

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

**PART 1: GENERAL**

1.01 General Requirements

- A. These guidelines are intended to provide a framework to evaluate building projects for the University of Texas at Austin to:
  - 1. Verify the feasibility of options which deviate from the guidelines provided elsewhere within the Design Standards.
  - 2. Establish project budgetary costs and energy impact.
- B. Designers wishing to provide non-standard solutions for building projects which may provide better value or superior sustainability features over construction projects defined by the design standards are encouraged to follow these guidelines for justification. The design team must notify the UT project manager of intent to provide an alternative solution to baseline design types identified within the design standards at the onset of the project. This notification should take place early in the project will during the Pre-Schematic Design Phase. If required, additional alternates may be investigated during the Schematic Design phases.
- C. After the design approach is approved, development of budgetary costs including construction budget, annual operating budgets impacts to campus utilities will be required.
- D. All projects will require the completion of the Energy Impact Statement; refer to the appendix for instructions and format.

1.02 Methodology:

A. General

The following process will be incorporated into the design plan for project teams which seek to incorporate alternative building systems into their designs and to assist in establishing project budgetary costs and energy impact. This process will ensure that the proposed project will provide the best value to the University. Best value will be determined on the basis of a weighted scoring system which will include the results of Life Cycle Cost (LCC) analyses and, as required, the qualitative benefits of sustainable design.

B. Definitions

- 1. Design Team – Third party designers or design/builders retained by the University to design building or building systems.

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

2. UT Project Team – Team of individuals employed by the University charged with oversight and steering of the project to ensure compliance with goals of the University.
3. Project Team – Members of both the Design and UT Project Teams.

#### C. Schedule / Milestones

1. Project Evaluation Workshop

During the Pre-Schematic Design phases, the Project Team will hold a Project Evaluation Workshop. The intent of this workshop is for the Design Team to identify any proposed alternates to the Design Standards and establish Project Sustainability Goals. Once identified, the team will then identify the method(s) of LCC analysis, the social and environmental impacts of the alternate(s), and confirm project parameters and data, including information requested from the University.

2. Project Design Evaluation

Evaluation alternates will be completed during the Schematic Design phase by the Design Team.

2. Project Evaluation Reviews

During the Schematic Design phase, the Project Team will meet to review the initial findings of the LCC analysis. The Design Team will present a comparison of alternatives to the baseline project, as defined by the Design Standards. The purpose of the review is to enable the Project Team to make decisions based on the Project Sustainability Goals. At this time, the UT Project Team will be given an opportunity to identify sensitivity criteria to investigate for the next review. This process will be repeated at least once more, at the discretion of the UT Design Team, before the conclusion of Design Development.

#### D. Project Evaluation Comparative Studies

1. Procedural Guidelines

The primary method of Project Evaluation Comparative Studies (PECS) will be a comparison between two or more alternatives for each of the topics identified for study during the Project Evaluation Workshop. The alternatives should be viable options under consideration for the project.

The PECS will be formally documented and reviewed twice during the design process, during the Schematic Design and Design Development

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

phases. However, the principles and knowledge gained by these studies are applicable at any stage in the design process. The Project Team will work together in the preliminary design stages to lay out the schedule and study categories to maximize the value of these studies for each specific project.

#### **3. Study Categories**

The following building systems shall serve as the basis for the selection of the comparative studies:

1. Energy Systems
2. Electrical Systems
3. Building Envelope
4. Siting / Massing Strategies
5. Structural Systems
6. Mechanical Systems
7. Water Systems
8. Interior Systems

Certain study categories may be more relevant to particular building types or projects and project-specific priorities will be established at the initial Project Evaluation Workshop in the Pre-Schematic Design phase. However, the above study categories/ building systems do not operate in isolation. The energy and life cycle cost models shall be developed with an understanding and acknowledgement of the inter-relationship of building systems. For example, this fact is very critical when evaluating issues such as quantity, capacity, and placement of air handling equipment.

#### **E. Development of Annual Operating Budget**

Following the Final Selection and Design Approval Process, a budget for the ongoing operations of the selected facility must be established by the design team. This budget will contain many of the components of the life cycle evaluation (discussed in greater detail in subsequent sub-sections of this Standard). These costs include:

- Operations and maintenance costs
- Energy costs
- Water / wastewater costs

The capture of these costs at the onset of the construction project will provide the University with a mechanism for budget planning.

#### **F. Documentation**

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

The following is a summary of documentation requirements for the Project Evaluation Process:

1. Record of Project Sustainability Goals from the Project Evaluation Workshop, including benchmarking objectives and metrics. Include in the project Scoping, Programming or Feasibility Study Report as required.
2. Record of project evaluation criteria to be evaluated, including social and environmental impacts, project parameters and data. Include in the project Scoping, Programming or Feasibility Study Report as required.
3. Record of largest energy impacts & priorities based on preliminary energy model in conjunction with the MEP Design Intent document.
4. Record of the initial LCC results in conjunction with the MEP Design Intent document submitted at the conclusion of Schematic Design. Refer to the Appendix for the LCC analysis template.
5. Updated project budget and schedule with justified elements incorporated.
6. Record of the refined LCC results in conjunction with the MEP Basis of Design document submitted at the conclusion of Design Development.
7. Final energy model report. Refer to Section 2.04 for contents of report.
8. Provide a projected Annual Operating Budget, Energy Impact Statement, and Initial Construction Budget for the project.

## **PART 2: LIFE CYCLE COST EVALUATION**

### **2.01 Life Cycle Cost Evaluation**

#### **A. General**

The Life Cycle Cost (LCC) process will be used to:

1. Evaluate project alternates.
2. Establish budgets for the final approved project.

The LCC process of evaluating project alternatives is a differential analysis. For portions of a project which are common to all alternatives (e.g. the shell of the building in an evaluation of different HVAC systems) it is not necessary to include cost estimates or operations and maintenance estimates for those portions which are common. Because this analysis is differential it is important to remember that the specific LCC value of each alternative are not specifically meaningful (operating budgets should not be based solely on these results) but rather only the differential between alternatives is important.

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

Once design alternates are chosen, new budgets considering the entire project scope must be developed. The methods below will also be utilized to establish these new budgets.

Refer to the Appendix for the LCC template.

2.02 Construction Cost Projection

A. Option 1 – Constructor’s Budget Estimate (Preferred)

For projects which are to be constructed by design-build teams, CM at risk teams, or CSP teams, provide actual working budget estimates for the construction of proposed alternatives. A budget for the baseline system must also be provided for inclusion in the baseline LCC model.

B. Option 2 – Engineer’s Opinion of Probable Cost

For design-bid-build projects, this option will be compiled using a combination of vendor quotes and published cost sources. Vendor quotes are preferred for major equipment purchases. If utilized, Project Team must ensure appropriate markups for contractor purchasing, handling and profit are added to equipment quotes to ensure true market conditions are reflected.

A published cost source for construction specific pricing such as RS Means Construction Cost Data books should be used to compile the estimate for the balance of the project. Ensure markups for overhead and profit as well as the city cost index for Austin, Texas are included in the compiled estimates.

C. Contingency

A 30% contingency factor should be applied to each alternative being studied since this estimate is being prepared in advance of the more refined design stages. This contingency should be included regardless of whether the estimate is generated by the contractor or the A/E.

D. Financial Terms

Construction cost inflation rate:..... 3.0% annually  
Term of financing: ..... 25 years  
Finance rate:..... 6.0% annually

The engineer’s opinion of probable cost shall also include appropriate cost for design, construction administration, and commissioning as based on a percentage of construction cost, as directed by the University.

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

#### E. Documentation

The engineer's opinion of probable cost shall be provided in sufficient detail such that costs for each CSI MasterFormat™ (2004 Edition) division are identified. Backup documentation, such as vendor quotes or contractor estimates shall be provided upon request of the University.

Consider impacts to all building components or systems. For example, be sure to capture cost savings for reductions in building foot print due to consolidation of mechanical spaces.

### 2.03 Operations and Maintenance

#### A. General

As it pertains to LCC development, operations and maintenance (O&M) costs encompass all costs of ownership outside of initial construction cost and energy, water, or wastewater consumption costs. Custodial costs, the cost of consumables (e.g. air filters, lubricating oil, etc.), and corrective repairs would all be considered to be O&M.

#### B. Option 1 – Vendor Quote (Preferred)

To implement this option, the Design Team would solicit quotes for annual service contracts from 3<sup>rd</sup> party maintenance providers in the Austin area. Quotes must be obtained for each of the systems to be analyzed (including the baseline system) from the same vendor to ensure an apples-to-apples comparison. The annual service contract quote should be for an all-inclusive service plan which includes regular service visits for preventative maintenance as well as inclusion of replacement parts and consumables.

#### C. Option 2 – Published Maintenance Cost

In lieu of soliciting quotes for maintenance contracts, the Design Team can develop O&M costs using a published cost sources such as the RS Means Maintenance and Repair Cost Data or the Whitestone Research Building Maintenance and Repair Cost Reference. Each volume is a comprehensive source of building maintenance and repair cost statistics.

These references define the cost to maintain a building and its systems over its service life. They also provide the average lifetime of a specific building components. Each volume provides detailed O&M cost information, including regional cost indexes to tailor cost information to the Austin area.

#### D. O&M Cost Types

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

1. Annually Recurring Maintenance Costs

These costs are also sometimes referred to as cyclical costs. Most vendor quotes or published sources will provide costs as annual values. Added facility personnel costs resulting from new equipment would be included in this category. Proposed long-term maintenance service agreements and extended warranty costs can be annualized and also added to the baseline annual operations & maintenance costs.

2. Non-annually recurring maintenance costs

As the name implies, these costs are not incurred each year, but when they do occur they may be substantial. An example of such a cost would be replacement of a building system component at a discrete time during the analysis period.

E. Financial Terms

O&M escalation rate:..... 3.0% annually

F. Documentation

Backup documentation, such as vendor quotes or contractor estimates shall be provided upon request of the University.

2.04 Energy Projections

A. General

Energy modeling is a prerequisite to conducting the Life Cycle Cost analysis component of the comparative studies. A preliminary energy model will be developed in the Schematic Design phase in order to identify and document the largest energy impacts of the project. This energy model will also serve as the platform from which to analyze energy consumption rates of the alternate options in both the Schematic and Design Development phases. The energy model will continue to be refined throughout the design phases. A final run of the model incorporating the selected alternative design elements will be performed and documented prior to the conclusion of Construction Documentation phase to establish the annual energy budget. Energy projections must be developed using an energy simulation program.

B. Software Requirements

The simulation program shall be a computer-based program for the analysis of energy consumption in buildings. The simulation program shall include calculation methodologies for the building components being modeled. The

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

simulation program shall be approved by the University and shall, at a minimum, have the ability to explicitly model all of the following:

- A minimum of 1400 hours per year
- Hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat set points, and HVAC system operation, defined separately for each day of the week and holidays
- Thermal mass effects
- Ten or more thermal zones
- Part-load performance curves for mechanical equipment
- Capacity and efficiency correction curves for mechanical heating and cooling equipment
- Air-side and water-side economizers with integrated control

In addition, the simulation program shall have the ability to either directly determine the design energy cost and energy cost budget OR produce hourly reports of energy use by energy source suitable for determining the design energy cost and energy cost budget using a separate calculation engine.

The simulation program shall also be capable of performing design load calculations to determine required HVAC equipment capacities and air and water flow rates. The simulation program shall also be tested according to ASHRAE Standard 140 and the results shall be furnished by the software provider.

C. Results

The simulation will be used to determine the utility consumption and demand of the facility. These will then be input into the LCC model to determine the relative energy costs for each alternative.

D. Financial Terms

Baseline steam cost:..... \$11.71 per klb  
Baseline chilled water cost: .....\$0.1065 per tonhr  
Baseline electric cost: ..... \$77.00 per MWh

Verify the values listed above are currently applicable with the UT Project Team before commencement of LCC analysis.

The University of Texas at Austin produces all of its own electricity via combustion and steam driven turbines. Fuel gas (natural gas) is the only imported energy commodity to the campus. Since natural gas ultimately drives the production of all energy commodities distributed on campus, the projected escalation in its cost is used to calculate prices for energy consumption.

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

To project the cost of natural gas, the U.S. Department of Energy (DOE) Energy Information Administration (EIA) publishes energy cost escalation indices to project future fuel and electricity costs. These indices are regionally specific for industrial, commercial, or residential customers and updated annually. They are published in the Energy Price Indices and Discount Factors for Life Cycle Cost Analysis - April 2007, Annual Supplement to Handbook 135. The factors are calculated with the latest Federal Energy Management Program (FEMP) discount factors.

Table 2.04.D – Projected escalation rates for natural gas in Texas (industrial) as of April 2007.

Year	Escalation Index
2008	-5.18%
2009	-4.28%
2010	-5.52%
2011	-2.47%
2012	-0.76%
2013	1.31%
2014	1.31%
2015	3.28%
2016	5.02%
2017	3.03%
2018	2.27%
2019	2.27%
2020	1.90%
2021	3.38%
2022	3.73%
2023	4.42%
2024	1.90%
2025	2.43%
2026	3.12%
2027	3.28%
2028	3.09%
2029	2.57%
2030	3.07%
2031	3.22%
2032	3.20%

E. Documentation - Energy Model Report

The Energy Model report shall contain, as a minimum, the following pieces of information:

- Inputs:
  - Room/zone design parameters

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

- Equipment design parameters
- Output:
  - Hourly reports of energy use by energy source
- Depending on the nature of the project, additional reports may also be requested by the University.

This information shall be presented as output from the computer program used for the analysis. If requested by the University, electronic files of the simulation models shall be provided.

2.05 Water / Wastewater Projections

A. General

Water and wastewater consumption can be omitted from the LCC analysis if it is deemed that the alternatives being studied will not appreciably differ from that of the baseline building. Gain approval from the UT project manager before omitting from analysis.

If water and waste water cost implications are to be included in the analysis, calculations must be provided to the UT project team to projected savings.

B. Financial Terms

Water rate:.....\$2.77 per 1000 gallons  
Wastewater rate: .....\$4.49 per 1000 gallons  
Water/wastewater escalation rate: ..... 3.0% annually

2.06 General Economic Conditions of Analysis

A. General

The following financial terms shall be used in the LCC analysis for projects on the UT Austin Campus:

Discount rate: ..... 6.0% annually  
General inflation rate: ..... 3.0% annually

2.07 Sensitivity Analysis

A. General

If desired by the University, the design team may be asked to provide additional life cycle calculations to determine the winning option's sensitivity to changing

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

economic factors. This is done to judge the potential risk of implementing a construction alternative.

#### **B. Sensitivity Variables**

Variables commonly adjusted for sensitivity analysis:

- Increase and/or decrease in discount rate
- Increase and/or decrease in inflation rates (capital cost, O&M, water / wastewater)
- Increase and/or decrease in construction costs (as a percentage)
- Increase and/or decrease in finance rate
- Increase and/or decrease in O&M costs (as a percentage)
- Increase and/or decrease in energy cost rates
- Increase and/or decrease in water /wastewater cost rates
- Or other, as defined by UT project manager

The UT project manager will specify what sensitivity analyses shall be run. The need for sensitivity analysis may not be apparent until after the baseline LCC results have been published.

## **PART 3: EVALUATION OF QUALITATIVE FACTORS**

### **3.01 Evaluation of Qualitative Factors**

#### **A. General**

LCC analysis does not directly address the social and environmental life-cycle impacts of design alternatives. These costs and benefits should be presented and evaluated in conjunction with the results of the LCC analysis. While tools (such as the USGBC's LEED certification program) are available to assist the Project Team in conducting this analysis, it is ultimately up to the Project Team to determine the method of assessment most compatible with project objectives.

#### **B. Sustainability Considerations**

Below is a list of considerations for social and environmental impact assessment. This list is not intended to be all-inclusive, but to highlight anticipated issues to spur discussion:

##### Land Use, Water and Ecosystem Quality

- Retain open space
- Optimize program and development density
  - Reduce site disturbance
  - Reduce building footprint
- Increase flexibility / adaptive reuse potential

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

- Optimize building orientation
  - Utilize passive design strategies
  - Employ natural ventilation strategies
- Reduce heat island effects
  - Provide adequate shade coverage
  - Select high albedo / light-colored materials
  - Select high-reflectance, high-emissivity roofing materials
- Reduce automobile use
- Promote efficient transportation alternatives
- Optimize parking lot location and design
- Maximize water use efficiency
  - Reduce potable water use
  - Use captured or recycled water
  - Employ sustainable landscaping strategies
- Minimize stormwater runoff
  - Select permeable paving materials
- Increase on-site stormwater filtration
- Reduce stormwater contaminants
- Employ restorative design strategies

#### Social & Programmatic Factors

- Improve building safety and security
- Improve site security
- Improve interior acoustic control
- Reduce exterior noise pollution
- Reduce exterior light pollution
- Improve operational efficiency
- Provide flexibility of systems

#### Materials and waste

- Reduce solid waste generation
  - Promote existing building reuse
  - Select reused and salvaged materials
  - Select recycled content materials
  - Reduce non-renewable resource selection
  - Maximize storage/ collection of recyclables
- Select rapidly renewable resource materials
- Select low-embodied energy materials

#### Indoor Environmental Quality

- Optimize ventilation effectiveness
- Employ natural ventilation strategies
- Minimize indoor and chemical pollutants
  - Select low-emitting materials
  - Encourage non-toxic maintenance protocols

## **4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**

### **DESIGN AND CONSTRUCTION STANDARD**

---

- Design separation from exterior pollutants
- Provide carbon dioxide monitoring
- Improve acoustic environment
- Enforce construction IAQ management
- Provide facility in-use IAQ management plan
- Increase thermal comfort
- Improve controllability of systems
- Optimize natural daylight & views

#### Energy and Atmosphere

- Reduce fossil fuel depletion
- Use renewable energy sources
- Reduce energy-related emissions
  - Reduce greenhouse gas emissions
  - Reduce ozone-depleting emissions
  - Maximize envelope thermal performance
  - Integrate daylight/electric lighting controls
  - Improve mechanical systems performance
  - Eliminate equipment use of CFC's

#### C. Other Considerations

- Architectural (signature) features
- Adaptability of building for future uses
- Demonstrated experience providing value to UT Austin or other institutions of higher education
- Other factors, as agreed upon by the Project Team

## **PART 4: PROCESS FOR FINAL SELECTION AND DESIGN APPROVAL**

### 4.01 Process for Final Selection and Design Approval

#### A. General

Once the LCCs have been compiled and the applicable qualitative factors accounted for, a scoring system shall be utilized to determine the best solution for the University. Because each project is different, and the objective of each facility varies, a simple weighting process cannot be established for all projects.

The Design Team must work closely with the UT Project Team to develop an appropriate framework of evaluation for each project.

#### B. Point System

**4.02.00 – PROJECT DESIGN EVALUATION AND APPROVAL PROCESS**  
**DESIGN AND CONSTRUCTION STANDARD**

---

LCC analysis results shall be presented in conjunction with social and environmental impacts to facilitate decision-making. A point system, developed by the Project Team during the Project Evaluation Workshop, shall be utilized for the final evaluation. Points may be awarded as needed for a given project type, for example a project such as an alumni visitor center may carry more architectural significance than a typical building. In this case, the LCC cost results may only count for 30% of the total design score, whereas aesthetic/sustainable features may compose the other 70% of the score.

END OF STANDARD