SUSTAINABLE, ENERGY - EFFICIENT PUBLIC BUILDINGS PROGRAM
WHAT?

NEW LEGISLATION ADDRESSING NEW AND RENOVATED MAJOR PUBLIC FACILITIES.

N.C.G.S. 143-135.35 thru 143-135.40
(Senate Bills 668 and 1946)
1. MADE RECOMMENDATIONS FOR IMPLEMENTATION OF THE LEGISLATION.
2. PROVIDE ON-GOING ADVICE TO THE SCO.
3. FUTURE RECOMMENDATIONS TO THE LEGISLATURE FOR ADDITIONAL SUSTAINABILITY REQUIREMENTS.

Doug Brinkley  US Green Building Council Co-Chair
Bill Laxton  DENR
Ginger Scoggins  ASHRAE
Jeff Tiller  ASU Energy Center
Tommy Harrill  SCO
Robert Fraser  NCSU
Jim Wise  RMF Engineering Inc.
Herb Stanford  Stanford White Co-Chair
Bob Powell  NC A&T
Herb Eckerlin  NCSU
Julie McLaurin  AIA O'Brien Atkins
Renee Hutcheson  AIA Small Kane
Rod Rabold  NC Commissioning Task Force/UNC CH
Thomas Hunter  NC Community College System
APPLIES TO MAJOR FACILITIES

- STATE-OWNED BUILDINGS, UNIVERSITY AND COMMUNITY COLLEGE BUILDINGS.
- NEW CONSTRUCTION: 20,000 GSF OR LARGER.
- RENOVATION: 20,000 GSF OR LARGER, WHERE COST OF RENOVATION EXCEEDS 50% OF INSURANCE VALUE.
Minimum Energy Performance Goals

- REDUCE NEW BUILDING ENERGY CONSUMPTION BY 30+% COMPARED TO THE REQUIREMENTS OF ASHRAE STANDARD 90.1-2004.

- 20+% ENERGY REDUCTION FOR RENOVATED BUILDINGS.
Minimum Water Performance Goals

- **20% LESS WATER CONSUMPTION FOR INDOOR PLUMBING COMPARED TO THE 2006 N.C. STATE PLUMBING CODE.**

- **50% LESS WATER CONSUMPTION FOR OUTDOOR LANDSCAPING BY APPROPRIATE TURFGRASS PLANTING AND REDUCED SPRINKLER APPLICATION.**
COMMISSIONING

- ENSURE DESIGN INTENT AND IS WELL DEFINED.

- ENSURE THAT THE BUILDING FUNCTIONS IN ACCORDANCE WITH THAT DESIGN INTENT.
Minimum Performance Goals

PERFORMANCE VERIFICATION

- WATER AND ENERGY CONSUMPTION METERING REQUIRED.
- 12-MONTH MONITORING PERIOD AFTER BUILDING OCCUPANCY (10 month “trending” evaluation).
WHEN?

NEW REQUIREMENTS FOR SUSTAINABLE, ENERGY EFFICIENCY BUILDINGS BECAME EFFECTIVE AUGUST 8, 2008.
WHY?

1. SUSTAINABLE, ENERGY-EFFICIENT BUILDINGS ARE ENVIRONMENTALLY PREFERABLE.

2. SUSTAINABLE, ENERGY-EFFICIENT BUILDINGS ARE ECONOMICALLY PREFERABLE.
ENVIRONMENT

◆ REDUCE RESOURCE DEPLETION…ENERGY AND WATER.
◆ REDUCE GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE IMPACT.
◆ REDUCE WATER RUNOFF AND POLLUTION.
◆ IMPROVE QUALITY OF LIFE.

STATE POLICY: THE RIGHT THING TO DO!!!
ECONOMICS

- 30-50% REDUCTION IN UTILITY COSTS.
- 0-4% INCREASED CAPITAL COSTS.
- 0-5 YEAR TYPICAL SIMPLE PAYBACK.
- SIGNIFICANTLY REDUCED LIFE-CYCLE COSTS.

STATE POLICY: THE RIGHT THING TO DO!!!
HOW?

STAKEHOLDER COMPLIANCE
OWNING AGENCIES

STAKEHOLDERS

DESIGNERS

CONTRACTORS
OWNING AGENCIES

- DESIGN PROCESS
- COMMISSIONING
- PERFORMANCE VERIFICATION

STAKEHOLDER COMPLIANCE AND IMPACTS
DESIGN PROCESS

❖ ALL MAJOR BUILDINGS MUST GO THROUGH ADVANCE PLANNING.
❖ THE ENTIRE DESIGN TEAM MUST BE ASSEMBLED AND WORK TOGETHER DURING ADVANCE PLANNING... THE OWNER IS A TEAM MEMBER!
❖ COMMISSIONING AGENT MUST PARTICIPATE IN THE DESIGN PROCESS.
❖ 0-15% INCREASED DESIGN FEES ANTICIPATED (1% OR LESS OF CONSTRUCTION COST).
COMMISSIONING REQUIREMENTS

Public agency, designer, and SCO must determine what level of commissioning is appropriate.

Start no later than the schematic design phase of the project.

Continue through the initial operations of the building.
COMMISSIONING GUIDELINES

ASHRAE/NIBS Guideline 0-2005: The Commissioning Process
(Used as the foundation of ASHRAE Guideline 1, NIBS Guideline 3, and other Total Building Commissioning Process technical guidelines)

1. ASHRAE Guideline 1-2007
   HVAC&R Technical Requirements for the Commissioning Process

2. NIBS Guideline 3-2005
   Exterior Enclosure Technical Requirements for the Commissioning Process

3. Guidelines 2-200X & 4-200X through 14-200X
   Technical commissioning guidelines dealing with structure, electrical, lighting, interiors, plumbing, etc.
OPTION 1: DESIGNER-LED COMMISSIONING

- APPROPRIATE FOR SMALLER, LESS COMPLEX BUILDINGS.
- DESIGNER WRITES A “BASIS OF DESIGN” AND DEVELOPS COMMISSIONING SPECIFICATIONS, INCLUDING START-UP AND FUNCTIONAL PERFORMANCE TESTS.
- DESIGNER PARTICIPATES IN AND VERIFIES TAB, START-UP, AND FUNCTIONAL TESTING.
OPTION 2: INDEPENDENT, 3rd PARTY COMMISSIONING

Third party commissioning authority (CxA) necessary on larger, more complex projects.

The CxA is independent of the design team and construction contractors.

CxA is an agent of the owner.
OWNER’S RESPONSIBILITIES DURING COMMISSIONING

- Representative of the owner responsible for O&M of the building must be involved in the entire Cx process.

- Owner’s assigned project planning and Capital Project Coordinator(s) must also participate in all Cx phases.
OWNER’S RESPONSIBILITIES DURING PERFORMANCE VERIFICATION

- Collect and validate utility metering, sub-metering, and BMS data for a period of 12 months.
- If water or energy use exceeds model projections by 15%, investigate and resolve any issues found, or recommend future corrections or modifications.
- Provide performance report to SCO and State Energy Office.
DESIGNERS

- DESIGN PROCESS
- COMMISSIONING
- PERFORMANCE VERIFICATION

STAKEHOLDER COMPLIANCE AND IMPACTS
Appendix A of Committee Report: Identifies changes to the State Construction Manual (green text):

- Advance Planning
- Integrated Design Process
- Analysis of Design Alternatives
ADVANCE PLANNING

- Evaluate building geometry, daylighting depth, and site development implications for north and south exposure.

- Identify and review potential energy and water conservation strategies for the building type and location for analysis during Schematic Design phase.
INTEGRATED DESIGN

What Is INTEGRATED DESIGN?

- Integrated team approach.
- Project delivery approach that uses the best skills and knowledge of all the stakeholders.
- Encourage and promote multi-lateral sharing.
- Team members are involved in the process.
- Risks are collectively managed and appropriately shared.
INTEGRATED DESIGN

Who Is on The Integrated Design Team?
INTEGRATED DESIGN

Key Principles of Integrated Design
- Collaboration
- Communication
- Informed decision making earlier
- Team approach process
- Life-cycle cost-based decision making
INTEGRATED DESIGN

How Is Integrated Design Implemented?

- Team meets and sets clearly defined project goals.
- Team establishes strategies to be employed.
- Assignments of responsibilities are made.
- Tools, deliverables, timelines are agreed upon.
- Regular meetings to make decisions, evaluate progress, and make adjustments as needed.
ANALYSIS OF DESIGN ALTERNATIVES

APPLY LIFE-CYCLE COSTING TO ALL SIGNIFICANT DESIGN DECISIONS.
<table>
<thead>
<tr>
<th>Component</th>
<th>Alternatives to Analyzed</th>
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<tbody>
<tr>
<td>Predesign</td>
<td>Maintain status quo (do nothing)</td>
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<td>New acquisition or construction</td>
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<td>Leasing</td>
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<td>Renovation, upgrade, or revitalization of an exiting facility</td>
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<td>Use of other state facilities</td>
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<tr>
<td>Site and Program</td>
<td>Building shape and orientation on the planned site (including impact on adjacent buildings)</td>
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<td></td>
<td>Alternative site(s)</td>
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<tr>
<td>Architecture</td>
<td>Substructure</td>
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<td>- Foundations</td>
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<td>- Slab on grade</td>
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<td>- Basement excavation</td>
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<td></td>
<td>- Basement and retaining walls</td>
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<td></td>
<td>Superstructure</td>
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<td></td>
<td>- Floor construction</td>
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<td>- Roof construction</td>
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<td>- Stair construction</td>
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<td></td>
<td>Wall construction</td>
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<td>- Increased insulation levels, insulation placement, etc.</td>
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<td>- Mass (passive solar thermal storage)</td>
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<td>- Daylighting</td>
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<td>- Building envelope (exterior closure) type</td>
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<td>Fenestration</td>
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<td>- Type, amount, and location/orientation of glass</td>
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<td>- Indoor/outdoor shading devices</td>
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<td>- Daylighting</td>
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<td>Interior space plan</td>
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<td></td>
<td>- Space arrangement</td>
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<tr>
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<td>- Circulation</td>
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<td></td>
<td>- Finishes and colors</td>
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<tr>
<td></td>
<td>- Ceiling heights</td>
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<tr>
<td></td>
<td>Roof construction</td>
</tr>
<tr>
<td></td>
<td>- Increased insulation levels, type of insulation</td>
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<td></td>
<td>- Roof membrane type and color</td>
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<td></td>
<td>- Daylighting</td>
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<tr>
<td>Conveyances</td>
<td>HVAC</td>
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<tr>
<td>Selection of elevators and dumbwaiters</td>
<td>Secondary HVAC system(s)</td>
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<tr>
<td>Escalators</td>
<td>System(s) type(s) and zoning</td>
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<tr>
<td></td>
<td>Economizer cycle(s)</td>
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</tbody>
</table>
ENERGY MODELING IS THE KEY TO LCCA!

Calculation methodology of ASHRAE 90.1-2004 Appendix G must be used to establish percentage improvement of proposed building over a baseline ASHRAE 90.1-2004-compliant building.

Pre-approved modeling software: DOE-2, Blast, EnergyPlus, eQUEST, EnergyPro, Carrier Hourly Analysis Program (HAP), and Trane Trace.
Energy modeling reports must be submitted beginning in the schematic design phase and be completed no later than the Design Development Phase.

The design energy model shall be updated, if necessary, and re-submitted in the Construction Document Phase.

Energy strategies shall be utilized for variable building elements, as applicable for each project. Each of the following categories shall be evaluated, and decisions on which items will be pursued shall be summarized in Energy Model summary:

- Building Envelope
- Lighting control and lighting design
- HVAC system design and control
- Service water heating systems
ENERGY MODELING CONDITIONS & CONSTRAINTS

- Same energy simulation software program shall be used for each phase (SD, DD, CD) of the project submittal, as well as for each energy conservation strategy. (Exceptions may be allowed by SCO.)

- An unlimited number of options may be modeled for each building, but design team must use judgment to determine options resulting in best energy savings and lower first costs, which will be compared in the resultant life cycle cost analysis to provide an overall lowest building cost for the long term.
CxA RESPONSIBILITIES DURING DESIGN

- Helps the owner to develop and maintain the Owner’s Project Requirements (OPR).
- Reviews SD, DD and CD documents.
- Provides design team draft commissioning specifications.
- Helps inform contractors of typical assistance required.
DESIGNER RESPONSIBILITIES DURING COMMISSIONING

- Participates in the Cx process.
- Maintains and updates the “Basis of Design” document throughout the project.
- Provides “Basis of Design” document training to facility personnel at completion of the project.
DESIGNER RESPONSIBILITIES FOR PERFORMANCE VERIFICATION

- Ensures all energy and water metering, sub-metering, and BAS monitoring requirements are met.
- Assists owner in validating metered data.
- Assists in evaluation and recommends solutions if energy or water consumption exceeds goals.
CONTRACTORS

- SUSTAINABLE DESIGN ELEMENTS
- COMMISSIONING
- PERFORMANCE VERIFICATION
SUSTAINABLE DESIGN ELEMENTS

- Use of new materials.
- Use of old materials in new ways.
- More integrated building systems.
- Better quality of construction of construction required.
CxA RESPONSIBILITIES DURING CONSTRUCTION

- Review materials, equipment, and systems submittals.
- Review contractor’s start up tests.
- Verify TAB effort.
- Conduct functional testing of building systems and components.
- Review contractor’s O&M manuals, as-built documentation, and training agendas.
CONTRACTOR RESPONSIBILITIES FOR PERFORMANCE VERIFICATION

- Assist owner in validating metered data.
- Assist in evaluation and recommend solutions if energy or water consumption goals are not met.
END RESULT?

BUILDINGS THAT MEET PROGRAM PERFORMANCE GOALS FOR SUSTAINABILITY, ENERGY AND WATER EFFICIENCY, AND THAT WORK!
ADDITIONAL INFORMATION

http://www.nc-sco.com/

◆ MANUAL
  ■ STATE CONSTRUCTION MANUAL

◆ GUIDELINES
  ■ “SUSTAINABLE, ENERGY EFFICIENT BUILDINGS ADVISORY COMMITTEE REPORT”
  ■ “LIFE CYCLE COST ANALYSIS”
  ■ “ENERGY AND WATER EFFICIENT BUILDING DELIVERABLES CHECKLIST”
  ■ “WATER CONSERVATION”

◆ FORMS
  ■ WATER CONSUMPTION PERFORMANCE
  ■ FINAL REPORT CHECKLIST
Energy Efficient Buildings

OC-25 Cost Estimates

Michael Hughes
State Construction Office
www.nc-sco.com
§ 143-341. Powers and duties of Department.

The Department of Administration has the following powers and duties:

(1) Repealed by Session Laws 1979, 2nd Session, c. 1137, s. 38.

(2) Purchase and Contract:
   a. To exercise those powers and perform those duties which were, at the time of the ratification of this Article, conferred by statute upon the former Division of Purchase and Contract.

(3) Architecture and Engineering:
   a. To examine and approve all plans and specifications for the construction or renovation of:
      1. All State buildings or buildings located on State lands, except those buildings over which a local building code inspection department has and exercises jurisdiction, and
      2. All community college buildings requiring the estimated expenditure for construction or repair work for which public bidding is required under G.S. 143-129 prior to the awarding of a contract for such work; and to examine and approve all changes in those plans and specifications made after the contract for such work has been awarded.
   b. To certify that a statement of needs pursuant to G.S. 143C-3 is feasible. For purposes of this sub-subdivision, "feasible" means that the proposed project is sufficiently defined in overall scope, building program, site development, detailed design, construction, and equipment budgets, and comprehensive project scheduling so as to reasonably ensure that it may be completed with the amount of funds requested. At the discretion of the General Assembly, advanced planning funds may be appropriated in support of this certification. This sub-subdivision shall not apply to requests for appropriations of less than one hundred thousand dollars ($100,000).
   c. To supervise the letting of all contracts for the design, construction or renovation of all State buildings and all community college buildings whose plans and specifications must be examined and approved under a. of this subdivision.
   d. To supervise and inspect all work done and materials used in the construction or renovation of all State buildings and all community college buildings whose plans and specifications must be examined and approved under a. of this subdivision, and no such work may be accepted by the State or by any State agency until it has been approved by the Department.
   e. To require all State agencies to use existing plans and specifications for construction projects, where feasible. Prior to designing a project, State agencies shall consult with the Department of Administration on the availability of appropriate existing plans and specifications and the feasibility of using them for a project.

Except for sub-subdivisions b, b1., and e. of this subdivision, this subdivision does not apply to the design, construction, or renovation of projects by The University of North Carolina pursuant to G.S. 116-31.11.

(4) Real Property Control:
   a. To prepare and keep current a complete and accurate inventory of all land owned or leased by the State or by any State agency. This inventory shall show the location, acreage, description, source of title and current use of all land (including swamplands or marshlands) owned by the State or by any State agency, and the agency to which each tract is currently allocated. Surveys may be made where necessary to obtain information for the purposes of this inventory. Accurate plats or maps of all such land may be prepared, or copies obtained where such maps or plats are available.
   b. To prepare and keep current a complete and accurate inventory of all buildings owned or leased (in whole or in part) by the State or by any State agency. This inventory shall show the location, amount of floor space and floor plans of every building owned or leased by the State or by any State agency, and the agency to which each building, or space therein, is currently allocated. Floor plans of every such building shall be prepared or copies obtained where such floor plans are available, where needed for use in the allocation of space therein.
Welcome to the State Construction Office

Our Purpose

The purpose of the State Construction Office is to provide professional architectural and engineering services and management leadership to state agencies. For more information, visit...

Our Mission: To direct and guide the state’s capital facilities development and management process. For more information, visit...

Quick Links

- InterScope (Agencies, Designers, Contractors)
- HUB Office
- Vendor Link
- Downtown Map with Parking
- General Assembly Home Page

State of Construction Buildings

- Funding Requests: $ 5,516,233,297
- PCAP Renovation Needs: $ 3,755,196,501
SCO GOES ELECTRONIC

Contractor Evaluations
Designer Evaluations
OC-25 Cost Estimates

Coming Soon: Electronic Change Orders

View your project data on-line.

Go to
http://www.nc-sco.com
(InterScope Quick Link)

Demonstrations and help with initial SCO Logins
ROOM 9
McKImmon Center
### COST ESTIMATE DETAIL

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<th>2003</th>
<th>OC-25#:</th>
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<td>Submitted By:</td>
<td>alopez</td>
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<td>Date Approved:</td>
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<tr>
<td>Description and Justification:</td>
<td>(Attach additional data as necessary to indicate need, size, function of improvements as well as master plan. Verify if compliance with GS 143-135.35 - 143-135.40, Sustainable, Energy Efficient Buildings, is required.)</td>
<td>Date Returned:</td>
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<td>B.</td>
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<td>B.</td>
<td>Site Demolition</td>
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<td>Site Work</td>
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<td>C.</td>
<td>Construction/Utility Services</td>
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<tr>
<td>C.</td>
<td>Construction/Building Demolition</td>
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<td>C.</td>
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<td>C.</td>
<td>Construction/Building Plumbing</td>
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+2%
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<thead>
<tr>
<th>ESTIMATED CONSTRUCTION COSTS:</th>
<th>[Calculate using: Percentage Total]</th>
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</thead>
<tbody>
<tr>
<td>CONTINGENCIES:</td>
<td>[Percentage of Estimated Construction Costs [3% New or 6% R&amp;R]]</td>
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<tr>
<td>DESIGN FEE:</td>
<td>[Percentage of Estimated Construction Costs + Contingencies]</td>
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<tr>
<td>COMMISSIONING FEE:</td>
<td>[0.5% simple; 1.0% moderate, 1.5% complex]</td>
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<tr>
<td>ADVANCE PLANNING:</td>
<td>[Includes programming, feasibility, analysis]</td>
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<td>FIXED OWNER COST:</td>
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<tr>
<th>ESTIMATED COSTS:</th>
<th>[Estimated Construction Costs + Contingencies + Design Fee + Commissioning Fee + Advance Planning]</th>
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<tr>
<td>Escalation % = 0.07% per month multiplied by number of months</td>
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<tr>
<td>(From Est Date to mid-point of construction) =</td>
<td>months</td>
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<td>ESCALATION COST INCREASE:</td>
<td>[Total of Estimated Construction Costs X Escalation %]</td>
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<tr>
<td>TOTAL ESTIMATED PROJECT COSTS:</td>
<td>[Estimated Costs + Escalation Cost Increase]</td>
</tr>
</tbody>
</table>

* Attach basis and justification for estimate, include description, quantities, units, special features, similar cost on recent projects, etc.
** Include items such as grading, roads, walks, parking, etc.
*** Attach explanation of any special building, mechanical, or electrical service requirements with appropriate distance to existing buildings, water, gas, electrical or other utility service.

Attachments

Comments

Discussions

Internet
ENERGY PERFORMANCE MODELING AND REPORTING

by the

Sustainable, Energy Efficient Buildings Advisory Committee
BUILDING COMMISSIONING

by the

Sustainable, Energy Efficient Buildings Advisory Committee
**ESTIMATED CONSTRUCTION COSTS:**

- CONTINGENCIES: [ ] Percentage [ ] Total
- DESIGN FEE: [ ] Percentage of Estimated Construction Costs [ ] (Percentage of Estimated Construction Costs + Contingencies)
- COMMISSIONING FEE: [ ] Percentage of Estimated Construction Costs [ ] (0.5% simple; 1.0% moderate; 1.5% complex)
- ADVANCE PLANNING: [ ] Percentage [ ] (Includes programming, feasibility, analysis)
- FIXED OWNER COST: [ ]

**ESTIMATED COSTS:**

(Estimated Construction Costs + Contingencies + Design Fee + Commissioning Fee + Advance Planning) [ ]

Escalation % = 0.67% per month multiplied by number of months
(From Est. Date to mid-point of construction) = [ ] months [ ] %

**ESCALATION COST INCREASE** (Total of Estimated Construction Costs X Escalation %) [ ]

**TOTAL ESTIMATED PROJECT COSTS:** (Estimated Costs + Escalation Cost Increase) [ ]

* Attach basis and justification for estimate, include description, quantities, units, special features, similar cost on recent projects, etc.
** Include items such as grading, mids, walks, parking, etc.
*** Attach explanation of any special building, mechanical, or electrical service requirements with appropriate distance to existing buildings, water, gas, electrical or other utility service.
### ESTIMATED CONSTRUCTION COSTS:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tr>
<td>CONTINGENCIES:</td>
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<td>DESIGN FEE:</td>
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<td>ADVANCE PLANNING:</td>
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<tr>
<td>FIXED OWNER COST:</td>
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</table>

### ESTIMATED COSTS:

*(Estimated Construction Costs + Contingencies + Design Fee + Commissioning Fee + Advance Planning)*

### Escalation % = 0.67% per month multiplied by number of months

(From Est. Date to mid-point of construction) = [ ] months [ ] %

### ESCALATION COST INCREASE (Total of Estimated Construction Costs × Escalation %)

### TOTAL ESTIMATED PROJECT COSTS: *(Estimated Costs + Escalation Cost Increase)*

* Attach basis and justification for estimate, include description, quantities, units, special features, similar cost on recent projects, etc.

** Include items such as grading, mafs, walks, parking, etc.

*** Attach explanation of any special building, mechanical, or electrical service requirements with appropriate distance to existing buildings, water, gas, electrical or other utility service.

### Attachments

- **Upload:**
- **Browse:**

### Comments

- **Comment:**