The California State University

Office of the Chancellor

Mechanical and Electrical Basis of Design Guidelines

Rev. 11/24/15

General

This document provides supplemental information that will be helpful in developing a Basis of Design report.

A written Basis of Design report (BOD) is a required design team deliverable for each CSU major capital project. BOD report submittals are required at each design phase.

The Basis of Design information provides to all parties involved with a project at each phase in its design process an understanding of the underlying thinking driving the selection of specific components, assemblies, and systems. Campus concurrence of the BOD report at each phase provides assurance to the design team of Campus concurrence of design approach decisions.

The BOD document is expected to be developed and revised incrementally by the design team at each design phase. The BOD is considered complete upon the completion of the Contract Documents package, however if a major systems change occurs during construction the BOD would be need to be appended and confirmed by the Campus as part of a change order process.

BOD reports will be relied upon by the Campus to support the commissioning process for the project. BOD reports are not intended to be a part of the Construction Documents, but BOD decisions will inform their composition and of course the ultimate project outcome.

Each BOD report shall be organized in Uni-format order consistent with the project cost estimate and CPDC Budget Form 2-7. Each BOD report shall address each of the following points:

F-30 Sustainable Building Measures

1. Identify sustainability targets for this project. At what LEED level will the project be certified? If not, why not? Identify the decision makers.

2. Identify photovoltaic generation or other renewables that are available for this project. These sources need not necessarily be on campus to be part of this campus project.

3. Identify design strategies for meeting California Building Code Energy and *CAL*Green requirements. Identify LEED approach and point targets sought.

4. Identify how this project responds to campus pledges, I.e. President (or past president) Campus Climate Commitments, trustees Policy on Sustainability, systemwide White House pledges, etc.

5. CSU is required to report Carbon Emissions estimates. Provide estimated annual estimated carbon emissions based on this project's estimated annual energy consumption modified by the projected energy sources to be employed. Identify realistic options that can be incorporated into this project to alter its carbon emissions.

6. Identify how this design achieves project program requirements and how this is/will be addressed in the Construction Documents.

D-20 Basis of Design Plumbing Systems

1. Provide a description of each planned plumbing sub-system. Include: sanitary sewer, waste and vent, storm drain, domestic water, compressed air and gases, natural gas, reclaimed water, irrigation, and other systems as may occur. Identify special features and assumptions within each. I.e. Reclaimed water agreements that outline future reclaimed water availability.
2. Discuss reasoning for selection of plumbing systems and materials. Provide a brief rationale for each sub-system.
3. Provide equipment and systems sizing calculations.
4. Discuss where campus guidelines and directives influenced design of plumbing systems.
5. Identify assumptions used in the proposed plumbing systems design.
6. Identify metering and sub-metering proposed for *this* project.
7. Identify potable water and reclaimed water systems. Identify project infrastructure necessary to support.
8. Identify how and where this project minimally meets or where design consciously will exceed code minimum requirements. Explain rationale for decisions.
9. Identify how this design achieves project program requirements and how this is/will be addressed in the Construction Documents.

D-30 HVAC Systems

1. Describe HVAC system options/types considered/employed. Identify extent of project reliance on thermal storage, cogeneration, and alternative energy sources, both on site and off site. Relate to sustainable project requirements.
2. Identify indoor air quality design considerations/constraints/requirements.
3. Describe interaction of the HVAC system with the building envelope, lighting, and other systems. Identify to what extent load is shed before it enters the building. Identify integration/reliance on architectural or site features for building performance. I.e., overhangs, external sunscreens, shading devices, landscape, topography, etc.
4. Describe project connection assumptions to campus central plant chilled water and hot water supply. Identify system connection assumptions, central plant capacity and allocation decisions to serve *this* project versus holding capacity for other projects.
5. Describe proposed building automation systems. Identify feature set. Identify readily available feature sets *not* provided. Identify rationale for providing/not providing various functionality.
6. Identify reasoning for the of proposed HVAC systems. This should be a short statement for each system (heating, cooling, fluid distribution, etc.) and include supporting information such as the requirements of codes/standards, design criteria, I.e., energy performance, indoor environmental quality, reliability, maintainability, first cost and lifecycle costs, preferred energy source, and campus directives.

7. Identify project performance assumptions and concerns.
8. Identify assumptions for calculations/sizing, including diversity factors, safety factors, redundancy, space usage and occupancy (both proposed and projected), ventilation rates, plug loads, lighting loads, power density, glazing and shading device characteristics, thermal insulation and vapor transmission, envelope reflectivity, material densities, utility rates, power generation sources, pressurization requirements.
9. Provide performance based energy calculations for overall building and envelope, mechanical system and lighting components for the building. Secure concurrence by assigned MRB peer reviewer if a prescriptive approach is proposed.
10. Identify energy modeling approach. Identify software (including version). Identify analysis and simulation models considered (heat loss, cooling load, duct pressure, pipe sizing, energy usage, control strategies). Identify manufacturers' sizing services where used.
11. Describe environmental conditions, including indoor and outdoor design conditions and air quality, interior pressure relationships, airflow velocity targets, and acoustic performance requirements/targets.
12. Identify impacts of project site constraints, building orientation in context, building shape in context, enclosed space relative to external walls and characterize efficiency.
13. Identify HVAC operational assumptions, space usage, operational schedules, and diversity of use, annual operation and maintenance budget, characterization of relative complexity to operate as proposed.
14. Identify codes, standards, guidelines and other references that influenced the design of HVAC systems, including campus standards and design guidelines.
15. Identify of Campus Project Requirements, including a specific listing of how each Project Requirement is addressed in the Construction Documents.
16. Identify how systems selected are supporting project sustainability targets.
17. Description of metering and sub-metering proposed for *this* project.
18. Identify how and where this project HVAC design minimally meets or where design consciously will exceed code minimum requirements. Explain rationale for decisions.
19. Identify how this design achieves project program requirements and how this is/will be addressed in the Construction Documents.

D-40 Fire Protection Systems

1. Provide description of system options considered. I.e., Fire sprinkler, fire alarm, pre-action systems, clean agent systems, fire pump need, onsite water storage, supplemental power to support fire suppression systems. If sprinklers are not proposed, identify why. Identify the decision makers. Provide CDBO statement of concurrence.
2. Identify passive/active design measures considered/incorporated.

3. Discuss the thought process for setting the building construction type and how this impacts fire life safety system requirements.
4. Where atriums is part of the project feature set, identify smoke evacuation assumptions/approach.
5. Identify reasoning for selection of proposed fire protection system. Identify to what extent campus guidelines and directives influenced/limited/advanced the selection of fire protection systems.
6. Confirm if the design documents require a *fire alarm* and *fire sprinkler* design as a part of the primary building design review, I.e. the fire alarm and sprinkler design is *not* a design built system and is *not* deferred submittal. If design build/deferred approach is proposed indicate that CDBO concurrence was obtained.
7. Identify how and where this project fire protection systems design minimally meets or where design consciously will exceed code minimum requirements. Explain rationale for decisions.
8. Identify how this design achieves project program requirements and how this is/will be addressed in the Construction Documents.

D-50 Electrical Systems

1. Provide a description of electrical service from the campus infrastructure. Identify campus electrical infrastructure capacity to serve this project. I.e. does the existing infrastructure readily or minimally accommodate this new proposed project demand?
2. Provide a description of electrical power distribution system.
3. Identify design voltages, assumed VA/square foot for each area in the building and assumptions for calculations/sizing electrical capacity, including diversity factors, safety factors and redundancy.
4. Identify electrical modeling approach. Identify software (including version). Identify analysis and simulation models considered (photometric calculations, load calculations, short circuit and arc flash calculations). Identify manufacturers' sizing services where used.
5. Describe interior and exterior lighting systems, control strategies, and proposed illumination levels for each area.
6. Describe of metering and sub-metering in the design of the electrical distribution system.
7. Describe renewable energy generation components and their interface with the building electrical system as well as campus wide electrical system.
8. Describe proposed grounding system.
9. Describe emergency power system for egress lighting and any other equipment requiring back up power. Identify power for elevators relative to fire code requirements.
10. Identify telecommunications, fire alarm and security systems. Identify interconnection to the campus network.

11. Discuss codes, standards, guidelines, regulations, and other references that influenced the design of electrical systems.
12. Identify how campus guidelines and directives influenced the design of electrical systems.
13. Discuss how mechanical system design basis influenced the design of the electrical system.
14. Identify how and where this project electrical systems design minimally meets or where design consciously will exceed code minimum requirements. Explain rationale for decisions.
15. Identify how this design achieves project program requirements and how this is/will be addressed in the Construction Documents.

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