Basis of Design – Format and Expected Content

Basis of Design

A document that records the major thought processes and assumptions behind design decisions used to meet the Owner’s Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines, including concepts, calculations, decisions, and product selections. The Document includes both narrative descriptions and lists of individual items that support the design process.

Background and Purpose

The Basis of Design is created to document the reasoning and assumptions made during the design process. While the Owner’s Project Requirements was limited to non-technical language so that all parties involved in the design process could understand it, the Basis of Design includes technical language to document the thought processes used by the designers while developing the systems. Throughout the design process, the Basis of Design needs to be consistent with the Owner’s Project Requirements and show how the designer transformed the intent into reality. The Basis of Design, fundamentally organized by Uniformat structure, details the selection of components, systems, manufacturers, or layouts, any assumptions made by designers during this process, and any codes, standards, or guidelines that influenced the designs.

The information provided in the Basis of Design will assist in the future operation and maintenance of the equipment installed during this building project. This information is critical to ensure that contractors, operators, and future designers understand the original assumptions, operational characteristics, and limitations of the system. The Basis of Design presents this critical information in a condensed format for easy reference. Throughout the design process, the basis of design needs to be consistent with the Owner’s Project Requirements. Each Owner’s Project Requirements item must be addressed in the basis of design to show how the designer transformed the Owner’s Project Requirements into reality.

This document is typically written by the design professionals during the Design Phase and is updated by them to include any changes during the Construction Phase

Design Narratives

The Design Narrative is a written description and discussion of the concepts and features the designer intends (during the schematic design phase) to incorporate into the design, or what they have incorporated (during the balance of design) to meet the Owner’s Project Requirements and associated Performance Criteria. Why the components and systems were chosen.

Standards and References

This section of the Basis of Design details the codes and standards, by individual discipline, which were followed when designing the various building assemblies/systems. The year and/or version of the code or standard that was published is included.

<table>
<thead>
<tr>
<th>Type of Code/Standard</th>
<th>Name/Year and/or Version</th>
<th>Why Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional</td>
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<tr>
<td>Provincial</td>
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<td>Municipal</td>
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<tr>
<td>Owner’s</td>
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<tr>
<td>Other</td>
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Design Rationales

The Design Rationale is the basis, rationale, and assumptions for calculations, decisions, schemes and assemblies and system selected to meet the Owner’s Project Requirements and to
satisfy applicable regulatory requirements, standards, and guidelines. Design compromises and Owner concessions are also documented here.

Overview
Provides general description of systems:
1. location of equipment,
2. area served,
3. narrative description of how each system operates, why it was selected, how the system will achieve its designed purpose, based on the functional and operational requirements as well as the Owner's Project Requirements,
4. options and analyses that were considered.
5. any special features,
6. interfaces with existing systems

Assumptions Made by the Designers
These sections of the Basis of Design document specific numbers used in the design of the building. These assumptions are an essential part of making the transition from the Owner's Project Requirements to installed assemblies/systems or equipment. Each Table, by individual discipline, lists the assumptions applicable to the specific project. Data that is specific to individual rooms/components/systems are listed in an appendix.

System Modeling and Calculations
Simulation programs that have been used to increase the accuracy and reduce the time required for calculations of many of the design parameters required are summarized here. All assumptions needed for the simulations are documented in the Designer assumption section above. All necessary spreadsheet, hand calculations and diagrams are documented in an appendix.

Component Selection
These sections of the Basis of Design contain brief narratives of each type of selected equipment, which include:
- Reasons for selection
- Maintenance requirements and other Owner's Project Requirements issues
- Manufacturer chosen


See Attachment 1 – Basis of Design - Sample Table Of Contents
See Attachment 2 - Systems Operations Manual - Sample Table Of Contents
ATTACHMENT 1 – Basis of Design - Sample Table Of Contents

TABLE OF CONTENTS – BASIS OF DESIGN

1. BACKGROUND AND PURPOSE
2. DESIGN NARRATIVES
3. STANDARDS AND REFERENCES
   A. Substructure
   B. Shell
   C. Interior
   D. Services
   E. Equipment and furnishings
   G. Sitework

4. DESIGN RATIONALES
   (See Attachment 2 - Systems Operations Manual – Sample TOC for Further Required Breakdowns)

   A. Substructure
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection

   B. Shell
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection

   C. Interior
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection

   D. Services
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection

   E. Equipment and furnishings
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection

   F. Special Construction
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection

   G. Sitework
      Overview
      Assumptions Made By The Designers
      System Modeling And Calculations
      Component Selection
ATTACHMENT 2 – Systems Operations Manual - Sample Table Of Contents

TABLE OF CONTENTS

Definitions

A. Substructure

B. Shell

C. Interior
   Door and Window Hardware
   Raised Floor Systems

D. Services

   D10 Conveying

      D1010. Elevators and Lifts
              Executive Summary

D20 Plumbing

      Executive Summary

D2010 - Domestic Water Distribution
   D2010.10 - Facility Potable-Water Storage Tanks
   D2010.20 - Domestic Water Equipment
      Domestic Water Pumps
      Domestic Water Booster Pump Package(s)
      Domestic Hot Water Heaters
      Domestic Hot Water Recirculation Systems
      Solar Domestic Hot Water Preheating
      Domestic Water Heat Exchangers
      Domestic Hot Water Recirculation Systems
      Solar Domestic Hot Water Preheating
      Treatment Equipment
         Particulate Filtration
         Disinfection – Ultraviolet (UV) Reactors

   D2010.40 - Domestic Water Piping
   D2010.60 - Plumbing Fixtures
   D2010.90 - Domestic Water Distribution Supplementary Components

D2020 - Sanitary Drainage
   D2020.10 - Sanitary Sewerage Equipment
      Sanitary Sewerage Pumps
      Laboratory waste treatment systems
      Trap Seal Primers

   D2020.30 - Sanitary Sewerage Piping
   D2020.90 - Sanitary Drainage Supplementary Components

D2030 - Building Support Plumbing Systems
   D2030.10 - Stormwater Drainage Equipment
      Stormwater Drainage Sump Pumps
      Weeping Tile Sump Pumps

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Elevator Sump Pumps
D2030.20 - Stormwater Drainage Piping
D2030.30 - Facility Stormwater Drains
D2030.60 - Gray Water Systems (Non Potable Water System)
  Gray Water Tanks (Rainwater Cistern)
  Gray Water Equipment
  Non Potable Water Booster Pump Package(s)
  Gray Water Treatment Equipment
  Particulate Filtration
  Disinfection – Ultraviolet (UV) Reactors
D2030.90 - Building Support Plumbing System Supplementary Components

D2050 - General Service Compressed-Air

D2060 - Process Support Plumbing Systems
D2060.10 - Compressed-Air Systems
D2060.20 - Vacuum Systems
D2060.30 - Gas Systems
D2060.40 - Chemical-Waste Systems
D2060.50 - Processed Water Systems
D2060.90 - Process Support Plumbing System Supplementary Components

D30 HVAC

D3010. Energy Supply
  Energy Recovery Systems
    Executive Summary
    Heat
    Cooling
  Energy Generation Systems
    Executive Summary
    Solar Thermal Fluid
    Solar Thermal Air
  Utility Metering
  Other 1 (Description)
    Executive Summary
  Other N (Description)
    Executive Summary

D3020. Heat Generation
  Primary Heating Systems (The Central Steam Plant and any Systems That
  Supplement the Central Steam Plant)
    Executive Summary

D3040. Cooling (Refrigeration) Generation (The Central Cooling Plant and any
  Systems That Supplement the Central Cooling Plant)
  Primary Cooling Systems
    Executive Summary
    Chiller and Cooling Tower

D3040. HVAC distribution
  Air Distribution Systems
    Executive Summary
    AHU 1 - <Description of Area Serviced>
    Building Automation System Graphic, if applicable.
  Basis of Design - Format & Expected Content 2023 05 17 (1)
Basis of Design
Expected System Parameters
Unique System Characteristics
Operating Procedures (Normal, Abnormal, Emergency Modes)
As Built System/Assembly Schematic
As Built Sequence of Operation

Exhaust Systems
Location Specific
Washroom
Fume Hood
General

D3043 Steam and Condensate System
D3044 Hot Water Heating System
D3047 Glycol Heating System

Vehicular Ramp Hydronic Snow Melt System
Executive Summary

Primary Humidification Systems
Executive Summary

D3050. Terminal and Packaged Units

Room Temperature and Ventilation Systems
Executive Summary
Room Type 1
Executive Summary
Room Type N
Executive Summary

D40 Fire protection

Executive Summary
Smoke Control
Diagrams of fire and smoke zones, rated separations
Lists of Type and Locations of fire dampers.
Stair Shaft Pressurization Systems
Wet and Dry Pipe Sprinkler Systems
Standpipe and Hose Systems
Fire Pumps
Special Fire Suppression Systems
Computer Room Halon Gas
Other 1 (Description)
Executive Summary
Other N (Description)
Executive Summary

D50 Electrical
D5010 Facility Power Generation
Executive Summary

Packaged Generator Assemblies
Basis of Design - Format & Expected Content 2023 05 17 (1)
Engine Generators
Steam-Turbine Generators
Hydro-Turbine Generators
Wind Energy Equipment
Frequency Converters
Rotary Converters
Uninterruptible Power Systems
Battery Equipment
Photovoltaic Collectors
Fuel Cells
Power Filtering and Conditioning
Transfer Switching

D5020 Electrical Service and Distribution
Executive Summary
As a minimum the executive summary will describe the Main Electrical Room, its location and the equipment it houses and any Remote Electrical Rooms their location(s) and equipment they house.

Electrical Service
Electricity Metering
Substations
Transformers
Switchgear and Switchboards
Protection Devices
Power Distribution
Breakers or fused disconnects (switches)
Switchboards and Panelboards
Bus Assemblies
Motor Control Centers (MCCs) & Motor Starters
Variable Speed Drives
Distribution Equipment
Electricity Metering
Electrical Cabinets and Enclosures
Electrical Wiring System
Raceways and Enclosures
Buss Ducts
Cable Trays
Wiring
Grounding System
Raceways
Wiring

D5030 General Purpose Electrical Power
Executive Summary

Branch Wiring System
Raceways and Enclosures
Ducts
Cable Trays
Wiring
Wiring Devices

D5040 Lighting
Executive Summary
Lighting Control
  Central Dimming Control
  Modular Dimming Control
  Network Lighting Control
  Theatrical Lighting Control
  Lighting Control Panels
  Lighting Control Devices
Branch Wiring for Lighting
  Raceways and Enclosures
  Ducts
  Cable Trays
  Wiring
  Wiring Devices
Lighting Fixtures
  Interior Lighting
    Offices
    Laboratories
    Conference Rooms
    Hallways
    Stairwells
    Lobbies
    Public Spaces (Atrium)
    Other
  Emergency Lighting
  Exit Signs
  Classified Location Lighting
  Special Purpose Lighting
  Exterior Lighting
    See G4050 Site Lighting

D5080 Miscellaneous Electrical Systems

D60 COMMUNICATIONS
  D6010 Data Communication Systems 27 20 00
  Executive Summary
  Information Transport Systems
    Backbone
    Horizontal
  Processing Systems
  Input/Output Devices

  D6020 Voice Communication Systems
  Executive Summary
  Information Transport Systems
    Backbone
    Horizontal
  Processing Systems
  Input/Output Devices

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D6030 Audio-Video Communication Systems
Executive Summary

Information Transport Systems
  Backbone
  Horizontal
Processing Systems
Input/Output Devices

D70 ELECTRONIC SAFETY AND SECURITY
D7010 Access Control and Intrusion Detection Systems
Executive Summary

Access Control Systems
Intrusion Detection Systems

D7030 Electronic Surveillance Systems
Executive Summary

Video Surveillance Systems
Electronic Personal Protection Systems

D7050 Detection and Alarm Systems
Fuel-Gas Detection and Alarm Systems
Fuel-Oil Detection and Alarm Systems
Refrigeration Detection and Alarm Systems
Water Intrusion Detection and Alarm Systems
Fire Alarm Systems

G40. Electrical Site Improvements

G4010 Electric Distribution Systems
Executive Summary
(Note: If the building is electrically fed from the tunnel or another building, the description of how this occurs should be in D50)

  Electrical Utility Services
  Electrical Substations
  Electrical Transformers
  Electrical Switchgear and Protection Devices
  Electrical Distribution Structures
  Underground Ducts and Manholes
  Electrical Transmission and Distribution Equipment
  Wiring
  Direct-Current Transmission
  Electrical Distribution System Instrumentation and Controls

  Electric Vehicle Charging Stations

G4050 Site Lighting
Executive Summary
  Parking Lighting
  Roadway Lighting

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Area Lighting
Landscape Lighting
Walkway Lighting
Flood Lighting
Exterior Athletic Lighting
Exterior Lighting Supplementary Components
   Lighting Poles and Standards
Site Lighting Instrumentation and Controls

E. Equipment and Furnishings
   Laboratory Equipment
   Dock Levelers
   Overhead Doors
   Kitchen Equipment

F. Special Construction

G. Sitework
   G2010. Roads
   G2020. Parking lots
   G2030. Pedestrian paving
   G2040. Site development
   G2050. Landscaping
   G3040. Heating distribution
      Site steam distribution
      Site hot water distribution
   G3050. Cooling distribution
      Chilled water
   G3060. Fuel distribution
      Natural Gas or Fuel Oil systems (for emergency genset)

Executive Summary