OVERVIEW

Chance never helps those who do not help themselves.

Sophocles

As described in the previous sections, pre-project planning is fundamental to project management and essential to project success. Once the project manager has completed and executed the *Owner's Project Requirements* (*OPR*), the next step in the Pre-Design Phase is to develop the *Basis of Design* (*BoD*).

The *BoD* is a document that records the general business expectations, performance criteria and special requirements as they relate to space, site, and technical design elements. The *BoD* criteria is not intended to be a substitute for the Owner's regulatory or code requirements, standards and guidelines, or the design professional's project design drawings and specifications. The *BoD* simply includes both narrative descriptions and lists of individual items that support the design process documenting the primary thought processes and assumptions behind design decisions that were made to meet the *OPR*.

The details of the *BoD* are fluid and dynamic and increase in detail as the design progresses. In the beginning, the documentation required is primarily a narrative of the building system descriptions, the purpose of the systems, how the systems will meet those requirements, and why this system, or that method, was chosen above others. As the design progresses, the documentation includes a specific description of the system and components, its function, how it relates to other systems, sequences of operation, and operating control parameters. That being said, it is important to note that the *BoD* document is not a substitute for what is required in the specifications or contract, where operational decisions are made.

It is very important for the team to realize that the *BoD* does not include detailed project information or calculations for the design, construction, commissioning, and operation of the building. These details will all be documented by the design team later in the Design Phase. The *BoD* process typically fails when the project team is too focused on the details.

POLICY

The *BoD* process is new to OFPC and the overall process has not been finalized. Therefore, the information within this section has not yet been fully vetted by staff or institutions in order to become a standard OFPC project delivery process. This section is intended to give the project manager and the institution a glimpse of a future OFPC process, while the implementation of the process described herein will be determined by the senior project manager.

When the *BoD* process is followed, the project manager requires the design professional to complete the necessary *BoD* information following the completion of each Pre-Design, Design, and Construction phase, including presenting the current *BoD* to Institution and User executives for approval, specifically noting any requested changes from previous sign-offs.

INTRODUCTION

PURPOSE

The *Basis of Design* (*BoD*) document records the thought processes and assumptions behind major design decisions being made to meet the *Owner's Project Requirements* (*OPR*). The *OPR* is intended to capture "what" the Institution and User need and expect from the project. The Construction Documents detail "how" the *OPR* will be physically achieved; therefore, the *BoD* captures important information linking the *Statement of Need* and the *OPR* to the Construction Documents.

BoD documentation is distinct from the Construction Documents, is seldom included in drawings and specifications, and is generally not needed by the contractor to meet their obligations. However, it is exceptionally valuable to the Commissioning Team when evaluating the ability of a design and its components to meet the *OPR*.

It also provides a record of the design decisions made. This is critical to ensure the contractor, operator, and future designers understand the assumptions made and the limitations of the systems. Without this information, future teams have to guess at the designer's line of reasoning followed during the design process.

The objective of specifically documenting *BoD* information is to provide the parties involved with a project description at each phase in the process, and an understanding of the underlying reasons that led to the selection of specific components, assemblies, systems and system integrations. A design narrative that provides an overview of assemblies and systems in verbal format is usually an integral element of the *BoD*.

The *BoD* document will typically be developed incrementally by the design professional as work on a project moves from Pre-Design to Design, and into the Construction Phase. Changes to the *BoD* that often occur as a design evolves must be documented and approved by the project manager, project team, and appropriate executives.

CONTENT

While the project *OPR* is limited to non-technical language so that it can be understood by all parties involved in the design process, the *BoD* includes technical language to document the thought process used by the design professional while developing the systems for the building. Content of the *BoD* document will vary from project to project and system to system, but in general it should have the following basic structure:

1. Fundamental *BoD* Criteria
2. Building Elements Lifespan
3. Economic Parameter for Life Cycle Cost Analysis
4. Architectural and Engineering Criteria (Pre-Programming Phase)
5. Architectural and Engineering Criteria (Post-Programming Phase)

This structure is then further broken down into content, such as:

- Assumptions regarding usage of the facility
- Description of systems, components and methods for achieving the design intent objectives
- Emergency power control and function
- Energy performance
- Expectations regarding system operation and maintenance
- Fire and life safety (criteria, general strategy narrative, and detailed sequences)
- Indoor air quality strategies and methods
- Information regarding ambient conditions (climatic, geologic, structural, existing construction) used during design
- Interior design and furnishings
- Listing of specific manufacturer makes and models used as the basis for drawings and specifications
- Manufacturers' catalog cut-sheets
- Material, labor, and equipment maintainability
- Narrative state of operation that verbally details how the facility is expected to operate under various situations (such as normal operation, extreme event, emergency)
- Narrative statement of design that verbally describes how the designer intends to meet the OPR
- Performance criteria that the system was designed to meet – linked to the *OPR*
- Schedules
- Unusual or specific codes, standards, and guidelines considered during design of the facility and designer interpretations of such requirements
- Specific design methods, techniques, software used in design

- Stand-alone and integrated sequences of operation, including set points and control parameters
- Structure
- Availability, type, and location of existing utilities

SELECTION OF COMPONENTS

When selecting a component, the *BoD* should include a short narrative for each type of equipment and component (e.g., air handler, terminal boxes, pumps, boilers, chillers, window, wall, etc.) and the reasoning for selecting it. Items relating to the project intent, such as maintenance requirements, should also be included. In addition, information on the type of equipment selected, specific manufacturer chosen, specific model chosen, or equipment sizing, etc. is included.

ASSUMPTIONS MADE BY THE DESIGNER

When making an assumption, the *BoD* should document specific numbers used in the design of the building. These assumptions are an essential part of making the transition from the project intent to installed equipment.

CODES & STANDARDS

When identifying any unusual or specific codes and/or standards (e.g., NIH, JCAHO, FDA, DOE), the *BoD* should document specific code numbers and editions used in the design of the building. These assumptions are an essential part of making the transition from the project intent to installed equipment.

LIFE CYCLE COST ANALYSIS

Cost effectiveness is a key component of the *BoD* and a building's design; and Life Cycle Cost Analysis (LCCA) is an essential Pre-Design and Design process for evaluating the initial and future cost of building ownership.

Life Cycle Cost (LCC) - the total discounted dollar cost of owning, operating, maintaining, and disposing of a building or building system over a period of time.

Life Cycle Cost Analysis (LCCA) – an economic evaluation technique that determines the total cost of owning and operating a building, building system or facility over a period of time. LCCA is based on the premise that multiple building design options can meet programmatic needs and achieve acceptable performance, and that these options have differing initial costs, operating costs, maintenance costs, and life cycle costs. By comparing the life cycle costs, LCCA can show the tradeoffs between low initial first cost and long-term cost savings. Thus the most cost-effective system for a given use can be identified, and the length of time it will take to "pay back" the incremental cost for this system can also be determined.

In keeping with UT System's and the Institution's sustainability practices (UT System Policy UTS169), LCCA can identify solutions that are environmentally desirable. Careful design choices that result in efficient use of energy and water often yield long-term cost savings. Also, should environmentally friendly choices not save money over time, LCCA may reveal that their additional cost over time is minimal.

GENERAL REQUIREMENTS

During Schematic Design and Design Development of the Design Phase, the design professional will be directed by the project manager and Institution's Representative to perform several LCCA comparative analyses from several building system categories. Each LCCA comparative analyses can have multiple alternatives (base case plus two alternate cases), which include:

- Building Envelope Systems
- Siting Systems
- Structural Systems
- Mechanical Systems
- Electrical Systems
- Energy Systems

The project manager should refer to the *Owner's Design Guidelines - Life Cycle Cost Analysis* for additional information regarding details of the general requirements, process, financial criteria, and final selection to be used by the design professional.

THE LCCA PROCESS

The LCCA process involves the design professional and project team establishing clear objectives, determining the criteria for evaluating alternatives, identifying and developing design alternatives, gathering cost information, and developing a life cycle cost for each alternative.

FINANCIAL CRITERIA

Financial criteria used to perform an LCCA study is established by the Institution's Representative in the *Basis of Design* (*BoD*) document during the "Pre-Design Phase." The *BoD* financial criteria are Institution- and project-specific and are used for the selection of appropriate equipment and systems fit for project specific purposes. The design professional should utilize the *BoD* financial criteria when calculating LCC.

PROCESS FOR FINAL SELECTIONS AND DESIGN APPROVAL

Once the LCCs have been compiled, a scoring system should be utilized by the project team to determine the best solution for the Institution. The design professional should work closely with the project manager and Institution's Representative to develop an appropriate framework of evaluation for each project. Other factors within the scoring system might include aesthetics; land use, water and ecosystem quality; social and programmatic factors; materials and waste; indoor environmental quality; energy and atmosphere; and adaptability for future use.

LEADERSHIP TAKE-AWAY

A leader is best when people barely know he exists, not so good when people obey and acclaim him, worse when they despise him. But of a good leader who talks little when his work is done, his aim fulfilled, they will say: We did it ourselves.

Lao-Tzu