ASHRAE Headquarters

Owner's Project Requirements

Prepared for

ASHRAE

Atlanta, Georgia

June 15, 2007

DELIVERING SUSTAINABLE, HEALTHY, HIGH PERFORMANCE BUILDINGS

Commissioning & Green Building Solutions, Inc.

4420 S. Lee Street, Buford, Georgia 30518

Executive Summary:

The OPR is a document that establishes ASHRAE's goals for the ASHRAE Headquarters Renovation project. 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. By establishing the goals of the ASHRAE Headquarters Renovation 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.

ASHRAE Headquarters is a building that will be used for administrative purposes, publication development activities, reference library & document archive, website support/computer room, shipping and receiving, staging area for ASHRAE off-site activities, meeting and conference center, and learning center. During the OPR Workshop several items important to the activities and functions performed within the headquarter building were identified and are contained in the body of this document. Most of the requirements identified in the OPR workshop are contained in the schematic design submittal dated September 15, 2006 and OPR Version 1.0 document dated June 9, 2006 given by ASHRAE. Some requirements identified may require minor adjustment in the design of the ASHRAE headquarters renovation and addition.

This document represents CxGBS understanding of the project and is presented as a draft for review and comment by the building committee and ASHRAE senior staff. The draft will be modified based on comments received from ASHRAE. Based on the schematic design documents dated September 15, 2006 additional area to meet staging area requirements identified during the OPR workshop may need to be added to allow ASHRAE staff to assemble and pack materials needed for off-site functions.

Contents

Tables

Owner's Project Requirements Process

Overview

Owner's Project Requirements (OPR) is typically developed in the pre-design phase of a project to assist the team with understanding the owner's objectives and criteria for the 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.

Owner's Project Requirements

Owner's Project Requirements 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. It also includes information to assist the project team to properly plan, design, construct, operate, and maintain systems and assemblies.

The information contained in the OPR supplements the pre-design programming data. Depending on the extent of the programming effort, additional owner objectives and criteria are typically identified through the OPR process. Information provided by the designers is also captured and used to define the owner's objectives and criteria. Information received from the designers and OPR 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, etc. do not become part of the OPR.

An effective Commissioning Process depends on a clear, concise, and comprehensive Owner's Project Requirements document. The Commissioning Authority facilitates the development of the Owner's Project Requirements. Input should be gathered from all stakeholders. Each item of the OPR shall have defined performance and acceptance criteria. Those that can be benchmarked should have the benchmark defined in specific terms and measurement.

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 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) Statistical (assumed probabilistic distribution of measured values) and quality tools that are to be used
(l) Operation and maintenance criteria for the facility that reflect the Owner's expectations and capabilities and the realities of the facility type
(m) Equipment and system maintainability expectations, including limitations of operating and maintenance personnel
(n) Quality requirements of materials and construction
(o) Allowable tolerance in facility system operations
(p) Energy efficiency and environmental sustainability goals
(q) Community requirements
(r) Adaptability for future facility changes and expansion
(s) Systems integration requirements, especially across disciplines
(t) Health, hygiene, and indoor environment requirements
(u) Acoustical requirements
(v) Vibration requirements
(w) Seismic Requirements
(x) Accessibility requirements
(y) Security requirements
(z) Aesthetics requirements
(aa) Constructability requirements
(ab) Communication requirements
(ac) Applicable codes and standards

There are no recognized industry standards that might serve as a uniform method of identifying and documenting system and assembly requirements for the Owner's Project Requirements document. The following list of topics can serve as a guide to identify system and assembly performance requirements:

(a) *Structural safety and serviceability*, including resistance to static and dynamic forces, resistance to impact and serviceability;
(b) *Fire safety*, including prevention, egress, suppression, notification, and containment;
(c) *Accident safety*, including protection against sharp points and edges, tripping, slipping and falling, and electrocution;
(d) *Health and hygiene*, including protection from contamination from waste water, garbage and other wastes, emissions, and toxic materials;
(e) *Indoor environment*, including hydrothermal, air temperature, humidity, condensation, indoor air quality, and weather resistance;
(f) *Light*, including natural and electric illumination;
(g) *Acoustics*, including control of external and internal noise and intelligibility of sound;
(h) *Durability*, including retention of performance over required service life when subject to the effects of environmental forces and of use, as well as specified maintenance;

(i) *Accessibility*, including access and use by children, aged, and disabled persons;
(j) *Security*, including protection against unwanted intrusion and vandalism;
(k) *Economics*, including operating and maintenance costs, demolition costs, and life-cycle costs;
(l) *Functionality*, including the accommodation and suitability for use, and the operability of operable elements;
(m) *Aesthetics*, including the appearance and symbolic meaning of a facility and its elements;
(n) *Adaptability*, including the capacity to be modified or extended over time;
(o) *Maintainability*, including the utilization of resources and the control of environmental pollution;
(p) *Constructability*, including transportation to site, erection of the facility, and health and safety during construction;
(q) *Communications*, including the capacity to provide current inter- and intra-telecommunications capability throughout the facility.
(r) *Sustainability,* including energy efficiency, water conservation, and environmental responsiveness.

Process

Developing the OPR

The Owner's Project Requirements is a document that evolves through each project phase. As decisions are made during the Design, Construction, and Occupancy and Operations Phases, this 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.

CxGBS suggests making the Owner's Project Requirements available to the project team as "supplemental information available to bidders." CxGBS does not recommend identifying the Owner's Project Requirements as 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 CxGBS. As the design progresses, the assumptions made by the designers are documented in the designer's developed Basis of Design. CxGBS provides a format for the designers to use in documenting their Basis of Design. The Basis of Design 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 CxGBS. Divisions between design and OPR are discussed and either the design or the OPR is revised based on guidance from the owner.

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.

Basis of Design Content

The Basis of Design documents what assumptions the designers made and the reasoning behind these assumptions. 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 is compared with 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 Basis of Design 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.

ASHRAE Headquarters – OPR

Overview

This document is designed to systematically and clearly communicate the expectations of the ASHRAE Building Committee (BC) to designers, contractors, and commissioning authority to help them understand what they are tasked with achieving. Additionally, the OPR provides a mechanism by which designers can respond to, and describe how they are meeting the BC's requirements. The document includes initial requirements and as the design progresses additional information will be added to the OPR as needed until the establishment of the project gross maximum price (GMP). Commissioning & Green Building Solutions (CxGBS) will maintain the OPR for the owner and modify it as directed by ASHRAE.

Owner's Project and Performance Requirements: General

Objectives and Functional Requirements

Objectives

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 utility and maintenance costs
- Excellent indoor environmental quality requirements that facilitate occupants' productivity by providing a comfortable environment while avoiding the design attributes related to poor HVAC system performance, poor space utilization, poor acoustical qualities, inconsistent interior style, and apparently low durability of finishes related to the ASHRAE Headquarters as it currently exists
- ASHRAE's desire to minimize environmental impacts and to achieve LEED® NC 2.2 & LEED® EB Gold Certifications

ASHRAE desires to make a statement with this renovation by fully complying with the provisions of the recently approved Sustainability Roadmap as well as the Society's energy and indoor air quality standards. ASHRAE wants a building that will truly be sustainable. 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 move towards becoming a "net zero building" at some point in the future.

The project involves the renovation of 31,000 square foot 2-story office building currently occupied by ASHRAE, plus a 4000 sq. ft. addition for the ASHRAE Learning Center. The total project including relocation, owner's contingency, design fees, swing space, and FF&E is budgeted at $6.95 million. The renovation portion is budgeted at $4.65 million including construction fees, design contingency and general conditions and will take approximately 9 months to complete, with a move-in date planned for August 15, 2008 . The project will be conducted as a design/bid/build project with a design team, a general contractor and an independent commissioning authority.

The facility will feature administrative offices, publication development areas, reference library & document archive, website support/computer room, shipping and receiving, a staging area for ASHRAE off-site activities, with a new meeting, conference, and learning center adjacent to the building's main entrance. As such, the facility must facilitate functions that accommodate a multitude of operations which require pertinent spaces including some individual private offices, cubicle spaces, and shared spaces consisting of a reception area, storage and copier areas, small meeting and break areas, larger meeting areas, staging areas for publications and preparation for ASHRAE functions off-site, and a functional shipping and receiving area. The facility will be designed to initially provide office space for a total of 109 occupants with design provisions to allow for expansion to a total occupancy of 125 over a 10-15 year period.

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. The use of potable water for irrigation purposes beyond what is required for initial establishment of site vegetation is strictly prohibited. Indigenous and adapted plant species shall be selected to minimize watering, fertilization, and pest management requirements. Design and construction of the building should be done to minimize maintenance requirements. The renovated building shall be a minimum of 30% more efficient than ASHRAE Standard 90.1-2004 and the addition shall be a minimum of 35% more efficient than ASHRAE Standard 90.1-2004.

The overall facility shall be served by an electrical infrastructure (telephone lines, electricity, intercom, etc.) that is capable of meeting 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 around a projector screen for presentations; 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 to provide for sub-metering of utilities serving mechanical equipment, plug loads and the lighting system by functional area, HVAC system type, and floor (i.e. learning center, 2nd floor and 1st floor, meeting rooms). Sub-metering shall meet the LEED® EB requirements listed within this text. Monitoring shall also be compatible with the building automation system (BAS) to allow remote monitoring. This integration will be cohesive enough to allow use of a web monitoring service to monitor key building systems, energy usage, preventative maintenance, schedule 24/7, and distribute necessary aspects of this information to staff, outside service provider, and (technical committee) TC members via web & automatic prompt e-mails.

Project Schedule and Budget

The building's design/bid/build allowable budget is $6.95 million; the headquarters renovation portion of the project has a current project budget of $4.65 million, with an additional $2.3 million for owner contingency, design fees, FF&E and swing space costs. The cost estimate will be reviewed and updated by the respective PM at each milestone in the design process to confirm adherence to the project scope and budget. The project schedule (Table 1), outlines the current schedule and is expected to be adhered to throughout the project. The project's construction is scheduled for completion in 9 months and the facility will be reoccupied on August 15, 2008. All potential delays or lags shall be coordinated with the ASHRAE BC.

Table 1: Schedule

Date	Event Description
April 15, 2006	Schematic Design Phase Begin
July 31, 2006	Schematic Design Phase Complete
Dec 10, 2006	Design Development Phase Complete
June 1, 2007	Construction Documents Complete
October 1, 2007	Bid & Negotiate Construction Contract
November 1, 2007	Construction Work Commencement
June 15, 2008	Construction Work Complete
TBD	Pre-construction meeting
TBD	Begin construction site visits/inspections
TBD	Construction checklists developed and distributed
TBD	Start-up and initial checkout plans
TBD	Start-up and initial checkout executed
TBD	Testing and Balancing (TAB)
TBD	Function performance tests
TBD	O&M documentation review and verification
TBD	Training and training verification
TBD	Final commissioning report
TBD	Deferred or seasonal testing

Commissioning Process Scope

Develop Owners Project Requirements

CxGBS will assist ASHRAE with defining 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.

Design Phase

Design phase commissioning will review the mechanical system and electrical system design 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 build 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.

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.

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.

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.

Plumbing Design Phase Commissioning

The review of plumbing system drawings and specifications will concentrate on the design of potable water systems. The commissioning team will review fixture selection, pumps and boiler/heater sizing.

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 contractors work. The following systems will be commissioned:

Table 2: Commissioning Scope

Systems to be commissioned during Construction Phase

Building Envelope		Plumbing System	
1. None included but envelope commissioning is available 2. Roof (If directed by committee) 3. New window and storefront assemblies (If directed by committee) 4. Wall assemblies of addition (If directed by committee) 5. New sealants (If directed by committee)		1. Fixture replacement (if appropriate) 2. Service water heating (if appropriate) 3. Fire Sprinkler & alarm	
HVAC System		**Electrical**	
1. Air Conditioning systems 2. Heating systems 3. Air distribution systems 4. General exhaust systems 5. Building automation system, associated hardware, and interfaces 6. Make-up air systems Variable frequency drives 7. Air handlers	8. DOASI 9. Ground Source Heat Pumps 10. VRV system 11. Fire and smoke dampers 12. Testing, adjusting, and balancing work 13. Indoor air quality	1. Exterior lighting control 2. Interior lighting control 3. Path of egress lighting 4. Occupancy sensors for lighting control 5. Multi-level switching 6. Electrical fixtures/devices/ installation in hazardous locations 7. GFRCI type receptacles 8. PV array (potential) 9. Security/CCTV 10. Intercom	

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.

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.

User Requirements

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.
- As-built 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.

Occupancy Requirements and Schedules

The facility is normally occupied from 7:30 am to 5:30 pm Monday-Friday, for a total of 50 hours per week. Intermittent occupancy of the building by volunteers working on weekends usually averages one weekend per month for two days (16 hours). This will yield an average weekly occupancy of 54 hours per week. 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 which typically is a total of 50 hours per week. The headquarters is intermittently partially occupied approximately one weekend a month providing an average number of HVAC operating hours of 216 hours per month. Occupancy of the building includes 109 employees assigned to functional areas divided into five departments and one executive branch. Requirements for each departments and executive branch can be found in the owner's directives section of this OPR.

Training Requirements for Owner's Personnel

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 per LEED® Credit EB 3.1.

Warranty Requirements

General 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 systems typically featuring a longer than one year 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

Water Heaters: 5 years

Elevator: 5 years

Operation and Maintenance Criteria

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 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 the first three years after occupancy.

Equipment and System Maintainability Expectations

Maintenance and replacement costs must be considered over the life of the facility and selections 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.

Quality Requirements of Materials and Construction

The renovated facility shall be designed to serve and endure for at least 75 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 90.1-2004, Section 5.4.3 Air Leakage; the fenestration and solar transmission shall be controlled and designed in accordance with ASHRAE Standard 90.1-2004 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 60 XL) in the new front entrance/vestibule area; the new glass panel will need to match the existing glass tint. 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 evaluated and if necessary modified 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 ASHRAE Handbook HVAC Applications, 2003 edition (Chapter 36 – Owning and Operating Costs). HVAC components such as coils and compressors shall have 20 years serviceable life. The piping and plumbing infrastructure shall have a serviceable life of 35 years. Lighting systems shall have 20 years serviceable life. Electrical systems shall 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.
Chapter 35 Energy Use and Management, Chapter 40 Building Energy Monitoring

Allowable Tolerance in Facility System Operations

(Yet to be defined)

Energy Efficiency and Environmental Sustainability Goals

The facility will be designed to comply with the energy efficiency requirements prescribed in ASHRAE Standard 90.1-2004. The building shall be designed to meet the following criteria:

- Allow a minimum energy savings of 30% beyond the efficiency levels prescribed by ASHRAE Standard 90.1-2004 for the existing Renovated Building and the new addition.
- Provide infrastructure for future renewable energy to meet at least 10% of the annual electrical energy usage of the building. Installation of donated PV array shall be installed in portion of roof area upgraded to provide for current and future PV capacity stated above.
- Using alternative electrical rate structures which would minimize operating costs.
- High efficiency lighting shall be used to reduce lighting power densities by 25 to 35% as compared to ASHRAE Standard 90.1-2004.
- Utilize daylighting strategies wherever applicable for the Renovated Building and new Learning Center.

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 seeking LEED® NC 2.2 and LEED® EB Gold Level certification to demonstrate that the facility is 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:

- Maximization of the HVAC credits under the Energy and Atmosphere section of the LEED® rating as a first priority.
- Provide capability for Indoor Environmental Quality (IEQ) monitoring that include air temperature, humidity, CO_2 concentration, air pollutants concentration, 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.

LEED® certification requires the incorporation and documentation of various energy efficiency and sustainability principles throughout the design and construction process. Not all LEED® credits are applicable to all projects. Tables 4 and 5 list LEED® credits that shall be incorporated into the project. Credits described as "potential" will require investigation by the project team to determine if adequate cost/benefit relationships exist for the credit to be pursued. Tables 4 and 5 are provided in the Benchmarking Section of the OPR that lists the LEED® Credits that have been deemed attainable. Table 3 represents Benchmarking which will be observed by CxGBS.

Benchmarking Requirements

A Benchmark is a standard to which the worthiness of an attempt is measured. Benchmarking requirements provide a means where the facility design, construction, and performance are measured and judged with respect to other similar facilities. Benchmarking requirements form the fundamental basis for the design and construction of the facility and this OPR document. This project will be regarded as successful upon meeting the benchmarks contained in Table 3 and obtaining credit for the USGBC LEED® Prerequisites and Credits listed below, which have been deemed achievable and practical by the ASHRAE BC, as well as having a positive impact on the following items and meeting the Owner's Project Requirements specified above.

Table 3: Observable Benchmarking Goals

• Building envelop shall be at least as tight as Section 5.4.3 of ASHRAE Standard 90.1-2004 • No moisture intrusion fenestration system – no evidence of water intrusion when tested in accordance with AAMA 501.2 procedures	• Project will fulfill the goals of ASHRAE's Sustainability Road Map. The intent is that the redevelopment program serves as a demonstration project to advance the technology of sustainable design and serve as a "living lab" for ASHRAE's members.
• No moisture intrusion due to negative pressurization – pressure mapping indicates interior spaces are positively pressurized relative to outside by >2 Pascal	• Project will meet LEED Gold Rating for NC 2.2 and EB, including compliance with ASHRAE Standards 55, 62.1 and 90.1
• Measure environmental factors on a continuous basis and compare to surveys	• Positive occupant IEQ surveys
• Mechanical system reliability	• Before & after maintenance expenses
• Comparison of sustainability between multiple building rating systems besides LEED	• Significantly reduce utility consumption based on measurements taken before & after renovation
• Number of meetings held at ASHRAE headquarters vs. off site	• Number of unexpected problems and bonuses encountered
• Absenteeism and tardiness rate	• Staff and member satisfaction and productivity

LEED® New Construction

Table 4: LEED NC Credit Goals

• SS Prerequisite 1 • SS Credit 1 • SS Credit 4.1 • SS Credit 4.2 • SS Credit 4.3	• SS Credit 4.4 • SS Credit 6.1 • SS Credit 6.2 • SS Credit 7.2 • SS Credit 8
• WE Credit 1.1 • WE Credit 1.2	• WE Credit 2 • WE Credit 3
• EA Prerequisite 1 • EA Prerequisite 2 • EA Prerequisite 3	• EA Credit 1 – 8 points • EA Credit 3 • EA Credit4 • EA Credit5
• MR Prerequisite 1 • MR Credit 1.1 • MR Credit 2.1	• MR Credit 4.1 • MR Credit 4.2 • MR Credit 5.1 • MR Credit 5.2
• EQ Prerequisite 1 • EQ Prerequisite 2 • EQ Credit 1 • EQ Credit 2 • EQ credit 3.1 • EQ Credit 3.2 • EQ Credit 4.1 • EQ Credit 4.2	• EQ Credit 4.3 • EQ Credit 4.4 • EQ Credit 5 • EQ Credit 6.1 • EQ Credit 7.1 • EQ Credit 7.2 • EQ Credit 8.2

LEED® Existing Building

Table 5: LEED EB Credit Goals

• SS Prerequisite 1 • SS Prerequisite 2 • SS Credit 1 • SS Credit 2	• SS Credit 3.3 • SS Credit 3.4 • SS Credit 6.2 • SS Credit 7
• WE Prerequisite 1 • WE Prerequisite 2	• WE Credit 1 • WE Credit 2 • WE Credit 3

• EA Prerequisite 1 • EA Prerequisite 2 • EA Prerequisite 3 • EA Credit 1 – 8 points • EA Credit 3.1	• EA Credit 3.2 • EA Credit 3.3 • EA Credit 5.1-3 • EA Credit 5.4 • EA Credit 6
• MR Prerequisite 1.1 • MR Prerequisite 1.2 • MR Prerequisite 2 • MR Credit 1.1	• MR Credit 2 • MR Credit 3 • MR Credit 4 • MR Credit 5 • MR Credit 6
• EQ Prerequisite 1 • EQ Prerequisite 2 • EQ Prerequisite 3 • EQ Prerequisite 4 • EQ Credit 1 • EQ Credit 3 • EQ Credit 3.2 • EQ Credit 4.1 • EQ Credit 4.2 • EQ Credit 5.1 • EQ Credit 5.2	• EQ Credit 6.1 • EQ Credit 7.1 • EQ Credit 7.2 • EQ Credit 8.1 • EQ Credit 8.2 • EQ Credit 9 • EQ Credit 10.1 • EQ Credit 10.2 • EQ Credit 10.3 • EQ Credit 10.4-5 • EQ Credit 10.6
• ID Credit 2	

Adaptability for Future Facility Changes and Expansion

The facility will be designed with provisions to accommodate 16 additional staff members over a 10-15 year period. 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 infrastructures to support expansion of business activities.

The design should also consider relocation of the existing chiller plant to facilitate the site planning needs of the project. Future expansion will be based on use of modular design work stations. Electrical and mechanical infrastructure shall accommodate future reconfiguration with little major changes.

Systems Integration Requirements

Mechanical systems shall function seamlessly to deliver the performance levels needed to maintain space comfort within specifications set forth by ASHRAE Standard 55-2004. The HVAC system will be capable of providing outside air volume that exceed ASHRAE Standard 62.1-2004 and maintain adequate levels of building pressurization. Humidity levels in the space must always be

maintained less than 60% relative humidity and should never be allowed to reach a level that would allow condensate to form on HVAC equipment or other building elements. Lighting controls in spaces with no occupancy sensors shall be "time-of-day" with temporary override located at the thermostat that places HVAC and lighting systems into occupied mode. 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.

Health, Hygiene, and 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/near the facility that impact the health, hygiene, and indoor environments of occupants:

Specifically:

- Whenever possible, non-toxic caulks, paints, adhesives, sealants and cleaning products shall be used. Paint surfaces that have frequent contacts must be durable and may require paints with higher VOC content. Materials with low or no VOC emissions are preferred for areas of less contact.
- Smoking or the use of smokeless tobacco will be prohibited during construction activities. Smoking will only be allowed outside of the building.
- 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
- Finishes that emit volatile organic compounds and other pollutants during curing shall be scheduled to minimize absorption by absorbent materials include ceiling tiles, carpets, insulation, gypsum products, and fabric-covered furnishings.
- The facility shall be positively pressurized. Outside air intakes shall not be accessible from grade.

- Outside Air Intakes shall be located at great enough distances 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.

Acoustical Requirements

The design should consider steps to reduce road noise from building spaces facing the interstate highway. Noise levels could be mitigated by a variety of strategies, including the placement of exterior noise barriers and replacing exterior glass with sound absorbing glass. 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. Sound transmission between private offices with the door closed to adjacent offices or corridor shall not exceed 30dB. Sound transmission in private offices from air terminal devices shall not exceed (Noise Criteria) NC 30. Sound transmission for executive offices, private offices, and conference rooms shall not exceed (Room Criteria) RC 25; sound transmission for open-plan offices shall not exceed RC 30. Sound level for corridors and lobbies shall not exceed RC 40.

For open offices the acoustical environment shall limit noise which would negatively impact occupant productivity, speech intelligibility, privacy, safety, positive user attitude and response to the open office environment. A suitable acoustic environment that allows ease of communication, limited intrusive noise (and resultant distraction) is required for the open office areas. The complete acoustic system will generally provide adequate speech privacy for normal conversations (60 dB) between adjacent open offices. An appropriate sound level of 45 to 55 dB is desired for open office environment. The Learning Center shall have acoustical ratings for sound transmission through all walls of conference rooms meets or exceeds 50-60 NIC (Noise Isolation Class) for all fixed walls and 45-50 NIC for all operable walls in separation position. Operable walls should be sound control type and not operable partitions designed only for space management. Ambient sound levels within all conference rooms shall range from 25-35 NC or less, and RT (Reverberation Time) falls between 0.8 and 1.2 seconds at mid-frequencies. Amplified sound is available for all conference rooms over 1000 square feet.

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.

Seismic Requirements

Comply with local code requirements.

Accessibility Requirements

The building will be designed to meet all ADA requirements.

Systems requiring routine maintenance, such as HVAC, shall be designed to provide adequate access and clearance for all maintenance tasks (ie filter access, sufficient space to remove/replace system components such as coils, fans, valves, etc).

Security Requirements

Security system shall be capable of being tailored to allow individual users unique access profiles. Security and surveillance provisions at all building entrance 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 interior space and around the building's exterior. The security system shall keep an access log which records profile of people entering the building, the time of entrance and exit.

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 Advanced Energy Design Guide for Small Offices.

Constructability Requirements

(To be Determined)

Communication Requirements

The building shall be served by a modern phone system and computer network. 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 mechanical rooms, electrical rooms, and other 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.

HVAC 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 will 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 offices spaces to meet changing needs of the organization without extensive HVAC modification needed to maintain comfort associated with indoor environmental quality. The Technical Advisory Committee recommends the following:

- 2nd floor, Dedicated Outdoor Air System (DOAS) with radiant cooling panels.
- 1st floor, DOAS with VRV (variable refrigerant volume) system.
- Learning Center, DOAS with VRV system.

- HVAC systems shall be designed to provide required cooling and heating load meeting the varying load requirements while maximizing energy efficiency.
- HVAC systems shall be zoned to maximize comfort and minimize cost of construction.
- Maintain building pressurization and humidity control 24/7 if cost effective.
- Ventilation to be 30% greater than ASHRAE Standard 62.1-2004 minimums.
- Provide MERV 13 air filtration with MERV 8 pre-filters and locate fresh air intakes out of the path of common local contaminates.
- Consider replacement of central plant chillers with more efficient and quieter scroll chillers.
- Provide simple controls that provide continual performance monitoring and "look only" web access to ASHRAE members.
- All controls to be native BACnet.
- Building occupancy schedule for HVAC systems will be easily modified by zone.

The renovated facility 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 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.
- Using separate and different HVAC systems for first and second floor as a long-term comparison study.

Applicable Codes and Standards

The facility shall be designed in accordance with the following codes:

ANSI/ASHRAE/IESNA Standard 90.1-2004
ANSI/ASHRAE 55-2004
ANSI/ASHRAE 62.1-2004
ANSI / ASHRAE 100-2006
ASHRAE Guideline 0-2005
ASHRAE Guideline 1-1996
USGBC LEED® Rating System EB Version 2.0
USGBC LEED®-NC Rating System 2.2
Applicable Local, State, and National Building Codes

Owner's Directives

General User Requirements:

ASHRAE staff will conduct normal administrative activities within this facility. The renovated facility is divided into five departments and one executive branch (see Table 6). 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 adjacent to visitor parking with protection from elements.

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 building if it does not negatively impact the environmental quality or add to maintenance costs. 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, CO_2 concentration, concentration of other air pollutants, air flow rates, lighting levels, and daylight availability
- Water consumption by the whole building and targeted end uses
- Outdoor conditions including weather, total and diffuse solar radiation, and air quality
- Occupant satisfaction information

Some of these data will require monitoring in near real time and at relatively short time intervals (approximately 1 minute in some case). 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 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.

Table 6: ASHRAE Departments

Departments	Current Staffing Level	Future Staffing Level	Sections in Dept.	Key Interface Dept.
Executive	5	TBD	President, Vice President, Executive Asst.	TBD
Technology	18	2	Dept. Director, Standards, Research & Technical Services	Publications & Education (reference library)
Member Services	20	3	Dept. Director, Region Activities, Student & YEA Activities, Membership Development, Chapter Programs, Meetings, Fundraising	Accounting, Marketing
Administrative Services	21	2	Dept. Director, Human Resources, Accounting, Mailroom, Management Information Systems	Member Services
Publishing & Education	34	10	Dept. Director, Certification, Education, Communications & Program, Publishing Services, Advertising Sales, Electronic Communications & Applications, Journal, Handbook, Special Publications	Marketing, Technology, Administrative Services
Marketing	10	2	Dept. Director, Marketing, Public Relations, Govt. Relations (Based offsite)	Publication & Education, Member Services

The general requirements for the renovated ASHRAE Headquarters include:

1. Lighting and Daylighting: Daylighting shall be provided by existing window system. Efficient artificial 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 Small Offices. The use of façade up-lighting to achieve LEED-NC light pollution credit will not be acceptable.

   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 be including 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 required illumination for egress purposes.

2. Electrical infrastructure shall be capable of meeting requirements necessary for business activities. The electrical system for the building shall allow sub-metering of utilities serving mechanical equipment, lighting systems, and plug-in 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 more easily. Monitoring shall also be compatible with the BAS to allow remote monitoring.

3. Greater 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 so that building occupants can easily access them.

4. Dedicated shipping and receiving areas will be of sufficient size to avoid the current clutter created by collection of goods awaiting shipment currently stored in the existing building hallways. 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.

5. Storage areas shall be designed with sufficient space so that files, forms, and other pertinent information can be found and located in a centralized location. Storage rooms should be adequately provided to accommodate departments' uses.

6. The 1st floor of the facility will have a centralized break area that will be designed to accommodate refrigerator, microwave, sink, vending machines, coffee counter, tables & chairs, 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.

7. Conference/meeting rooms shall be designed with wall surfaces suitable for tacking or other display of flip chart-type sheets; ceiling mounted projectors will be installed in each conference/meeting 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.

8. The new entrance/vestibule area will be designed with sufficient space (at least 10 feet in length) to allow the simultaneous opening of the front door and the vestibule door opening into the building.

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

1. 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 90.1-2004 requirements. Private offices as well as other daylighted spaces shall have manual ON and automatic Off occupancy sensors.

2. 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.

3. Private offices for senior staff will be near the exterior of the building. High quality furnishings that are ergonomically designed will be considered for use in private offices. Recognizing that enhanced operator comfort is a large contributor to operator productivity shall be considered when evaluating initial cost.

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

1. 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 90.1-2004 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. Lighting shall be continuously dim rather than switch electric lights in response to daylights variations to avoid occupant distractions.

2. 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.

3. Glass shall be used extensively to create interior partitions.

4. Provisions for modular workstations with task lighting and reconfiguration of stations.

5. Provisions for adding noise masking equipment later, if needed.

Executive:

This branch will include the private offices of the President, Vice President, and Executive Assistant/s to the BOD offices (see Table 6). The current staffing level includes 4 fulltime staff and 1 part time (President). 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.

Technology:

The Technology Department will include the Standards and Research & Technical Services section (see Table 6). The current staffing level includes 18 employees with the anticipated expansion of 2 staff in the future. 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.

Member Services:

This department will include various sections including Region Activities, Membership Development, Chapter Programs, etc. (see Table 6). The current staffing level includes 20 employees with the anticipated expansion of 3 staff in the future. 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.

Administrative Services:

The current staffing level includes 21 employees with the anticipated expansion of 2 staff in the future. This department will include the Human Resources, Accounting, etc. (see Table 6). The location selected for Human Resources section shall be a private and centrally located space. 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.

Publishing & Education:

This department includes Publishing Services, Advertising Sales, etc. (see Table 6). The current staffing level includes 34 employees with the anticipated expansion of 10 staff for the areas of Certification and Education. 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.

Marketing:

The current staffing level for the Marketing Department includes 10 employees with the anticipated expansion of 2 staff in the future. This department includes Marketing, Public Relations, etc. (see Table 6). The director's office shall be designed to include all requirements for private office specified above.

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:

1. Lighting: The Conference and Learning center shall have a controllable level of lighting (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.

2. HVAC systems should be zoned to allow comfortable inside air quality while maximizing energy efficiency. Dedicated learning rooms shall have individual climate 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).

3. 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:
    i. 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.
    ii. 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.

4. The conference center shall have separate utility sub-metering with reporting and trending capabilities at the building automation system.

End of Report