Connecticut
Department of Administrative Services

Capital Projects
High Performance Buildings Guidelines

Prepared for Capital Projects with Oversight By:
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0450 - Capital Projects High Performance Buildings Guidelines

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1.0 Capital Projects High Performance Building Guidelines - General:

In accordance with Connecticut General Statutes (CGS) § 16a-38k the CT Office of Policy and Management (CT OPM) and the CT Department of Administrative Services (CT DAS) – Division of Construction Services (DCS) have issued regulations for the Establishment of High Performance Building Construction Standards for State Funded Buildings. They have also developed a guidance document – *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings* – which provides detailed information regarding the regulation requirements. This guidance document can be found online on the CT Department of Energy and Environmental Protection's (CT DEEP) website:

http://www.ct.gov/deep/cwp/view.asp?a=4405&Q=481888&deepNav_GID=2121

Or click here to download a copy of the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings (Revised September 2011):*

http://www.ct.gov/deep/lib/deep/energy/buildingstandards/compliancemanualhighperformancebuildings.pdf

The *0450 - Capital Project High Performance Buildings Guidelines* is intended to provide a brief synopsis of these requirements and to make the consultant aware of his responsibilities under these laws.

1.1 There are four (4) different project types that fall under this statutory requirement:

1.1.1 New Construction of State Facilities projected to cost $5,000,000 or more;

1.1.2 Renovation of State Facilities projected to cost $2,000,000 or more;

1.1.3 New Construction of State Funded Public School Buildings projected to cost $5,000,000 or more;

1.1.4 Renovation of State Funded Public School Buildings projected to cost $2,000,000 or more.

2.0 New Construction of State Facilities [16a-38k–2(a)]:

2.1 Applicability - New Construction of State Facilities [16a-38k–2(a)]:

New construction of a state facility that is projected to cost five million dollars or more, and for which all budgeted project bond funds are allocated by the State Bond Commission on or after January 1, 2008.

IMPORTANT NOTE: Five million dollars or more means the <u>total</u> amount of funds appropriated for the Project.

2.2 Twelve (12) Mandatory Requirements [16a-38k–3]:

The regulations require the Design Team for New Construction projects covered by 16a-38k-2(a) to include all of the following Twelve (12) Mandatory Requirements in the project. These Mandatory Requirements are summarized below.

Twelve (12) Mandatory Requirements [16a-38k-3] Summary:		
Item No.	**Regulation**	**Summary Description**
1.	16a-38k-3(a)	**Building Commissioning:** Building commissioning shall be an integral part of the building project.
2.	16a-38k-3(b)	**Integrated Design Process:** All building construction projects shall follow an integrated design process to achieve environmental and building performance goals.
3.	16a-38k-3(c)	**Energy Performance:** The base minimum energy performance for all building projects shall be twenty-one percent (21%) better than the most current Connecticut State Building Code or ASHRAE 90.1-2004, whichever is more stringent. Base minimum energy performance shall be determined using approved building modeling software that is identified in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings (Revised September 2011)*.
4.	16a-38k-3(d)	**ENERGY STAR Products:** Energy consuming products installed in the building shall be ENERGY STAR compliant if the product category has an ENERGY STAR specification.

2.2 Twelve (12) Mandatory Requirements [16a-38k–3]: (Continued)

Twelve (12) Mandatory Requirements [16a-38k-3] Summary: (Continued)			
Item No.	**Regulation**	**Summary Description**	
5.	16a-38k-3(e)	**Indoor Air Quality Management Plan:** An indoor air quality management plan shall be developed for the construction phase of the project. As part of the plan, the following *(partially described below)* shall be addressed:	
		1.	Periodic inspections of materials stored on-site to ensure that all installed or stored absorptive materials are protected from moisture and mold damage
		2.	Surface grades, drainage systems, and heating, ventilating and air conditioning condensate drainage systems shall be designed so as to prevent accumulation of water under, in, or near the building.
		3.	Ductwork shall be sealed from outside elements during transport and storage, and interior surfaces shall be wiped down immediately prior to installation. During installation, open ends of ductwork shall be temporarily sealed and ductwork shall be protected with surface wrapping. No installed ductwork shall contain internal porous insulation materials or lining.
		4.	Heating, ventilation, and air conditioning (HVAC) equipment shall be covered and protected from moisture during transportation and onsite storage.
		5.	Materials that off-gas toxic, or potentially toxic, fumes shall be preconditioned for at least seventy-two hours prior to installation within the building.
		6.	In the event that any portion of the building is occupied during construction or renovation activities, the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA) *Indoor Air Quality Guidelines for Occupied Buildings Under Construction* shall be followed.
6.	16a-38k-3(f)	**Water Usage:** Use low-flow fixtures to consume twenty percent less water in aggregate as compared to base levels calculated by meeting the Federal Energy Policy Act of 1992 fixture performance requirements.	
7.	16a-38k-3(g)	**Recycling of Materials:** The building or building site shall contain convenient areas to serve as collection points for recyclable materials and shall include an area for the sorting and storage of such materials for pick-up by recyclers.	
8.	16a-38k-3(h)	**Erosion and Sedimentation Control:** All construction shall include a plan for erosion and sedimentation control, as required by CGS § 22a-325 through CGS § 22a-329.	
9.	16a-38k-3(i)	**No Smoking Policy:** No smoking shall be permitted in any building or portion of a building owned and operated or leased and operated by the state or any political subdivision thereof as mandated by CGS § 19-342.	
10.	16a-38k-3(j)	**Integrated Pest Management Plan:** An Integrated Pest Management Plan, as defined in CGS § 22a-47, shall be established as required under CGS § 22a-66*l* for general pest and rodent control in state buildings. Schools shall comply with CGS § 10-231 and CGS § 22a-66*l*.	
11.	16a-38k-3(k)	**Chlorofluorocarbon (CFC)-Based Refrigerants:** Chlorofluorocarbon (CFC)-based refrigerants shall not be utilized for energy systems in new construction. For renovation projects where existing HVAC equipment is reused, a CFC phase-out conversion shall be undertaken.	
12.	16a-38k-3(l)	**Minimum Ventilation Requirement:** Buildings shall be designed to meet the minimum ventilation requirements of the current ASHRAE Standard 62.1 using the Ventilation Rate Procedure for mechanical systems. If the current Connecticut State Building Code contains more stringent requirements, it shall be used to meet minimum ventilation requirements.	

2.3 Building Standard Options for State Facilities [16a-38k-4]:

The regulations require the Design Team for New Construction projects covered by 16a-38k-2(a) to include a minimum of twenty-six (26) of the sixty (60) Building Standard Optional Strategies into the project. These Building Standard Optional Strategies are listed in 16a-38k-4 and are described in detail in the Guideline.

2.4 Alternative Options to Building Standard Options [16a-38k-7]:

As an alternative to meeting the requirements of Building Standard Options for State Facilities [16a-38k-4], the regulations allow the Design Team to meet the requirements by receiving certification from a recognized rating system.

IMPORTANT NOTE:
If it is the intent to formally register a project with the United States Green Building Council (USGBC) for certification as a Leadership in Energy and Environmental Design (LEED) project, then the direct costs, i.e. the registration fees paid to the USGBC, will be considered additional services in the design contact.

2.5 Reporting Requirements [16a-38k–8]:

In accordance with the requirements of this regulation the following six (6) types of Reports are required to be produced:

- Award of the Design Contract Letter;
- Design Development Phase Completion Report;
- Construction Document Phase Completion Report;
- Construction Substitution Reports
- Pre-Occupancy Commissioning (Cx) Report;
- Post-Occupancy Commissioning (Cx) Report;

2.5.1 Award of Design Contract Letter:

The Design Team shall provide a letter to the DCS PM to be submitted to both the Secretary of CT OPM and the CT DAS Commissioner. This letter shall include:

2.5.1.1 The project timeline;

2.5.1.2 Members of the design team;

2.5.1.3 Affirmation that the Design Team understands the requirements of these regulations and will design the project in accordance with them.

2.5.2 Design Development Phase Completion Report:

The Design Team shall submit a report to the DCS PM to be submitted to both the Secretary of CT OPM and the CT DAS Commissioner on behalf of, and signed off by, the agency that will be responsible for the ongoing care, operation, and maintenance of the building. This submittal shall include details of how the project will comply with the mandatory measures under the regulations, and include a listing of twenty-six (minimum) of the sixty measure options planned for implementation. For most DCS projects, the Design Team will utilize the alternative compliance option; the report shall document how the Design Team will meet this path of compliance including a completed copy LEED Project Checklist for New Construction and Renovation. An example of the LEED 2009 Project Checklist is available at:
www.usgbc.org/ShowFile.aspx?DocumentID=5719]

2.5.3 Construction Document Phase Completion Report:

The Design Team shall submit a report to the DCS PM to be submitted to the Secretary of CT OPM and the CT DAS Commissioner which will include energy modeling for the current Connecticut State Building Code requirements versus the proposed building project and cost differentials and operational savings for the project.

2.5.4 Construction Substitution Report(s):

The Design Team shall submit a report to the DCS PM for substitution for any of the stated measure options. The DCS PM will submit these reports to the Secretary of CT OPM and the CT DAS Commissioner.

2.5.5 Pre-Occupancy Commissioning (Cx) Report:

The Commissioning Agent (CxA) shall submit a report to the DCS PM to be submitted to the Secretary of CT OPM and the CT DAS Commissioner that demonstrates that the project has met all of the requirements of the regulations. This report will be signed and sealed by the CxA engineer.

2.5.6 Post-Occupancy Commissioning (Cx) Report:

The Commissioning Agent (CxA) shall prepare a Post-Occupancy Commissioning (Cx) Report to be submitted to the DCS PM for review. The report will be transmitted by the DCS PM to the State Agency that is responsible for the ongoing care, operation, and maintenance of the building for submission to the Secretary of CT OPM and the CT DAS Commissioner within one hundred eighty (180) days after one year of occupancy *(Date of DCS Acceptance of the Work)*. The Report shall include results of any post-occupancy survey of building occupants, a description of any adjustments made to equipment or building operation and the reasons for which the changes were made, and one year of all energy usage by source and water usage.

2.6 Exemptions Requests for New Construction of State Agencies Facilities [16a-38k-9(a)]:

Any exemption request shall be submitted to the Secretary of CT OPM with the signature of the owning State agency commissioner or other official that is responsible for the ongoing care, operation, and maintenance of the building. Within no more than forty-five (45) days of submittal of an exemption request, the Secretary, in consultation with the CT DAS Commissioner and the Institute of Sustainable Energy may exempt a facility from complying with these regulations if the secretary finds, in a written analysis, that the cost of such compliance significantly outweighs its benefits. Requests for exemptions are described in the *Connecticut Compliance Manual for High Performance Buildings* and shall be submitted to the DCS PM with cost/benefit calculations and other supporting documentation.

3.0 Renovation of State Facilities [16a-38k–2(b)]:

3.1 Applicability - Renovations of State Facilities [16a-38k–2(b)]:

State facility renovation that is projected to cost two million dollars or more of which two million dollars or more is state funding, and is approved and funded on or after January 1, 2008.

IMPORTANT NOTE: Two million dollars or more means the <u>total</u> amount of funds appropriated by the State Legislature for the Project.

3.1.1 State Facility Renovation Definition: As defined by CT OPM & DCS a *"State facility renovation means an undertaking whereby the designer manipulates the building envelope, electrical systems, mechanical systems, and efficiency of equipment for modification of performance, when costs are two million dollars or more. This includes entire buildings as well as isolated portions of the building. A renovation should include <u>energy efficiency as a priority item</u> even if [the State Agency is] only looking at renovating one or two of the "building systems".*

3.2 Technical Requirements for Renovations to State Facilities:

The technical requirements for renovations of State facilities are the same as the requirements for new construction – Sections 2.2 through 2.6.

3.3 Pre-Design High Performance Building Feasibility Study:

Where it appears that compliance with High Performance Building Standards may significantly outweigh its benefits for a renovation project, **<u>the DCS PM will request</u>** the Design Team to produce a written Pre-Design High Performance Building Feasibility Study, prior to the beginning of the Schematic Design Phase. This study will be submitted to the DCS PM. This Feasibility Study shall include the following:

3.3.1 Detailed description of a project scope and budget which meets the High Performance Building Regulations (i.e. includes the 12 Mandatory Requirements and achieves LEED Silver).

3.3.2 Detailed description of a suggested project scope and budget that meets the project objectives, but does not meet the High Performance Building Regulations. This scope should incorporate as many high performance measures as logical for the project.

3.3.3 A cost/benefit analysis of the differences between these scenarios.

3.3.4 If the Pre-Design High Performance Building Feasibility Study demonstrates that compliance with the High Performance Building Regulations **significantly outweighs the benefits to the Project** then the DCS PM shall request the Design Team to prepare an **Exemption Request** for the Project in accordance with RCSA 16a-38k-9(a) (See 2.6 above).

3.3.5 If the Pre-Design High Performance Building Feasibility Study demonstrates that compliance with the High Performance Building Regulations **does not significantly outweigh the benefits to the Project** then the DCS PM shall direct the Design Team to proceed with the design in accordance with the High Performance Building Regulations.

4.0 New Construction of State Funded Public School Buildings [16a-38k–2(c)] and School Renovations [16a-38k–2(d)]:

4.1 Applicability–New Construction of Public School Buildings [16a-38k–2(c)] & School Renovations [16a-38k–2(d)]:

New construction of public school buildings costing five million dollars or more; or public school renovations costing two (2) million dollars or more, of which **two million dollars or more** is state funding, and authorized by the General Assembly pursuant to chapter 173 on or after January 1, 2009. Regional Technical High Schools and magnet high schools located on Community College campuses funded by the CT Department of Education are considered State Facilities for purposes of these regulations. However the Six (6) "Additional Mandatory Building Project Requirements for Schools" defined in 16a-38k-5 are required for all DCS administered K-12 school projects.

IMPORTANT NOTE: Two million dollars or more means the total amount of funds appropriated by the State Legislature for the Project.

4.1.1 State Funded Public School Renovation Definition: As defined by CT OPM & DCS a *"State [Funded Public School] renovation means an undertaking whereby the designer manipulates the building envelope, electrical systems, mechanical systems, and efficiency of equipment for modification of performance, when costs are two million dollars or more. This includes entire buildings as well as isolated portions of the building. A renovation should include energy efficiency as a priority item even if [the CT Department of Higher Education is] only looking at renovating one or two of the "building systems".*

4.2 Technical Requirements for New Construction or Renovation of Public School Buildings:

The technical requirements for new construction or renovation of public school buildings are the same as the requirements for new construction of State facilities – Sections 2.2 through 2.6. In addition to these requirements, the regulations add the following requirements for schools.

4.3 Six (6) Additional Mandatory Building Project Requirements for Schools [16a-38k–5] Summary:

In addition to complying with the requirements set forth in Sections 2.2 through 2.6, all K through 12 schools must also meet the standards for **all** of following six (6) Additional Mandatory requirements as summarized below.

Six (6) Additional Mandatory Building Project Requirements for Schools [16a-38k-5] Summary:		
Item No.	**Regulation**	**Summary Description**
1.	16a-38k-5(a)	**Acoustical Standards:** All classrooms, including art rooms, music rooms, science rooms, computer rooms, and special needs, remedial and library space shall meet the acoustical standards as required under CGS § 10-285g.

4.3 Six (6) Additional Mandatory Building Project Requirements for Schools [16a-38k–5] Summary (Continued**):**

Six (6) Additional Mandatory Building Project Requirements for Schools [16a-38k-5] Summary: (Continued)		
Item No.	**Regulation**	**Summary Description**
2.	16a-38k-5(b)	**Properly Locate Outside Air Intakes:** Outside air intakes shall be located a minimum of twenty-five feet from any hazard or noxious contaminants such as vents, chimneys, plumbing vents, exhaust fans, cooling towers, street alleys, parking lots, loading docks, dumpster areas, bus loops, or any area where vehicle idling occurs. If locating an air intake within twenty-five feet of a contaminant source is unavoidable, the intake must be located a minimum of ten feet horizontal distance and two feet lower than the contaminant source.
3.	16a-38k-5(c)	**Install Gas Equipment with Electronic Ignition:** Only electronic ignitions shall be specified for gas-fired water heaters, boilers, furnaces, air handling units, and stovetops/ovens.
4.	16a-38k-5(d)	**Use Low VOC Materials:** The following materials shall be certified for low emissions of volatile organic compounds (VOCs) using specifications or certification programs listed in the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings*:
		1. 50% of adhesives and sealants used in the interior of the building;
		2. Acoustic ceiling tiles and wall panels;
		3. Interior paints;
		4. Wall coverings;
		5. Carpet systems and associated adhesives;
		6. Composite and solid wood flooring;
		7. Resilient flooring and associated adhesives.
5.	16a-38k-5(e)	**Environmental Assessment of Building Site:** The town or regional board of education and the building committee of such town or district, shall provide for a Phase I environmental site assessment in accordance with the American Society for Testing and Materials Standard #1527, Standard Practice for Environmental Site Assessments: Phase I Site Assessment Process, or similar subsequent standards, as required pursuant to CGS § 10-291. If a town, regional board of education or the building committee of such town or district suspect contamination, a Phase II Environmental Site Assessment shall be undertaken as described in American Society for Testing and Materials Standard E1903-97 or similar subsequent standards. Any contamination found shall be remedied.
6.	16a-38k-5(f)	**HEPA Vacuuming:** Prior to substantial completion of the building, vacuum all carpeted and soft surfaces with a high-efficiency particulate arrestor (HEPA) vacuum. For phased or occupied renovations, HEPA vacuum the carpet daily in occupied areas.

5.0 Building Commissioning Process for High Performance Buildings:

When DCS determines that the New Construction or the Renovation of a State Facility falls under the applicability of the regulations, then the Design Team must meet the requirements of the **High Performance Building Construction Standards for State Funded Buildings Regulations** (RCSA 16a-38k 1-9). This includes the mandatory requirement for **Building Commissioning** [16a-38k-3(a)].

5.1 Commissioning Definitions:

5.1.1 **ASHRAE Guideline 0-2005**: Is the industry recognized standard for the commissioning process. DCS has adopted this as its standard; therefore the Project Team shall follow the requirements of ASHRAE Guideline 0 – 2005 for project commissioning. The charts included in this document from the ASHRAE 0-2005 are presented for informational purposes.

5.1.2 **Basis of Design (BOD):** 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 lists of individual items that support the design process.

5.1.3 **Commissioning Agent (CxA):** The entity hired by the owner who leads, plans, schedules and coordinates the commissioning team to implement the commissioning process. The CxA shall have the following qualifications:

5.1.3.1 Has acted as the principal Commissioning Authority for at least three projects of relative size and complexity to this project over the past three (3) years. Including recent extensive experience with sustainable design and construction projects, specifically LEED projects.

5.1.3.2 Extensive experience with operation and trouble shooting of HVAC systems and energy management systems and in building operation and maintenance training.

5.1.3.3 Knowledge in testing and balancing of various media systems.

5.1.3.4 Experience with high performance system design and HVAC control strategy optimization.

5.1.3.5 Excellent verbal and written communication skills. Highly organized; and able to work with both management and trade contractors.

5.1.3.6 Experience in writing commissioning specifications.

5.1.3.7 Staff licensed as Professional Engineers in mechanical or electrical engineering is required. Trade and contracting licensure is also desirable.

5.1.3.8 The Commissioning Agent staff should be certified in building commissioning by a nationally recognized organization such as ASHRAE, the Building Commissioning Association, the Associated Air Balance Council Commissioning Group, the Association of Energy Engineers, or the National Environmental Balancing Bureau.

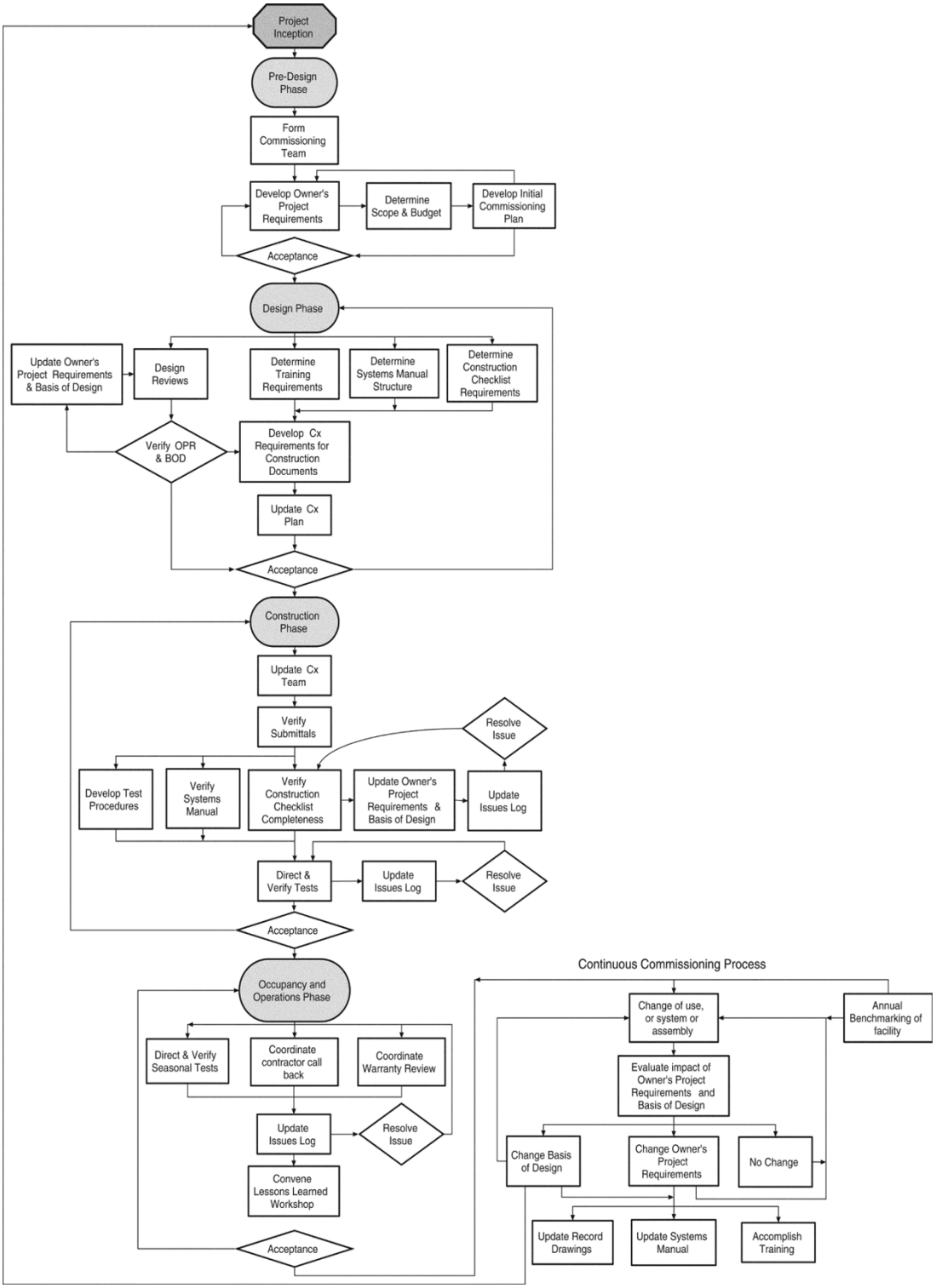
5.1.4 **Commissioning (Cx) Plan:** A plan that includes a list of all equipment to be commissioned, delineation of roles for each of the primary commissioning participants, and details on the scope, timeline, and deliverables throughout the commissioning process.

5.1.5 **Commissioning (Cx) Process:** A systematic process of ensuring that all building systems perform interactively according to the contract documents, the design intent, and the building's operational needs. Commissioning involves three phases: pre-design, construction, and warranty.

5.1.6 **Owner's Project Requirements (OPR):** A written document that details the functional requirements of a project and the expectations of how it will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

5.1.7 **ASHRAE Guideline 0 - Figure B.1 Commissioning Flow Chart:** The following Flow Chart is an example of the Commissioning Process from "Project Inception". The "Continuous Commissioning Process" shown in the Flow Chart are ongoing the tasks during the Occupancy and Operations Phase after the last "Acceptance" Flow Chart block.

5.1.7.1 ASHRAE Guideline 0 - Figure B.1 Commissioning Flow Chart:



5.1.8 ASHRAE Guideline 0 - Table D - 1 Documentation Matrix Phase: The following Table is a summary the documents that are produced during the Commissioning Process.

ASHRAE Guideline 0 TABLE D - 1 Documentation Matrix Phase:						
	Document	**Input By**	**Provided By**	**Reviewed / Approved By**	**Used By**	**Notes**
Pre-Design Phase	Owner's Project Requirements	O&M, User Agency, Capital Projects, Design Team	**CxA**	Owner	CxA, Design Team	Design Team may not be hired yet.
	Commissioning Plan	Owner, Design Team, CxA	CxA	Owner	CxA, Owner, Design Team	Design Team may not be hired yet.
	Systems Manual Outline	O&M, CxA	CxA	Owner	Design Team	May be included in OPR
	Training Requirements Outline	O&M, User Agency, CxA, Design Team	CxA	Owner	Design Team	May be included in OPR
	Issues Log	CxA	CxA	N/A	CxA, Design Team	May be only format at this phase
	Issues Report	CxA	CxA	Owner	Design Team, Owner	
	Pre-Design Phase Commissioning Process Report	CxA	CxA	Owner	Owner	Close of Phase report
Design Phase	Owner's Project Requirements Update	O&M, User Agency, Capital Projects, Design Team	**CxA**	Owner	CxA, Design Team	
	Basis Of Design	Design Team	Design Team	Owner, CA	Design Team, CxA	
	Construction Specifications for Commissioning	Design Team, CxA, Owner	**CxA**	Owner	Contractors, CxA, Design Team	May also be provided by Project Manager / Construction Administrator.
	Systems Manual Outline-Expanded	Design Team, CxA, O&M, Contractor	**Design Team**	Owner, CA	Design Team, Contractor	Contractor may not be hired yet.
	Training Requirements In Specifications	O&M, Users, CA, Design Team	**CxA**	Owner	Design Team	Contractor may not be hired yet.
	Design Review Comments	CxA	CxA	Owner	Design Team	
	Issues Log	CxA	CxA	N/A	CxA, Design Team	
	Issues Report	CxA	CA	Owner	Design Team, Owner	
	Design Phase Commissioning Process Report	CxA	CxA	Owner	Owner	Close of Phase report
Construction Phase	Owner's Project Requirements Update	O&M, User Agency, Capital Projects, Design Team	**CxA**	Owner	CxA, Design Team, Contractors	
	Basis of Design Update	Design Team	Design Team	CxA, Owner	Design Team, CxA	
	Commissioning Plan Update	Design Team, CxA, Owner, Contractor	CxA	CxA, Owner, Design Team, Contractor	CxA, Owner, Design Team, Contractors	

5.1.8 ASHRAE Guideline 0 - Table D.1 Documentation Matrix Phase: (Continued)

ASHRAE Guideline 0
TABLE D-1 Documentation Matrix Phase (Continued)

	Document	Input By	Provided By	Reviewed / Approved By	Used By	Notes
Construction Phase (Continued)	Submittal Review Comments	CxA	Design Team	Design Team	Contractor	
	Systems Coordination Plans	Contractor, Design Team	Contractor	CxA, Design Team	Contractor, CxA	
	Inspection Checklists	CxA, Contractor, Design Team	CxA	CxA, Design Team	Contractor	
	Inspection Reports	Contractor	CxA	CxA, Owner	Contractor	
	Test Procedures	CxA, Contractor, Design Team	CxA	CxA, Design Team	Contractor	
	Test Data Reports	Contractor	CxA	CxA, Owner	Contractor	
	Commissioning Meeting Agendas and Minutes	CxA	CxA	All	ALL	
	Training Plans	Design Team, CxA, O&M, Contractor	**CxA**	Owner, CxA	O&M, User Agency, Contractor	
	Systems Manual	Design Team, CxA, O&M, Contractor	Contractor	Owner, CxA	O&M, Users	
	Issues Log	CxA	CxA	N/A	CxA, Design Team, Contractor	
	Issues Report	CxA	CxA	Owner, Design Team	Design Team, Owner, Contractor	
	Preliminary Construction Commissioning Process Report	CxA	CxA	Owner	Owner	Prior to Occupancy
	Final Construction Phase Commissioning Process Report	CxA	CxA	Owner	Owner	Close of Phase Report
Occupancy And Operations	Owner's Project Requirements	O&M, Users, Design Team	**CxA**	Owner	CxA, Design Team, Contractor	
	Basis of Design Update	Design Team	Design Team	CxA, Owner	CxA, Design Team	
	Maintenance Program	O&M, Contractor, CxA	**Owner**	Owner, CxA	O&M, Users	
	Test Procedures	Contractor, CxA, O&M, Design Team	CxA	Design Team, CxA	Contractor	
	Test Data Reports	Contractor	CxA	CxA, Owner	Contractor, O&M	
	Issues Log	CxA	CxA	N/A	CxA, Design Team, Owner, Contractors	
	Issues Report	CxA	CxA	Owner	Design Team, Owner, Contractors	
	Commissioning Process Report	CxA	CxA	Owner	Owner	Final Report
	Re-Commission plan	O&M, Users, CxA	**CxA**	Owner	Owner	

6.0 Integrated Design Process for High Performance Buildings:

When DCS determines that the New Construction or the Renovation of a State Facility or State Funded School Building falls under the applicability of the regulations, then the Design Team must meet the requirements of the High Performance Building Construction Standards for State Funded Buildings Regulations (RCSA 16a-38k 1-9). This includes the mandatory requirement for the Integrated Design Process [16a-38k-3(b)]:

The Integrated Design Process is closely allied with the Commissioning Process as prescribed in ASHRAE 0-2005. While the regulation and LEED require a minimum of two (2) meetings, ASHRAE 0-2005 contemplates several meeting to provide for a coordinated and fully integrated design. The following is an outline of the regulation requirement and a summary of the ASHRAE prescribed design process.

6.1 Integrated Design Definitions:

6.1.1 Integrated Design Process: The consideration and design of all building systems and components. It brings together the various disciplines involved in designing a building and reviews their recommendations as a whole. It also recognizes that each discipline's recommendation has an impact on other aspects of the building project. Design integration is the best way to avoid redundancy or conflicts with aspects of the building project planned by others. The design integration approach allows for optimization of both building performance and cost. It also allows professionals to take advantage of efficiencies that are not apparent when they are working in isolation.

6.2 Project Stakeholders: To achieve a successful high-performance building, an interactive approach to the design process is required to set environmental and building performance goals. All of the Project's Stakeholders must participate in the Integrated Design Process throughout all of phases of the project. The list of stakeholders may include but are not limited to the following:

6.2.1 Owner Team – will include, but is not limited to:

6.2.1.1 DCS Project Manager (PM);

6.2.1.2 State Agency Representative(s), including site operations personnel;

6.2.1.3 Commissioning Agent (CxA);

6.2.1.4 Construction Administrator (CA).

6.2.2 Design Team - will include but is not limited to:

6.2.2.1 Architect (including any specialty consultants);

6.2.2.2 Mechanical Engineer;

6.2.2.3 Electrical Engineer;

6.2.2.4 Civil Engineer;

6.2.2.5 LEED AP.

6.2.3 Construction Team – will include, but is not limited to:

6.2.3.1 Construction Manager At Risk (CMR Project Delivery Method);

6.2.3.2 General Contractor;

6.2.3.3 All subcontractors (specifically mechanical, electrical, and controls contractors, etc.).

6.3 Integrated Design Scope: According to RCSA 16a-38-3(b), the Integrated Design Process includes the following minimum requirements:

6.3.1 At least one collaborative session of the Design and Owner Teams prior to the start of design to set environmental and building performance goals. This meeting shall include development and discussion of the Owner's Project Requirements, the Basis of Design, the commissioning plan and post commissioning requirements.

6.3.2 At least one collaborative session of the Design, Owner and Construction Teams prior to the start of construction, to insure knowledge of design intent, required approval processes, and commissioning procedures.

6.3.3 For more detailed information on the Integrated Design Process [16a-38k-3(b)] see the *Connecticut Building Standard Guidelines Compliance Manual for High Performance Buildings (Revised September 2011)* , which is available for download on the CT DEEP website: **http://www.ct.gov/deep/cwp/view.asp?a=4405&Q=481888&deepNav_GID=2121**

6.4 Integrated Building Design Meetings: ASHRAE Guideline 0 – 2005 recommends the Project Stakeholders participate in several Design Phase meetings during the course of the Project to collaborate and create the documents necessary to implement the strategies for High Performance Buildings.

6.4.1 Pre-Design Phase: The Owner and Design Teams shall meet to collaborate, and create High Performance Building documentation that includes but is not limited to following:

6.4.1.1 Owner's Project Requirements (OPR): The Owner and Design Teams shall meet to collaborate on the OPR. The Commissioning Agent (CxA) shall then create the OPR in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex J, Table J-1 that contains an Example Matrix For Developing Owner's Project Requirements: Below are the twenty-nine (29) "Criteria" from the OPR Matrix.

ASHRAE Guideline 0 – 2005, Annex J, Table J-1 Examples of Owner's Project Requirements (OPR) Criteria:	
.1	Project schedule and budget;
.2	Commissioning Process scope and budget;
.3	Project documentation requirements, including the Systems Manual;
.4	Owner directives;
.5	Restrictions and limitations;
.6	User requirements;
.7	Occupancy requirements and schedules;
.8	Training requirements for Owner's personnel;
.9	Warranty requirements;
.10	Benchmarking requirements;
.11	Statistical (assumed probabilistic distribution of measured values) and quality tools that are to be used;
.12	Operation and maintenance criteria for the facility that reflect the Owner's expectations and capabilities and the realities of the facility type;
.13	Equipment and system maintainability expectations, including limitations of operating and maintenance personnel;
.14	Quality requirements of materials and construction;
.15	Allowable tolerance in facility system operations;
.16	Energy efficiency and environmental sustainability goals;
.17	Community requirements;
.18	Adaptability for future facility changes and expansion;
.19	Systems integration requirements, especially across disciplines;
.20	Health, hygiene, and indoor environment requirements;
.21	Acoustical requirements;
.22	Vibration requirements;
.23	Seismic Requirements;
.24	Accessibility requirements;
.25	Security requirements
.26	Aesthetics requirements
.27	Constructability requirements
.28	Communication requirements
.29	Applicable codes and standards

6.4.1.2 Commissioning (Cx) Process Scope and Budget: The Owner and Design Teams shall meet to establish the Commissioning Process Scope and Budget in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex E. The DCS PM and the CxA shall document the final Commissioning Process and Budget.

6.4.1.3 Commissioning (Cx) Process Participants - Roles and Responsibilities: The Owner and Design Teams shall meet to define the roles and responsibilities in the Commissioning (Cx) Process participants in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex F.

6.4.1.4 Develop the Initial Commissioning (Cx) Plan: The Owner and Design Teams shall meet to develop the Commissioning (Cx) Plan. The CxA shall then create the Commissioning (Cx) Plan in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex G, Commissioning Plan.

6.4.1.5 Acceptance Plan of the Commissioning Process Activities: The Owner and Design Teams shall meet to develop an Acceptance Plan for the Commissioning (Cx) Process Activities. The CxA shall then create the Commissioning (Cx) Acceptance Plan in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex H.

6.4.2 Design Phase: The Owner and Design Teams shall meet to collaborate, and create High Performance Building documentation that includes but is not limited to following:

6.4.2.1 Basis of Design (BOD): The Owner and Design Teams shall meet to document following Basis of Design (BOD) issues. The Design-Team shall create the BOD in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex K. Below are examples Basis of Design (BOD) create the BOD.

ASHRAE Guideline 0 – 2005, Annex K Examples of Basis of Design (BOD):		
.1	Specific codes, standards, and guidelines considered during the design of the facility and designer interpretations of such requirements;	
.2	Information regarding ambient conditions (climatic, geologic, structural, existing construction) used during the design of the facility;	
.3	Assumptions regarding usage of facility;	
.4	Expectations regarding system operation and maintenance;	
.5	Performance criteria that the system was required to meet – linked to Owner's Project Requirements (OPR);	
.6	Specific design methods, techniques, software;	
	.1	See Energy Performance [16a-38-3c] from the Mandatory Requirements for acceptable energy modeling software programs.
.7	Narrative from the designer that describes how the designer intends to meet Owner's Project Requirements (OPR).	
.8	A Narrative statement of – that how the facility is expected to operate under various situations (such as normal operation, extreme event, and emergency);	
.9	A list of specific manufacturer makes and models used as the basis for drawings and specifications.	

6.4.2.2 Develop Commissioning (Cx) Specifications Standards: The Owner and Design Teams shall meet to develop the standards for comprehensive Commissioning (Cx) Specifications. The Design-Team shall create comprehensive Commissioning (Cx) Specifications for the Project in accordance with the recommendations of ASHRAE Guideline 0 – 2005, Annex L.

6.4.2.3 Update Owner's Project Requirements (OPR) and Basis of Design (BOD): The Owner and Design Teams shall meet to review and comment on the ability of the design to achieve the Owner's Project Requirements (OPR) and Basis of Design (BOD). The Commissioning Agent (CxA) shall then update the OPR and the Design-Team shall then update the BOD.

6.4.2.4 Update Commissioning (Cx) Plan: The Owner and Design Teams shall meet to review and comment on the ability of the design to achieve the Commissioning (Cx) Plan. The Commissioning Agent (CxA) shall then update the Cx Plan.

END - 0450 - Capital Projects High Performance Building Guidelines