

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.

Type of Code/Standard	Name/Year and/or Version	Why Used
Professional		
Provincial		
Municipal		
Owner's		
Other		

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 ASHRAE Guideline 0-2005 – The Commissioning Process INFORMATIVE ANNEX K - BASIS OF DESIGN

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

Basis of Design - Format & Expected Content 2023 05 17 (1)

- 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 Served>
 - 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

Basis of Design - Format & Expected Content 2023 05 17 (1)

- 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

Basis of Design - Format & Expected Content 2023 05 17 (1)

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

Basis of Design - Format & Expected Content 2023 05 17 (1)

- 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