Technology Parkway, Peachtree Corners, Georgia. The building is currently un-occupied.

The facility will have administrative offices, publication development areas, reference library and document archive, website and IT support, computer server room, shipping and receiving, a staging area for ASHRAE off-site activities, meeting rooms, conference areas, and learning center. As such, the facility must facilitate functions that accommodate a multitude of operations which require pertinent spaces including a minimum number of individual private offices, open plan work spaces, and shared spaces consisting of reception, storage and copier areas, small meeting and break areas, larger meeting areas, staging areas for publications and preparation for ASHRAE functions off-site, wellness center, and a functional shipping and receiving area. The facility will be designed to provide office space initially for a current total of 125 occupants. Provisions shall also be made for the expansion to a total occupancy of 140 over the next 10 to 15 years, although funds have not been budgeted for this potential expansion. The design principle of long life, loose fit shall be top of mind in the planning of the facility.

3.2. Project budget and schedule

Under the leadership of the PM, the cost estimate and project schedule will be managed, tabled, reviewed and updated continuously through the design process to guide design decisions and choices and to confirm adherence to the overall project scope and budget.

3.3. Restrictions and limitations

The move in date is fixed and shall not be exceeded.

The defined budget is fixed and shall not be exceeded.

3.4. Applicable codes and standards

The facility shall meet or exceed the following standards, guidelines and codes. In some cases, exceeding these standards will be defined elsewhere in this OPR.

ANSI/ASHRAE/IES Standard 90.1-2016

ANSI/ASHRAE 55-2017

ANSI/ASHRAE 62.1-2016

ASHRAE Standard 189.1-2017

ASHRAE Guideline 0-2013

ASHRAE Guideline 1-2017

Applicable Local, State, and National Building Codes

ASHRAE Thermal Guidelines for Data Processing Environments

ASHRAE Advanced Energy Design Guide for Zero Energy Office Buildings

4. Objectives

ASHRAE desires to make a statement with this renovation by exceeding the provisions of the Society's energy and indoor air quality standards. ASHRAE wants a building that will be restorative, livable, and resilient.

Features like water efficient plumbing and landscape, energy efficient HVAC and lighting systems, as well as the ability to harness on site energy production and be a "net zero building" are defined herein as project requirements.

ASHRAE's objective is to develop a high-quality headquarters building by applying sustainable development principles in a practical, well planned and cost-effective manner that will meet:

- The occupant's needs to fulfill their daily mission.
- Operation and maintenance needs, featuring an easily maintainable and secure facility that has low operations and maintenance costs.
- Excellent indoor environmental quality requirements that facilitate occupants' productivity by providing a comfortable environment, good HVAC system performance, good space utilization, good acoustical qualities, unified interior style and high durability of finishes. Design team should examine these areas with respect to possible inadequacies of the current space related to these items.
- A building which creates a work environment that enhances the general health, fitness, and wellbeing of the workforce. Some of its requirements are addressed in the building design, most are achieved in the policy and programs offered to the staff. It is recognized that there are health and wellness certification programs that may be used to substantiate this criteria.
- A building that is both resistant to disruptions from weather, utility outages and other causes as well as a building that can "bounce" back and be resilient. The level of service during extreme events should be defined ranging from no disruption of operations to the ability for the organization to function at some level during longer interruptions. These features will be integrated into the building envelope, HVAC systems, and through storage and renewable systems. While a generator may be used for life-safety, it is not considered part of the resistance and resilience.
- ASHRAE's desire to be sustainable. This may be substantiated through available certification programs such as LEED, Green Globes, Fitwell or WELL Building or Living Building Challenge.

The Objectives for the project are provided in two categories; mission critical and highly desirable. All mission critical goals are required for the project to be successful and are not listed in the order of priority. The highly desirable goals are listed in order of their priority with the direction that the design and construction teams utilize their collective ingenuity through the IDP process to meet as many of the highly desirable requirements as are feasible within the limits of the budget.

Mission Critical Requirements

- 1) Safety during construction and building operation
- 2) It is required that the project be designed and built to exhibit the best possible sustainable features affordable and appropriate to the budget and program. The Design and Construction team shall study and advise ASHRAE throughout the Design Process on the best possible benchmarking of the design against available popular certification programs and provide recommendations on the program(s) recommended for implementation, including impact on professional fees, project and construction cost, schedule and value.
- 3) Exceed the requirements of ASHRAE Standards 90.1-2016, 62.1-2016, 55-2017
- 4) Demonstrate office, meeting and conference and general space planning concepts and construction techniques are designed as recommended in the document "Sounds Matter", produced by GSA Public Building Service, December 2011. Office space shall also be designed to exceed, by 3 to 5 NC/RNC, the acoustic requirements listed in the latest ASHRAE HVAC Applications Handbook, chapter 48.
- 5) Net Zero Energy, Building EQ rating 100.

Highly Desirable Requirements (in ranked order)

- 1) Exceed the requirements of ASHRAE Standard 189.1-2017
- 2) A maximum energy consumption of building (excluding renewables) of 21.4 kBtu/SF/yr. Work with owner to limit maximum daytime plug load to 0.5 W/SF.
- 3) Director/Manager enclosed offices, maximize access to daylighting and views
- 4) Include a fitness center
- 5) Deliver Outside Air at a value of at least 1.3 times the requirements of Std. 62.1 OA to regularly occupied areas and use Demand Controlled Ventilation (DCV) for high occupancy spaces, such as conference and meeting rooms and training center, set at carbon dioxide limit of 400 ppm over ambient, providing a reduction in outside air delivery to these spaces during low or non-occupancy
- 6) Achieve Spatial Daylighting Autonomy (SDA) which assures the vast majority of occupants have a generous level of daylighting in their work space 55% of the time, This shall be done while maintaining glare to not be objectionable to occupants to the point of distraction.
- 7) Achieve Resilience at a level established by ASHRAE.
- 8) Include in the project a New Patio
- 9) Include in the project a New Lobby
- 10) Design the project to achieve a Plug Load < 0.4 w/sf
- 11) Design and construct the building to achieve a demand side EUI < 15 kBtu/SF/yr

4.1. Blower Door Testing

PM shall employ the services of a qualified Air Barrier Pressure Testing Agency (Blower Door Testing Agency) and Thermographer as specified in Unified Facilities Guide Specifications (UFGS) Section 07 05 23 - Pressure Testing an Air Barrier System for Air Tightness.

The agency will conduct pressure tests of the existing air barrier per UFGS Section 07 05 23. Results of the air barrier tests shall inform the design team of the building's existing infiltration rates. Additionally, results shall be used to identify building elements and/or areas that should be addressed in the building renovation and the building will be retested after remediation.

The design team shall use the results of the Blower Door testing and envelope remediation (if applicable) in the development of the building energy model and verification of the ultimate building EUI.

4.2. Equipment and system expectations, including limitations of operating and maintenance personnel

Design and construction of the building should be done to minimize maintenance requirements. HVAC systems shall be designed to contribute to overall building energy goals as defined in this document. The HVAC systems shall have low life cycle cost and be capable of providing excellent indoor environmental quality to facilitate occupant's productivity while minimizing maintenance requirements. The HVAC system will allow the reconfiguration of office spaces to meet changing needs of the organization without the need for extensive HVAC modification and maintain comfort associated with indoor environmental quality. The Technical Advisory Subcommittee recommends consideration of the following:

- HVAC systems shall be designed to provide required cooling and heating load meeting the varying load requirements while maximizing energy efficiency and IEQ and meeting or exceeding the code and standards requirements defined herein.
- HVAC systems shall be zoned to maximize comfort, economical after hours use and minimize cost of construction.
- Provide for humidity control 24/7 such that space relative humidity does not exceed 65% at any time.
- Ventilation to be a minimum level of 30% greater than ASHRAE Standard 62.1-2016.
- Provide intelligent controls that provide continual performance monitoring and "look only" web access to ASHRAE members. Occupant controls shall be simple and intuitive and operable directly by the occupants in the zone.
- All controls to be native BACnet.
- Individual occupant temperature control by the maximum number of zones which are economically feasible within the confines of the project budget. Favor system selection that maximizes thermal comfort and zoning.
- Implement best practices for server room HVAC, including waste heat recovery and expanded temperature ranges as identified in ASHRAE Thermal Guidelines for Data Processing Environments.

- Building occupancy schedule for HVAC systems will be easily modified by zone.
- The building will be functioning as a “Living Lab” to be used for educational purpose. In addition to requirements above, HVAC systems will also be designed with the following intentions:
 - Provide energy, demand, and environmental data from the HQ building through web interface accessible to ASHRAE members.
 - Where appropriate, consider making mechanical and electrical systems and components visible within the space as an educational feature.
 - Consider providing additional sensors and monitoring capability in several spaces (e.g. conference rooms) in the building so that they could support experimental work for ASHRAE Research, if it is determined that this feature can be achieved within the confines of the available project budget.

4.3. Energy efficiency and Sustainability goals

The building shall have a Building EQ score of 100 or zero energy as defined by the DOE Common Definition for Zero Energy Buildings.

The maximum demand side site EUI for the building shall be 21.4 kBtu/SF/yr consistent with the energy targets in the Advanced Energy Design Guide for Zero Energy Office Buildings. A secondary (or stretch) goal for the project shall achieve an EUI of less than 15.0 kBtu/SF/yr, not including site PV. Once the primary goal is met, this stretch goal shall be considered and included in the energy model for verification of its achievability.

The design team shall investigate opportunities for electrical utility partnering to improve operation of renewable energy systems to be more integrated with the utility daily and annual carbon emissions profile

4.4. Water and waste efficiency goals

Water efficiency goals should be enough to achieve 11 of 11 LEED Water Efficiency points

The site has existing landscaping and irrigation. While much of the landscaping is not in the scope of the project, a plan should be developed such that any landscaping changes shall not use any irrigation water after initial establishment. The Owner intends to shift the site landscaping to indigenous and adapted plant species in the future to minimize watering, fertilization, and pest management requirements.

Plumbing fixtures shall be selected for Best Available water efficiency. The Design team shall investigate opportunities for recovering water effluent from building systems for potential re-use for building non-potable end-uses. Effluent assets to be investigated, include HVAC condensate, stormwater run-off from the roof and wash-water. Non-potable end uses include cooling tower make-up, if applicable, toilet flushing and irrigation.

4.5. Resiliency and expansion

A resilient building is one that is both resistant to disruptions from weather, utility outages and other causes as well as having the ability to recover quickly and return to full operation after such disruptions. The Design Team shall facilitate a resiliency workshop with the client to establish goals for the resiliency of the building and its operations. The level of service during extreme events should be defined ranging from no disruption of operations to the ability for the organization to function at some level during longer interruptions. These features will be

evaluated for integration into the building envelope, HVAC systems, and through storage and renewable systems. While a generator may be used for life-safety, it is not considered part of the resistance and resilience.

Building Resiliency Design Objectives to be examined for feasibility shall include the following:

- Design team shall research and determine the effects of severe storms, potential flooding, wildfires and other impacts resulting from a warming climate. If impacts are significant, the building design shall include building elements to address these issues.
- Critical building systems shall be located to withstand flooding and extreme weather events.
- Climatic design conditions shall be based on future conditions (20 years) rather than utilizing past climatic design data.
- Building shall be capable of sustaining occupiable conditions in the event of an extended loss of power. (Acceptable low and high drift temperatures 45 - 90 °F (7 - 32 °C) Define number of hours and/or number of days
- Utilize durable building materials, windows capable of withstanding storm event winds predicted based on future conditions (20 years) and interior finish materials that can dry out in the event they become wet.
- Optimize use of on-site renewable energy systems.
- Recover and reuse water to the extent possible. Rainwater harvesting and condensate collection systems shall be considered. (Gravity fed if feasible. Optimize use of existing stormwater pond. Consider lake on generator powered pump.)
- Consider redundant water supplies or on-site water storage for use during emergencies. (Potable water: 3 liters per person per day, Non-potable water: 20 liters per person per day.)
- Reuse existing building materials to the extent possible.
- Utilize locally available building materials.
- Utilize building products and materials that do not off-gas or leach hazardous substances in the event of flooding or fire damage.
- Consider redundant electrical service.
- Utilize existing 350 kW emergency generator. (Is it sufficient to power entire facility? If not what systems should be on emergency power service?)
- Building design should include a storage room sufficiently sized for non-perishable food storage and water that could sustain occupants for 1 week. Design should provide for 3 liters of potable water per day and 20 liters of non-potable water per day.
- Incorporate a safe room in the building design.

The Design and Construction team shall study and advise ASHRAE throughout the Design Process on the best possible benchmarking of the design against available popular resiliency certification programs and provide recommendations on the program(s) recommended for implementation, including impact on professional fees, project and construction cost, schedule and value.

5. Functional Uses

5.1. Occupancy requirements and schedules

Mechanical systems shall function seamlessly to deliver the performance levels needed to maintain space comfort in excess of the requirements set forth in ASHRAE Standard 55-2017. A goal is to have the HVAC system deliver Outside Air at a value of at least 1.3 times the requirements of Std. 62.1 OA to regularly occupied areas and use Demand Controlled Ventilation (DCV) for high occupancy spaces, such as conference and meeting rooms and training center, set at carbon dioxide limit of 400 ppm over ambient, providing a reduction in outside air delivery to these spaces during low or non-occupancy periods. Humidity levels in the space must always be maintained less than 60% relative humidity during occupied hours and should never be allowed to reach a level over 65% RH or at a level that would allow condensate to form on HVAC equipment or other building elements.

Lighting controls shall be simple and intuitive. All areas should use vacancy sensors which require staff to engage with the lighting system to turn-on lights. Staff can also turn off lights or lights will turn off automatically when spaces are not occupied. HVAC occupancy can be triggered by occupancy or “time-of-day” controls with temporary user overrides. Occupants should be able to adjust temperatures within the comfort range.

The building security system shall be seamless with occupants requiring only a single access card to enter all gates and doors through which they have permission to travel. The use of BACnet native BAS system shall provide a turnkey solution to machine-to-machine communications and shall be capable of remote access/alarm notification.

5.2. Adaptability for future facility changes and expansion

The facility will be designed with provisions to accommodate additional staff members as directed by the owner and documented in the final Program.. Interior spaces should be designed to facilitate reconfiguration of office spaces to meet changing needs of the organization without further renovation work. Interior areas must have the required mechanical and electrical infrastructure to support expansion of business activities.

Future expansion will be based on use of modular design work stations. Electrical and mechanical infrastructure shall accommodate future reconfiguration without major changes.

5.3. Systems integration requirements, especially across disciplines

The overall facility shall be served by an electrical infrastructure (telephone/data electricity, intercom, etc.) that can meet the current and future requirements for common areas, conference rooms and office areas. For example, conference rooms used for A/V presentations shall include the ability to dim/turn off the lighting for presentations and a lighting mode to satisfy general occupancy requirements.

The electrical and mechanical systems shall be flexible and functional enough to accommodate the facility's future expansion growth and needs; the facility's mechanical and electrical systems shall be designed to permit the easy rearrangement of office space (including cubicles, partition

walls, desks, etc.) without adding or tearing down existing systems to accommodate the occupant's needs.

The design of the electrical system for the building shall divide into separate panels lighting, plug, HVAC, and process and provide sub-metering of utilities serving mechanical equipment, plug loads and the lighting system by functional area and floor. Monitoring shall also be compatible with the building automation system (BAS) to allow remote monitoring and data storage. This integration shall allow use of a web monitoring service to monitor key building systems, energy usage, preventative maintenance, schedule, and distribute necessary aspects of this information to staff, outside service providers, and (technical committee) TC members.

Metering shall be provided as follows at a minimum of a 15-minute interval:

Mandatory

- a. HVAC energy
- b. Lighting energy
- c. Plug Loads energy
- d. Whole Building energy
- e. Photovoltaics energy
- f. Domestic Hot Water energy

Desirable

- g. Domestic Water usage
- h. Cooling Tower water usage
- i. Irrigation Water usage
- j. Domestic Hot Water usage

Note: If an integrated space heating and domestic hot water system is used, these loads do not need to be disaggregated into separate heating and DHW end use categories.

6. Occupancy Requirements

6.1. Occupancy requirements and schedules

The facility is normally occupied from 7:30 am to 5:30 pm Monday-Friday. Intermittent occupancy of the building by volunteers working on weekends usually averages one weekend per month for two days (16 hours). Design of HVAC systems and controls will allow for manual override for periodic late-night occupancy.

The HVAC system will bring the occupied space to within occupied set point temperature range from 7:30 am to 5:30 pm Monday-Friday during non-holiday periods. The meeting spaces are intermittently occupied approximately one weekend a month. Occupancy of the building includes 124 employees assigned to functional areas divided into five departments and one executive branch. Requirements for each department and executive branch can be found in the owner's directives section of this OPR.

6.2. Indoor environment requirements

Creation of good indoor environmental quality requires the coordination of many design parameters and construction activities, including acoustical quality, ventilation rates, materials used to construct the facility, installation sequence, location of makeup air intakes, external and internal pollutant generation, humidity, temperature, and other parameters that may affect occupant comfort.

The following are the known activities that generate pollutants in or near the facility that impact the health, hygiene, and indoor environment of occupants:

Specifically:

- Whenever possible, non-toxic caulks, paints, adhesives, sealants and cleaning products shall be used. Ideally, materials with no VOCs will be used. Exceptions must be preapproved and shall not compromise chosen certification paths. Design teams are encouraged to find solutions that would not be classified as exceptions.
- Smoking, vaping, or the use of smokeless tobacco will be prohibited on the property including during construction.
- Procedures during construction shall be implemented by the contractors to minimize construction-related contaminants in the building. These procedures include activities such as control of moisture, regular space-cleaning activities, and protection of delivered equipment and materials before and after material/equipment installation, start-up of HVAC systems.
- Building materials should be stored in a weather-tight, clean area prior to unpacking for installation.
- Accumulation of water during construction should be avoided and any porous construction materials such as insulation should be protected from moisture.
- Dust in the construction area shall be suppressed with wetting agents or sweeping compounds. Dust shall be cleaned regularly using a damp rag, wet mop, or vacuum equipped with a high efficiency filter or wet scrubber
- The facility shall be positively pressurized. Outside air intakes shall not be accessible from grade.

- Outside Air Intakes shall be located at a minimum as defined in ASHRAE Std. 62.1 and with sufficient separation so that recirculation of pollutants emitted from toilet exhausts, kitchen hoods, flue gas, and any other harmful or noxious emission are not mixed with outside air entering the HVAC system.

6.3. Health and Wellness

The building will create a work environment that enhances the general health, fitness, and wellbeing of the workforce. Some of its requirements are addressed in the building design, most are achieved in the policy and programs offered to the staff. A fitness center space should be included, although the equipment may not be in the scope of this project. Fitness equipment, if specified, should be of the type that is self-powered or provides energy to the building rather than being an energy consumer. Showers should be provided as well as bike racks. Connections to walking paths can be included as budget allowance as landscaping is not part of the scope of this effort. Stair wells should be inviting such that they are frequently used.

It is recognized that there are certification programs that may be used to substantiate these criteria.

The Design and Construction team shall study and advise ASHRAE throughout the Design Process on the best possible benchmarking of the design against available popular Health and Wellness certification programs and provide recommendations on the program(s) recommended for implementation, including impact on professional fees, project and construction cost, schedule and value.

7. Budget Considerations and Limitations

7.1. Project schedule and budget

The project completion date, including move-in is not extendable due to contractual agreements on the current ASHRAE headquarters building.

The design team and contractor shall prioritize based on the prioritized object list in Section 4. Identify strategies that meet multiple objectives in order to meet budgetary limitations. An overlying theme is to meet the EUI target within the fixed budget provided. To do this, analysis must be completed to allocate budgets to maximize their value for energy savings and architectural appeal, while meeting the programmatic requirements. Design teams should bring innovation to the effort to show that zero energy ready EUI targets are achievable at market rates such that ASHRAE can show leadership in moving the market towards low-energy buildings.

The renewable energy aspects of the building may be financed through third parties, base renovation budget, or other innovative financing strategies. The cost of renewable energy has made it economically feasible with a wide-range of strategies. Note that additional renewable energy is not an alternative trade-off to increased EUIs. The design team shall investigate any utility incentive programs that might subsidize acquisition of more energy efficiency or equipment that might reduce the facility peak electrical demand.

8. Performance Criteria

8.1. General

8.1.1. Quality requirements for materials and construction

In order to achieve the objectives for low maintenance and operating costs, ASHRAE has determined that the building exterior should minimize and resist long term degradation from nature. Construction materials selected for the project should be based on long term serviceability, environmental and sustainability goals

8.1.2. System integration requirements, especially across disciplines

The design and construction teams are encouraged to function through the Integrated Design Process. The outcome can be increased in value through optimization, something the traditional project delivery approach cannot provide. Integrative design is distinguished from conventional design by establishing a highly collaborative multidisciplinary team at the project's inception and empowering this team to understand and develop all aspects of the building towards accomplishing the common project goals

8.1.3. Acoustical requirements

Soundproofing and acoustical treatment should be implemented in the design and construction of all private offices to prevent sound transmission to adjacent corridors, offices, and other space. Spaces shall be planned, configured and designed for compliance with the requirements of GSA-P100, as detailed in the document GSA Sound Matters (Dec. 2011).

8.1.4. Vibration requirements

Prevent occupants adjacent to HVAC equipment and corridors from sensing vibrations from structural deflection as a result of occupant traffic, and equipment operation. Vibration isolation for all rotating equipment shall be selected for 95% vibration elimination.

8.1.5. Seismic requirements

Comply with local code requirements.

8.1.6. Accessibility requirements

The building shall be evaluated as to the implications of meeting all Federal, State and Local ADA requirements. An ADA Assessment Report by Nova, Dated October 31, 2018 on the existing building is available for information. The design team shall review the report and provides recommendations on items to be upgraded as appropriate to the budget and needs of the client.

Systems requiring routine maintenance, such as HVAC, shall be designed to provide adequate access and clearance for all maintenance tasks (i.e.: AHU filter access, sufficient space to pull coils, light bulbs, etc.)

8.1.7. Security requirements

Security system shall be capable of being tailored to allow individual users unique access profiles. Security and surveillance provisions at all building entrances and exits will allow approved visitors and employees access to building 24/7. CCTV monitoring system will be provided at the main entrance into the main lobby, at the east entrance to the training center and

around the building's exterior. The security system shall keep an access log which records profiles of people entering the building, the time of entrance and exit.

8.1.8. Aesthetics requirements

Private and open offices shall maintain the same interior design attributes as the rest of the building. A goal has been established of maintaining a uniform look throughout the interior of the building. Façade lighting shall follow How-To tips contained in Sections EL-18 to EL-24 in the Energy Advanced Energy Design Guide for Zero Energy Offices.

8.1.9. Constructability requirements

The Construction Manager shall conduct a constructability review of the design at the completion of Design Development and 90% completion point of the Construction Documents to assure the design can be constructed for the owner's budget and within the required timeframe. Participants at these reviews should include the design team and project manager.

8.1.10. Communication requirements

The building shall be served by a modern phone system and computer network, which could be VOIP. This system is part of the plug loads of the building and must be accounted for in the energy model. All offices, workstations, and conference rooms shall have the capability for a least two (2) telecommunications ports (network and telephone). Conference rooms, corridors, and public spaces shall be configured to accommodate the installation of wireless access points to support both staff and volunteers access to the network and the Internet.

Access to a wireless network shall be possible within all spaces in the building excluding areas known to be problematic to RF communications. Wireless networks shall be maintained to allow secure network access separate from public internet access. The Learning Center occupants shall have wireless network access separate from the network used by ASHRAE staff. Additional information is required from ASHRAE and will be added upon receipt of input.

The building shall be equipped with a public address (PA) system.

The use of BACnet native BAS system shall provide a turnkey solution to machine-to-machine communications and shall be capable of remote access/alarm notification.

Note that all these items should be configured to have low-power modes or off modes when the building is not occupied.

8.2. Economic

8.2.1. Benchmarking goals

The Design and Construction team shall study and advise ASHRAE throughout the Design Process on the best possible benchmarking of the design against available popular certification programs and provide recommendations on the program(s) recommended for implementation, including impact on professional fees, project and construction cost, schedule and value.

8.2.2. Energy efficiency goals

The facility will be designed to comply with the energy efficiency requirements prescribed in section 4, paragraph 4.3 Energy Efficiency and Sustainability Goals.

8.3. User Requirements

ASHRAE staff will conduct normal administrative activities within this facility. The renovated facility is divided into five departments (Technology, Member Services, Administrative Services, Publishing & Education, and Marketing) and one executive branch. The facility's design will feature an open floor plan with few interior walls to promote daylighting and views to the outside; closed meeting or huddle spaces will be near to the building's core. Spaces shall be designed to promote good office circulation so that each department can easily interface with other departments. The facility will feature a defined entrance and reception area with protection from elements adjacent to visitor parking. Confirmation of programming and staff numbers will be required at the outset of the design phase through a series of workshops with the client. For conceptual purposes, the staff population can be considered 125 persons.

Furthermore, ASHRAE desires the facility to function as a "Living Lab" that will be used by members to help advance the arts and science of HVAC & R. Space shall be designed and renovated with this intention. For example, equip building to support its use as a "Living Lab" including provisions for a building automation system, additional wiring and sensors in selected spaces, electronic data storage and manipulation capability, web access, and a meteorological monitoring station. Sensing and data acquisition system/equipment will have capabilities to provide sufficient data that are useful for a broad range of HVAC & R research and development on buildings, the building environment, building systems, subsystems, equipment, and controls. The facility shall display the performance of the building, and showcase mechanical features of the building if it does not negatively impact the environmental quality or add to maintenance costs. This display shall consist of two or more dashboards mounted in the main lobby and the training center to display system operation and energy consumption. Some examples of the desired monitoring data include but are not limited to:

- Energy use and electric power demand of the whole facility including major systems, subsystems, and individual system components/equipment segregated by energy type
- Conditions such as on/off status, operation mode, temperature, humidity, pressure, and flow rate at numerous points in various systems and equipment
- Indoor environmental conditions such as air temperature, humidity, CO₂ concentration, concentration of other air pollutants, air flow rates, lighting levels, and daylight availability
- Water consumption by the whole building and targeted end uses such as cooling tower water make-up and irrigation water
- Outdoor conditions including weather, total and diffuse solar radiation, and air quality
- Occupant satisfaction information and feedback on features will be established in a post occupancy survey to aid in the fine-tuning process.

Some of the data will require monitoring in near real time and at relatively short time intervals (approximately 1 minute in some cases). The data acquisition system will have the capability to effectively manage the data collected from the building with minimum active human involvement (labor). This criterion will include the storing of collected data in a suitable database with adequate secure backups and provide access to all ASHRAE members and performers of ASHRAE research via the Internet and World Wide Web (this will include the

demonstration and monitoring of selected performances variables on an on-site display for viewing by ASHRAE staff and visitors via world wide web). In addition, the facility will be designed to accommodate a dedicated “research” space suitable for a wide range of “real-world” investigations of interest to ASHRAE Technical Committees and other organizations working on ASHRAE research with minimum design alterations.

8.3.1. The general requirements for the ASHRAE Headquarters include:

- Lighting and Daylighting: Daylighting shall be provided via the existing or replaced window system, a case for revised window to wall ratios or reconfigured fenestration can be pursued to improve daylighting. Efficient electric lighting shall be designed to provide the required level of lighting for occupants’ use on cloudy days, night time, or when natural lighting is not sufficient. Designers should follow, as a minimum, the lighting and daylighting recommendations from the Advanced Energy Design Guide for Zero Energy Offices (90% draft or later).
- Lighting should be based on the tasks that will be performed in each space of the facility. Task based design for meeting/conference rooms would include modes to support the room’s use for A/V presentations including the ability to dim/turn off the lighting around a projector screen for presentations; a lighting mode to satisfy general occupancy requirements; a lighting mode to provide adequate lighting for classroom type tasks, and a lighting mode providing minimum illumination for egress purposes. In the event of a power failure, this lighting system shall provide required illumination for egress purposes.
- Electrical infrastructure shall be capable of meeting requirements necessary for business activities. The electrical system for the building shall allow separately sub-metering of utilities serving mechanical equipment, lighting systems, and plug loads. The electrical branch circuits in panelboards serving each load category noted above shall be grouped so that the monitoring of the energy usage for these loads can be accomplished. In addition, photovoltaic power generation and use (both on site and sent to the utility grid) shall be monitored. Monitoring shall also be compatible with the BAS to allow remote monitoring.
- Bathroom capacity with better odor removal shall be provided in the design of ASHRAE Headquarters design. Restrooms shall be sized to meet the needs of the renovated facility and the new Learning Center. Restrooms will be conveniently located for easy access by building occupants. Toilet exhaust systems will be designed for superior odor control and removal.
- Dedicated shipping and receiving areas will be of sufficient size such that goods awaiting shipment can be stored therein, without overflow into corridors serving the receiving area.
- The staging area within shipping and receiving shall accommodate 18 large crates of materials allowing compiling, checking for readiness, easy conveyance to vehicles, and unloading upon return.
- Storage areas shall be designed with sufficient space so that materials stored therein, including files, forms and other such items, may be easily

accessed and organized at a central location within the room. Storage rooms should be adequately provided to accommodate departments' uses. The total area to be provided for file and other storage shall be determined and verified via the programming exercise with the owner.

- The first floor of the facility will have a centralized break area that will be designed to accommodate refrigerator, microwave, sink, vending machines, coffee counter, tables and chairs, for programmed room capacity etc. Break area will also be spacious enough to provide comfortable seating for staff members during lunch or break time. Break areas will be adequately ventilated to prevent odors from drifting to adjacent space. All equipment shall be considered within the EUI budgets.
- Conference/meeting rooms shall be designed with wall surfaces suitable for tacking or other display of flip chart-type sheets; flat screen monitors will be installed in each conference/meeting/training room. Each dedicated conference/meeting room shall be designed to include one in-room telephone outlet, simultaneous Internet connectivity via a wireless network separate from the network being utilized by ASHRAE employees and adequate electrical outlets throughout the room to allow occupants to plug in individual laptops. The lighting system shall be designed to incorporate the conference lighting requirements specified above.
- The new entrance/vestibule area will be designed with sufficient space (at least 10 feet in length) to minimize the simultaneous opening of the front door and the vestibule door opening into the building.

8.3.2. Private Offices are where ASHRAE personnel of director grade and higher will operate. Each department will include a private office for the Department Director. The general requirements for Private Offices include:

- Lighting: Lighting shall be provided to levels adequate to perform typical office tasks. A lighting consultant should be enlisted to provide advice that will allow designers to deliver the correct lumen levels needed while using the least amount of electrical power possible with a goal to reduce lighting power density 25% below ASHRAE 90.1-2016 requirements. Private offices as well as other daylighted spaces shall have manual ON and automatic Off occupancy sensors.
- Electrical systems shall be capable of meeting requirements necessary for business activities. Additional information is required from ASHRAE and will be added upon receipt of input.
- Private offices for senior staff will be near the interior of the building. High quality furnishings that are ergonomically designed will be considered for use in private offices. Recognizing that enhanced user comfort is a large contributor to user productivity shall be considered when evaluating initial cost.

8.3.3. Open Offices (workstations) are where ASHRAE staff will perform general operational tasks. The general requirements for Open Offices include:

- Existing workstations shall be reviewed by the design team and verified adequate for relocation to and use in the renovated building assessing construction, partition height and the effect on daylighting goal, optimum configuration and areas for various types of employees.
- Lighting: Lighting shall be provided to levels adequate to perform typical office tasks. A lighting consultant should be enlisted to provide advice that will allow designers to deliver the correct lumen levels needed while using the least amount of electrical power possible with a goal to reduce lighting power density 35% below ASHRAE 90.1-2016 requirements. Lighting for open work plan areas and storage areas shall be implemented using a flexible wiring system to simplify future redistribution or reorganization of lighting fixtures due to workspace rearrangements. Electric lighting shall be continuously dimmed rather than switched to respond to daylight variations in order to avoid occupant distractions.
- Electrical systems shall be capable of meeting requirements necessary for business activities. Additional information is required from ASHRAE and will be added upon receipt of input.
- Glass shall be used extensively to create interior partitions.
- All new required workstations shall be modular workstations with task lighting and simple reconfiguration of stations.
- Provisions shall be made for adding noise masking equipment later, if needed.

8.3.4. Executive:

This area will include the private offices of the Executive Vice President, and Executive Assistant/s to the BOD offices. Executive office shall be designed to include all requirements for private offices specified above. A coffee bar in staff area is required to serve executive staff and visitors on the 1st floor. Executive branch will have easy access to the Conference and Learning Center.

8.3.5. Technology:

The Technology Department will include the Standards and Research & Technical Services section. This department requires additional meeting space for multiple meetings held in parallel, 1 walk-up workstation, and a temporary workspace for visiting members with web access. The Director's Office as well as meeting rooms and workstations shall be designed to include all requirements specified above.

8.3.6. Member Services:

This department will include various sections including Region Activities, Membership Development, Chapter Programs, etc.. Director's office shall be designed to include all requirements for private office specified above.

Adequate space shall be designed in the assembly/packaging area for mailing and documents.

8.3.7. Administrative Services:

This department will include the Human Resources, Accounting, etc.. The location selected for Human Resources section shall be a private and centrally located space with provisions for both acoustic and visual privacy. Adequate storage rooms will be provided for the shipping/receiving area. Computer room shall be designed to be a fully enclosed space (floor to deck) for better humidity control and fire protection. Director's office shall be designed to include all requirements for private office specified above.

8.3.8. Publishing & Education:

This department includes Publishing Services, Advertising Sales, etc.. The spatial design for the department includes 2-3 workstations and team huddle areas. Additional space will be provided for the library; the library will be designed to provide easy access to members. Director's office shall be designed with requirements specified for private office mentioned above.

8.3.9. Marketing:

- This department includes Marketing, Public Relations, etc.. The director's office shall be designed to include all requirements for private office specified above.

8.3.10. Requirements for the Conference and Learning Center:

The design of the facility shall provide space provisions and allowances for the Learning Center to be built adjacent to the building's main entrance. The Learning Center will serve as a meeting place for large assemblies. The general requirements for the Learning Center include:

- Lighting: The Conference and Learning center shall have a controllable level of lighting (dimmable from a maximum 30-50 foot candles at tabletop). The Conference and Learning Center shall have lighting controls that include modes supporting the room's use for A/V presentations, including the ability to dim/turn off the lighting around a projector screen for presentations; a lighting mode to satisfy general occupancy requirements; a lighting mode to provide adequate lighting for classroom type tasks, and a lighting mode providing minimum illumination for egress purposes. In the event of a power failure, this lighting system shall provide illumination for egress purposes. The design of A/V systems should be performed by a professional A/V consultant to ensure ASHRAE receives A/V systems that are state of the art. The Conference and Learning Center shall have unobstructed interior views for projection capability, flip charts, microphones, image and video display equipment. This center will offer and promote a package plan that includes computer and video-image display equipment in the main meeting room. The Learning Center and all meeting rooms will have access to Wi-Fi and ASHRAE network server.

- HVAC systems should be zoned to allow comfortable indoor air quality while maximizing energy efficiency. Dedicated learning rooms shall have individual temperature control. The HVAC system shall have smart controls allowing the Conference and Learning Center to be controlled as a single space when all partitions are opened, and separate spaces when partitions are closed creating multiple rooms (learning rooms).
- The Conference and Learning Center design will include sufficient inventory so that no less than 60% of all meeting space can be set up using:
- Ergonomically designed chairs having minimum width of 18 inches; a depth of 16-17 inches for chairs with non-adjustable seat pans; and seat height within range of 15½ to 20½ inches.
- Tables with at least 24 inches wide and that have non-reflective, hard writing surface with a high pressure laminate or hardwood veneer finish; tables shall be of sufficient length to allow at least 30 inches of space per occupant.
- The conference center shall have separate utility sub-metering with reporting and trending capabilities at the building automation system.

8.4. Construction Process

8.4.1. Training requirements for Owner's personnel

Operator training and users' project documents are required for O&M staff to properly maintain the facility. These documents include: the O&M manual, as-built drawings, and a Systems Manual. Documentation will be tailored to the specific components that are installed. The requirements for ASHRAE Headquarters Renovation documentation are as follow:

- The O&M manual should provide the information needed to understand, operate, and maintain the system and/or assemblies and to inform those not involved in the design and construction process about the systems and assemblies. This information shall be included in printed documents as well as embedded in the final 3D CAD drawings for ease of access by operations and other personnel.
- Record drawings should provide accurate information in an understandable drawing technique which future contractors can easily read and understand to perform construction tasks. Maintain and submit one set of Contract Drawings and as-built drawings. If modifications are made, mark the as-built drawings to show the actual installation when installation varies from that shown on the Contract Drawings. Include a cross reference on the Contract Drawings to identify that a modification has occurred. Identify and date each record drawing. Record and check markups before enclosing concealed installations. Contractor shall maintain a continuously updated set of as-built drawings on site for

review by CxA during construction. The Contractor will mark-up record set and scan approved marked-up drawings in PDF format. Submit one set of approved contract drawing in DXF format to be used by the technical committee (TC) in handbook figures or for the next renovation.

- The Systems Manual will be the repository of information on updates and corrections to systems and assemblies as they occur during the Occupancy and Operations Phases. The Systems Manual expands the scope of the traditional operating and maintenance documentation to include the additional information gathered during the Commissioning Process and to provide a systems-based organization of information.
- Outside service providers will provide preventative maintenance and necessary repairs. Maintenance supervision will be performed by ASHRAE staff and will require select ASHRAE staff to receive detailed training on the building HVAC systems. The Training provided to the ASHRAE staff will educate staff on identified systems and assemblies to be installed in the facility. Training will include the education of multiple members of staff in the proper use of the monitoring system. One member of ASHRAE staff will be responsible for maintaining and updating the building documentation package for easy online reference.
- Training shall include an overview of system components and descriptions, equipment locations and functions, safety provisions and concerns, normal operating and energy conservation techniques, BAS, etc. Training shall also include a review of the written O&M instructions, discussion of relevant health and safety issues or concerns, discussion of warranties and guarantees, discussion of common troubleshooting problems and solutions, etc. Training shall normally start with orienting facility operations and information technology staff with the facilities infrastructure including location of data ports in the ceilings, valves, and equipment during construction. Classroom sessions for operators followed by hands-on training for each piece of equipment will occur immediately after start-up of the specific equipment. Classroom sessions may include the use of overhead projection, slides, and training videos from equipment manufacturers as might be appropriate. Hands-on training shall include start-up, operation in all possible modes, (including manual, shut-down and any emergency procedures) and preventative maintenance for all pieces of equipment. Training is a progressive on-going process which will occur during construction, after substantial completion, and prior to final completion. A final training exercise will be conducted on-site after occupancy phase.
- The intent of training is to clearly and completely instruct the Owner's Personnel on all capabilities of the control systems, electrical systems, and mechanical systems. It is not typically expected that the trainees will have memorized everything from the training session but that they know where the information is, can find it, and understand sufficiently how to

walk through the key steps to troubleshoot a problem and resolve it. Training will be witnessed and documented by the commissioning authority; the contractors will develop and execute the training program. All persons performing tasks related to building operations and maintenance shall receive at least 24 hours of training related to building systems. Staff training shall be videotaped and electronic files provided to ASHRAE for future use in staff training.

8.5. Operations

8.5.1. Training requirements for Owner's personnel

Provide to Owner after all equipment is in operation and at an agreeable time, instructions for the purpose of training Owner's personnel in all phases of operation and maintenance of equipment and systems.

Training sessions when given to the owner's personnel shall be videotaped for future owner reference. Turn one copy over to the owner upon completion.

8.5.2. Warranty requirements

General equipment and assembly warranty periods provided by manufacturers for building materials and systems are for a period of one year after substantial completion. However, some specific systems have longer warranty periods. Substantial completion is defined according to Section 9.8 of AIA document A201-1997. A representative list of assembly and equipment typically featuring a longer than one-year manufacturer's warranty is listed below:

- Roofing: 20 years for Leakage and Weather
- Windows: 10 years for trim and glass
- Sealants: 2 years
- HVAC Compressors: 5 years parts and labor
- Water Heaters: 5 years
- Elevator: 5 years

8.5.3. Operations and Maintenance requirements will be established by the current ASHRAE Headquarters staff that will monitor the building systems and determine what corrective action is required. ASHRAE Technical Committee 7.3 will be encouraged to participate in establishing operation and maintenance guidelines that will form the requirements and provide best management practices for establishing preventative maintenance strategies. The current staff will monitor the preventative maintenance and repairs will be performed by outside contractors.

- To ensure that maintenance can be easily performed, and the facility's business will not be compromised because of deconstruction due to maintenance, the maintenance criteria shall be adhered as follows:

- Designers are to ensure sufficient access and clearances are provided by the design to perform routine maintenance tasks.
- Contractors shall coordinate the installation of building materials and components so as to allow sufficient space for maintenance and service without limited range of motion in the space which would require deconstruction to provide required service space.
- System manual shall include any changes made to components and systems after substantial completion and shall include the final set points established through the commissioning process.
- Outside maintenance contractors will have between 10 and 25 years of experience and it is assumed they are conversant in basic maintenance techniques and are computer proficient.

It is ASHRAE's preference that the Mechanical Contractor selected for construction will also provide maintenance & service for the first three years after occupancy.

- 8.5.4.** Equipment and system maintainability expectations, including limitations of operating and maintenance personnel;

Maintenance and replacement costs must be considered over the life of the facility and selection of materials will be based on minimizing life cycle costs. Design of mechanical, electrical, and plumbing systems shall allow required maintenance and replacements of key system components to be performed without deconstruction. All systems and their components shall be easily accessible for adjustments to the respective system components. Access to the building exterior shall be provided that allows easy maintenance, repair, and replacement of the building exterior including windows, gutters, and sealants.

- 8.5.5.** Allowable tolerance in facility system operation;

Occupancy sensors shall be installed in office areas, conference rooms, and other public areas to efficiently control lighting usage in accordance with demand.

The ASHRAE Headquarters Renovation will be designed, constructed and operated in an energy efficient and environmentally sustainable manner that will provide both valuable information to the various technical committees as well as an example for others to follow. The renovated facility shall be designed and constructed to achieve:

- Deliver Outside Air at a value of at least 1.3 times the requirements of Std. 62.1 OA to regularly occupied areas and use Demand Controlled Ventilation (DCV) for high occupancy spaces, such as conference and meeting rooms and training center, set at carbon dioxide limit of 400 ppm over ambient, providing a reduction in outside air delivery to these spaces during low or non occupancy

- Provide capability for Indoor Environmental Quality (IEQ) monitoring that includes air temperature, humidity, CO₂ concentration, air pollutants concentration (VOC), air-flow rates, ambient noise level, lighting levels, and daylighting availability in sufficient granularity to represent the general office & conference space on the first and second floors.

8.6. Systems

Building systems and equipment requirements are left to the design team in order that they may provide the most efficient building possible in order to meet the energy and other goals defined herein.

8.6.1. Quality requirements for materials and construction

The renovated facility shall be designed to serve and endure for at least 50 years; thus, selection of materials should be based on the ability to provide years of service with minimum maintenance and withstand weather conditions typical in this region.

- The building envelope will be tightened to conform with minimum requirements allowed by ASHRAE Standard 90.1-2016, Section 5.4.3 Air Leakage
- The fenestration and solar transmission shall be controlled and designed in accordance with ASHRAE Standard 90.1-2016 through glazing selection and external shading.
- Designers should consider the utilization of high-performance glazing to minimize solar heat gain and maximizes visible light transmittance for daylighting (e.g. PPG Solarban 70 XL) in the new front entrance/vestibule area; the new glass panel will need to match the existing glass tint. Glass-framing for the fenestration system shall be highly thermally broken, to maintain the thermal integrity of the assembly.
- The existing roofing structure shall be improved to minimize the heat island effect (thermal gradient differences between developed and undeveloped areas); roofing structure shall be bridged to support the installment of photovoltaic (PV) array.
- Interior finish shall be highly durable low volatile organic compound emitting materials and require no more than 3 replacements over 75 years. Heavy traffic areas will be designed to have resilient carpet tiles. Easily maintained and low maintenance materials with 25 years life cycle cost will be used for wall and floor coverings.
- The Design Team should address moisture intrusion and impacts of occasional snow/ice and freeze/thaw conditions that have occurred in this region.
- Mechanical systems shall be designed with required serviceable life as specified in the most current ASHRAE Handbook HVAC Applications,

(Chapter 37 – Owning and Operating Costs, Chapter 36 Energy Use and Management and Chapter 41 Building Energy Monitoring).

- HVAC components such as coils and compressors shall be designed to have 20 years serviceable life. The piping and plumbing infrastructure shall be designed to have a serviceable life of 35 years. Lighting systems shall be designed to have 20 years serviceable life. Electrical systems shall be designed to be designed with a serviceable life of between 35 to 50 years. Electrical systems will allow the replacement of electrical switch and panel boards, conductors and other electrical products as advancements in technology become available.

9. Commissioning

Commissioning shall be performed and completed in accordance with ASHRAE Guideline 0 - 2013 The Commissioning Process and Guideline 1.1-2007 HVAC & R Technical Requirements for the Commissioning Process by an Independent Commissioning Authority hired on behalf of ASHRAE directly by the PM.

The Commissioning Authority (CxA) will assist ASHRAE with fine tuning the Owner's Project Requirements by helping clarify ASHRAE's objectives and criteria including: goals and functional requirements, expectations of how the building will be used and operated, sustainability/LEED goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information. The Owner's Project Requirements (OPR) forms the basis from which all design, construction, acceptance, and operational performance evaluations are made.

9.1. Design Phase

Design phase commissioning will review the mechanical and electrical system designs for compliance with the OPR. The commissioning authority will provide:

- Design phase commissioning report
- Commissioning plan
- Commissioning specifications to the designers incorporating commissioning and operator training requirements into the project
- Specific design and construction checklists to be used by the design and construction team during the delivery of the project
- Specific functional testing procedures for testing commissioned systems to verify system performance and functionality in accordance with contract documents.

9.2. General

Review of the drawings and specifications will concentrate on verifying that the designers have met the owner's project requirements as defined in this document.

9.3. Mechanical Design Phase Commissioning

The review of the mechanical drawings and specifications will concentrate on design, efficiency, humidity and odor control, safety, and the ability to provide occupant comfort. The commissioning team will assess the ability of the HVAC system to control airflow (and thus pollutants) throughout the building. Evaluations shall be made on equipment sizing and selection, placement of fresh air inlets, filtration, adequacy of the make-up air system to pressurize the building envelopes and their interstitial spaces, balance between make-up air and building exhaust—both internally and externally, environmental and energy management controls, equipment layout, and start-up procedures.

9.4. Electrical Design Phase Commissioning

The review of electrical drawings and specifications will concentrate on adequacy and distribution of electrical power, lighting efficiency, illumination levels, and compliance with life safety requirements. The commissioning team will review panel schedules and single-line drawings, interior and exterior lighting layouts, and electrical life safety drawings.

9.5. Plumbing Design Phase Commissioning

The review of plumbing system drawings and specifications will concentrate on the design of potable water systems, along with any systems for harvesting non-potable water effluents for re-use. The commissioning team will review fixture selection, pumps and boiler/heater sizing.

9.6. Construction Phase Commissioning

The commissioning authority will develop construction checklists and performance testing procedures to be used by the contractors to determine acceptance of the contractor’s work. The following systems will be commissioned:

Table 6: Commissioning Scope

Systems to be commissioned during Construction Phase

Building Envelope		Plumbing System	
1. Blower door testing post construction		1. Fixture replacement (if appropriate)	
2. Automated shading controls		2. Service water heating (if appropriate)	
		3. Fire Sprinkler & alarm	
HVAC System		Electrical	
1. Air Conditioning systems	8. DOAS Radiant Panel	1. Exterior lighting control	8. GFRCI type receptacles
2. Heating systems	9. Fire and smoke dampers	2. Interior lighting control	9. Elevator
3. Air distribution systems	10. Testing, adjusting, and balancing work	3. Path of egress lighting	10. PV array and control system (potential)
4. General exhaust systems	11. Indoor air quality	4. Occupancy sensors for lighting control	11. Security/CCTV
5. Building automation system, associated hardware, meters, and interfaces		5. Multi-level switching	12. Intercom
6. Make-up air systems		6. Electrical metering system	
Variable frequency drives		7. Electrical fixtures/devices/ installation in hazardous locations	
7. Air handlers			

The commissioning authority will facilitate the following tasks:

- Review final operation & maintenance (O&M) manuals prior to turn-over to owner for completeness and as required for system training.
- Facilitate training sessions by coordinating a schedule with the construction team for conducting training in accordance with the training requirements.
- Prepare an Executive Summary of the results of the commissioning program and training session, as well as written documentation verifying that equipment testing is complete and equipment is operating as intended.

9.7. Warranty Phase Commissioning

Coordinate and supervise required seasonal (or deferred) testing, deficiency corrections, and provide the final testing documentation for the commissioning record and O&M Manuals. A pressure map of the building to verify that the HVAC system is maintaining the correct internal and external pressurizations will be conducted.

---END of OPR---