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**BUILDING ENERGY MODELING
STEP-BY-STEP PROCEDURES FOR LEED
CERTIFICATION**

ONLINE PROFESSIONAL COURSES LED BY
THE WORLD'S TOP SPECIALISTS

ONLINE TRAINING BY KRISHNAJI PAWAR

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MODULE
L24

Sample Basis of Design(BOD)

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BUILDING ENERGY MODELING : STEP-BY-STEP PROCEDURES FOR LEED CERTIFICATION

A comprehensive BOD typically includes a project overview, design objectives, regulatory requirements, assumptions, design criteria, materials and systems, sustainability goals, and future considerations. For example, a BOD for a new university science building would include a project overview, design objectives, regulatory requirements, assumptions, materials and systems, sustainability goals, and future considerations.

Learning Objectives

- Introduction and Course Outline
- Building Energy Modeling Checklists
- Scaling an imported drawing from AutoCAD
- ASHRAE Standards and Guidelines
- Zones Input Details in BEM Tools
- Setup and Running the Building Energy Modeling Simulation
- Review BEM Software Output Reports.
- Sample Owner Project Requirements(OPR)
- Summary and Resources
- BEMP Practice Test V.4.1



INTRODUCTION

- A foundational reference for project development.
- Outlines principles, criteria, and assumptions guiding design process.
- Serves multiple functions including alignment, documentation, risk mitigation, and performance benchmarking.
- Comprises project overview, design objectives, regulatory requirements, assumptions, design criteria, materials and systems, sustainability goals, and future considerations.
- Similar to a cooking recipe or architectural blueprints, providing specific instructions and guidelines.
- Facilitates effective communication and collaboration among stakeholders.
- Understanding and developing a robust BOD is a fundamental skill for professionals in architecture and engineering.

BASIS OF DESIGN - BOD

- The BOD is a crucial document in engineering and architectural professions, guiding the design process.
- It serves multiple functions: alignment, documentation, risk mitigation, and performance benchmarking.
- The BOD includes project overview, design objectives, regulatory requirements, assumptions, design criteria, materials and systems, sustainability goals, and future considerations.
- An example of a BOD for a new university science building includes:



BASIS OF DESIGN - BOD +

- Project Overview: Urban campus in a temperate climate.
- Design Objectives: Facilitate collaborative research and education.
- Regulatory Requirements: Compliance with the International Building Code (IBC) and local zoning ordinances.
- Assumptions: Anticipated peak occupancy of 300 students and faculty.
- Design Criteria: HVAC systems to maintain indoor air quality standards.
- Materials and Systems: Use of recycled and locally sourced materials.
- Sustainability Goals: Targeting LEED Gold certification.
- Future Considerations: Design flexibility for future laboratory expansions and technology upgrades



GENERAL PROJECT INFORMATION

TRAINING, OPERATIONS, & MAINTENANCE

| Owner's Requirement | Location | Total Time Required |
|------------------------------|---|---------------------|
| Operations staff training | Conference Room at old office | 2 hours |
| System Manual | Specification Division, In-house Training Program, Commissioning Provider's Scope of work | 4 hours |
| Minimum Warranties and Bonds | | |

BUILDING DESIGN ASSUMPTIONS

- Standard Practice: ASHRAE 2004 STANDARDS
- Energy Efficiency goals outlined in the Design Intent Document
- LEED V2.2 Green Building Energy Efficiency Goals

OCCUPANTS

| Building Space | OCCUPANTS | | | | |
|---|-----------------------------------|-------------------------|-----------------------|--------------------------|-------------------------|
| | Density (ft ² /person) | Sensible (Btu/h/person) | Latent (Btu/h/person) | Outdoor Air (cfm.person) | Plant and AHU Diversity |
| General Office | 75 | 4,086 | 1,090 | 15 | |
| Corridor/restroom/support/Stairs/Reception Area | 100 | 2,698 | 1,390 | 21 | |
| Service Area | 100 | 3140 | 674 | 21 | |

LIGHTING EQUIPMENT

| Building Space | LIGHTING | | | EQUIPMENT | |
|---------------------------|--------------------------------------|-----------------------|---------------|--|---------------|
| | Lighting Density(w/ft ²) | Lighting Illumination | AHU Diversity | Equipment Density (w/ft ²) | AHU Diversity |
| General Office | 1.5 | 400 | | 2 | |
| Corridor/restroom/support | 1.5 | 200 | | 0 | |

ENVELOP COMPONENTS

| Envelop Component | U-Value (Btu/ft ² /hr°F) | Shading Coefficient |
|---------------------|-------------------------------------|---------------------|
| Walls below ceiling | 0.089 | |
| Walls above ceiling | 0.089 | |
| Roof | 0.067 & 0.073 | |
| Windows | 0.52 | 0.400 |
| Skylights | | |

BUILDING ZONES

| BUILDING ZONE | HVAC SYSTEM SERVICE | LIGHTING SYTEM SERVICE | HVAC CONTROLS | LIGHTING CONTROLS | EQUIPMENT MAINTAINABILITY |
|-----------------------------|-------------------------|--------------------------|---------------|-------------------|---------------------------|
| Ground Floor Office Area | Ducted Split | 4x18W Fluorescent lights | Thermostats | Switches | |
| GF- Service Area | Wall Mounted Split Type | 4x18W Fluorescent lights | Thermostats | Switches | |
| Mezzanine Floor Office Area | Ducted Split | 4x18W Fluorescent lights | Thermostats | Switches | |
| Warehouse Area | Non AC | High Bay Lights | | Switches | |

SYSTEM SUMMARY

The mechanical and electrical systems are designed to meet the Design Intent owner's project requirements as described in this section. To tie these systems together and provide a functional, operations facility at the end of construction.



SYSTEM SPECIFICATION

The Building's Cooling and Ventilation design intent is met with Dusted Split System Air Conditioners, which cover the entire office space. The air conditioned systems are designed using the following rationale:

| SYSTEM TYPE | Model Number | Tons | Blower Capacity | Input Supply (KW) | Design Air Supply(cfm) | Design Supply Air Temperature, Cooling (° C) | Fan Type | Design Air Velocity, across Coils (feet/minute) |
|------------------|--------------|------|-----------------|-------------------|------------------------|--|----------------------------------|---|
| Direct Expansion | YE2SD42 | 3.5 | 1350 | 4.30 | 1350 | 19 | Double Inlet blower/direct drive | |
| Direct Expansion | YE2SD42 | 4.0 | 1540 | 4.90 | 1540 | 19 | Double Inlet blower/direct drive | |
| Direct Expansion | YE2SD42 | 5.0 | 1850 | 5.65 | 1850 | 19 | Double Inlet blower/direct drive | |
| Direct Expansion | YE2SD42 | 6.0 | 2450 | 7.25 | 2450 | 19 | Double Inlet blower/direct drive | |

DOMESTIC WATER SYSTEM

The building will meter potable water service distributed through mains, risers, and branches to plumbing fixtures. Systems and design rationale described below will meet the design requirements and intent:

System

- Solar Water Heating System
- Number of similar units: 2 (Conergy Premium, Model 300-liters)
- Full Load Capacity(kBtu/Hr): 1.8 per unit
- Collector Efficiency: 40%
- System Efficiency to heat: 40 %

Manufacturer: SOLITAIRE SOLAR INTERNATIONAL CONERGY

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THANK YOU

