Basis of Design

INTRODUCTION

The consultant is responsible for ensuring that the design they propose adheres to Yale’s design standards. This can be achieved by providing a summary of the design through submission of the basis of design herein. Other formats may be submitted as supplemental information, but they are not a substitute for completing this document. The consultant must also identify any proposed deviation(s) from Yale’s design standards through documentation by way of the basis of design.

COVER SHEET

|  |  |
| --- | --- |
| Project | Enter text |
| Project number | Enter text |
| Phase | *Select one:*  Schematic design (SD)  Design development (DD)  Construction documents (CD)  As built |
| Building | Enter text |
| FACID number | Enter text |
| User | Enter text |
| Planner | Enter text |
| Project manager | Enter text |
| Primary consultant | Enter text |
| Consultants | Enter text |

TABLE OF CONTENTS

1. Project overview
2. Project description
3. Space use
4. Codes and standards
5. Deviations to Yale’s design and construction standards
6. Sustainability
7. Energy, mechanical, electrical, plumbing, fire protection,   
   building system automation
8. Existing conditions
9. General design criteria
10. Energy
11. Mechanical systems (M)
12. Electrical systems (E)
13. Plumbing systems (P)
14. Fire protection systems (FP)
15. Building automation systems (BAS)
16. Landscaping, civil, structural
17. Landscaping (Not available at this time)
18. Civil systems (Not available at this time)
19. Structural (Not available at this time)
20. Environmental Health & Safety, Risk Management, Security, ITS
21. Environmental Health & Safety (Not available at this time)
22. Risk management (Not available at this time)
23. Security (Not available at this time)
24. ITS (Not available at this time)

APPENDICES

*Please select which appendixes are included in this submission. In later project submissions (CD-level and beyond), please reference where more detailed information is located within a project drawing set.*

|  |  |  |
| --- | --- | --- |
| # | Title | Document location |
| 1 | LEED scorecard or compliance table |  |
| 2 | Zero carbon-ready checklist |  |
| 3 | Existing conditions assessment |  |
| 4 | Interior conditions table |  |
| 5 | Energy analysis |  |
| 6 | Computational fluid dynamics analysis |  |
| 7 | Lighting analysis |  |
| 8 | Systems analysis |  |
| 9 | Conceptual one-line diagrams for M/E/P/FP |  |
| 10 | BAS controls sequences |  |
| 11 | Lighting controls sequences |  |

|  |
| --- |
| 1. Project Overview |

1. Project description

*Please describe the project, especially where and why it is being completed. Please also describe any enabling projects, or future requirements that may be part of the project scope.*

Enter text

1. Space use

*Please describe the intended use of the space. How many people will be using and servicing the space and when throughout the day, week, month, year?*

Enter text

1. Codes and standards

*Please list all applicable codes, guidelines, standards, regulations, and other references that will be followed for the project.*

|  |  |
| --- | --- |
| Building |  |
| Accessibility |  |
| Energy |  |
| Mechanical |  |
| Electrical |  |
| Plumbing |  |
| Fire protection |  |
| Life safety |  |
| Sustainability |  |
| Other |  |

1. Deviations to Yale design and construction standards

*Please list the date that Yale standards were reviewed and any deviations from* [Divisions 00 through 33](https://facilities.yale.edu/contractor-consultant-resources/design-guidelines/yale-university-design-standards-capital-project) *that are included in the most recent project deliverables. It may also be helpful to note significant areas of design that do not have an applicable Yale design standard.*

|  |  |
| --- | --- |
| Yale section | Deviations |
|  |  |
|  |  |

1. Sustainability

*Please list the project sustainability goals. Include a LEED scorecard or the* Yale LEED Compliance Table *as an appendix to this document. Describe how zero carbon readiness  
is achieved. If there are deviations from* Yale Section 01352*, please note them in the   
previous section.*

Enter text

|  |
| --- |
| 1. Energy, M/E/P/FP, Building Automation Systems |

1. Existing conditions

*Please provide an overview of existing conditions to the extent that they impact the scope of this project. Address existing mechanical, electrical, plumbing, fire protection, and building automation systems that remain. If a more detail existing conditions assessment has been completed, include it as an appendix to this document.*

Enter text

1. General design criteria

*Please describe the owner’s project requirements and all criteria that will define the design and operation of mechanical, electrical, and plumbing systems. Include the Interior Conditions Table for all spaces in the project as an appendix to this document.*

Enter text

1. Outdoor design conditions

*These design conditions should be reviewed with Yale Engineering, as different buildings and systems may require anywhere from 1% to 0.4% as reported for Bridgeport or Hartford, Connecticut. See next page.*

|  |  |
| --- | --- |
| ASHRAE criteria used |  |
| Summer dry-bulb temp |  |
| Summer wet-bulb temp |  |
| Winter dry-bulb temp |  |
| Dehumidification |  |

**Interior load assumptions**

*Building-wide averages could be provided with space-by-space breakout if spaces   
are unique.*

|  |  |
| --- | --- |
| Lighting w/ square feet |  |
| Equipment w/ square feet |  |
| Plug loads w/ square feet |  |
| Other load w/ square feet |  |
| Square feet per person |  |
| BTU per hour per person |  |
| Ventilation |  |
| Infiltration |  |
| Wall assembly |  |
| Roof assembly |  |
| Floors or slab |  |
| Fenestration |  |

**System design parameters**

|  |  |
| --- | --- |
| Duct sizing criteria | * *Low pressure mains:* [x]*/100’ pressure loss and velocity of* [x] *fpm* * *Low pressure branches:* [x]*/100’ pressure loss and velocity* [x] *fpm.* * *Low pressure runouts to diffusers: velocity* [x] *fpm* * *Medium pressure ductwork* [x]*/100’ pressure loss and velocity* [x] *fpm.* |
| Chilled water temperatures | ***Campus chilled water***  *Summer:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text  ***Primary cooling coils******(AHUs, FCUs)***  *Summer:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text  ***Chilled beams and/or radiant cooling***  *Summer:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text  ***Process cooling***  *Summer:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text  ***Other***  *Summer:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text |
| Hot water temperatures | ***Primary heating coils***  *Peak:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text  ***Chilled beams and/or radiant heating***  *Summer:* Enter text *degree F, Delta T* Enter text  *Off-peak:* Enter text *degree F, Delta T* Enter text |
| Steam | ***Campus steam***  *Heating:* Enter text *psig*  *Process:* Enter text *psig*  *Please identify the process loads and equipment connected to steam.* |
| Domestic hot water temperatures | *Setpoint:* Enter text *degree F* |

1. Energy

*Please describe the energy impact and goals for this project. Include energy analysis calculations or a model summary report as an appendix (A2) to this document. It is expected that every project will include some level of energy analysis appropriate to the scope of work. A complete energy modeling exercise shall include monthly projected energy use across all applicable utilities.*

**Energy impact summary**

|  |  |
| --- | --- |
| Electricity | *Estimated total annual electrical consumption:* Enter text *kWh* |
| Steam | *Estimated total annual steam consumption:* Enter text *MMBTU* |
| Chilled water | *Estimated total annual chilled water consumption:* Enter text *ton-hours* |
| Gas | *Projected annual gas consumption:* Enter text *CCF* |
| Water | *Projected annual water consumption:* Enter text *gallons* |

|  |  |  |
| --- | --- | --- |
| *This project will result in* | higher  lower  same | *total energy use than before the project.* |
| *This project will result in* | higher  lower  same | *total water use than before the project.* |
| *This project will result in* | higher  lower  same | *total greenhouse gas emissions than before the project.* |

Comment:  
*If the project is a new construction or major renovation, it is eligible for utility incentives for whole building performance and energy modeling services. Please indicate when you met with a United Illuminating Company (UI) representative to review.*

1. Mechanical systems

*For each system, please select, then provide the following information on new and existing equipment that will be used. This information may be summarized here and detailed on equipment schedules when the project is further developed.*

*Local chiller*

*Local boiler*

*Cooling tower*

*Air handling units (include filtration type, heat recovery)*

*FCU/CRAC/Unit heaters*

*Heat pump*

*Variable refrigerant flow (VRF) system*

*Variable air volume (VAV) terminal*

*Chilled beams*

*Exhaust fans*

*Displacement ventilation*

*Heating hot water systems (pumps, heat exchangers, etc.)*

*Chilled water systems (pumps, heat exchangers, etc.)*

*Steam and condensate systems (PRVs, traps, condensate pumps)*

*Radiant heating and cooling*

*Humidification*

*Specialty systems (vacuum, compressed air, medical gases, etc.)*

*Other:* Enter text

*A system description includes spaces served, unique applications, why the equipment was chosen, redundancy, sizing considerations and diversity, and tie-in points, if utilizing   
existing systems.*

*Please note that for air distribution systems, describe how they apply to different spaces, how return air, filtration, air quality monitoring, and comfort is addressed. If a computational fluid dynamics (CFD) analysis was performed to understand air distribution, quality, or comfort issues, please summarize the results and recommendations, including a copy of the analysis as an appendix.*

*Please include mechanical one-line drawings for each system that show tie-ins, equipment, and general distribution as part of an appendix.*

1. Electrical systems
   1. **Normal power**

*Provide a general scope description of changes to be made, or new work to be done, for normal power.*

Enter text

*Will the project tie into existing building power, or will a new main building switchgear   
be provided?*

Enter text

*If connecting to existing building power, identify the tie-in point within the existing building electrical infrastructure. What method was utilized to determine that sufficient capacity exists for the new project load? If testing was conducted, include the test results.*

Enter text

*If there is a new switchgear, provide a load calculation summary and sizing criteria along with a description of the gear.*

Enter text

*What is the estimated load for the project?* Enter text kVA

*What does this capacity represent?*

Increase

Incremental

Decrease

*If an incremental or decrease, what is the projected net change?* Enter text kVA

*Identify the voltages for equipment and systems (lighting, motors, elevators, etc.)*.

Enter text

*Identify the rating(s) of each dry-type transformer(s) that will be utilized for each application, as applicable.*

Enter text

*What is the expected building power factor?*

Enter text

*Provide descriptions and summaries of the following items.*

*Wiring methods (type of wire, routing, sizing, etc.)*

Enter text

*Conduit and cable*

Enter text

*Building distribution and panelboards*

Enter text

*Grounding methods*

Enter text

*Other equipment, as applicable*

Enter text

* 1. **Emergency and alternate power**

*Will there be emergency power for any building loads? What basis was used to determine the needs of emergency/alternate power for the project?*

Enter text

*Identify how emergency power will be provided (standalone generator, connection to a central system with alternate power, connection to an existing emergency generator, etc.).*

Enter text

*If connecting to a central system or an existing emergency generator, identify the tie-in point(s) and location of the proposed panel(s). What method was utilized to determine that sufficient capacity exists for the new project load? If testing was conducted, include the   
test results.*

Enter text

*If a new standalone generator is being provided, list all the relevant information regarding its sizing, fuel source, storage capacity, voltage, cooling source, etc.*

Enter text

*Will a separate fire-rated room be provided for alternate power? Describe how this will be accomplished, if applicable.*

Enter text

*List each load on emergency power and identify the total connected load.*

Enter text

*Will an uninterrupted power source (UPS) be installed? If so, list all the equipment that will be connected to the UPS and identify the UPS discharge time.*

Enter text

*Will an automatic transfer switch be provided? If so, how many poles will the switch have? Also, determine if the normal and alternate source are “separately derived systems,” i.e., do they share a common ground connection?*

Enter text

* 1. **Electrical settings**

*Is a coordination study necessary for the project?*

Enter text

*If “yes” to the question above, has a formal request been submitted to Yale to perform and submit short circuit/coordination study results?*

Enter text

*How will electrical testing be performed on the project, and in accordance with what electrical testing standard?*

Enter text

*How will arc flash labeling be provided on the project? Identify the extent of the labeling scope and coordinate with Yale Engineering on the labeling type to be used, as needed.*

Enter text

* 1. **Interior lighting and control systems**

*What type of luminaire will be provided and how will it be applied to the project?*

Enter text

*What is the foot-candle (lumens per square feet) requirement for each building space   
(i.e. classroom, office, conference, etc.). How many of each type of luminaire will be   
utilized to meet the foot-candle demand? Is natural lighting accounted for in meeting foot-candle requirements?*

Enter text

*Please describe how lighting and plug loads are controlled in each space in accordance with the* [State of Connecticut’s energy code](https://portal.ct.gov/DAS/Office-of-State-Building-Inspector/Connecticut-State-Building-Code/Regulations)*. Is there an existing lighting control approach and/or system in the building? Describe if, and how, the lighting and plug load controls are integrated with the building management system.*

*Local standalone control system?* Yes/No

* + *Occupancy/vacancy sensors? Wall-mounted override switch?*

Enter text

* + *Photocell sensors? Wall-mounted override switch?*

Enter text

* + *Dimmers?*

Enter text

* + *Timers or other time-based scheduling?*

Enter text

* + *Zone-level scene settings?*

Enter text

*Building-level network control system?* Yes/No

* + *Occupancy/vacancy control?*

Enter text

* + *Daylighting control?*

Enter text

* + *Building-level dimming/demand response?*

Enter text

* + *Time-of-day scheduling?*

Enter text

* + *Asset tracking?*

Enter text

* + *Data collection?*

Enter text

*Include a detailed sequence of operation for the lighting controls as an appendix.*

*Please provide the initial settings for lighting control equipment and written controls sequences to direct the lighting control vendors to install systems that meet the design intent.*

* 1. **Exterior lighting and control systems**

*Please describe the exterior lighting systems that will be provided and how they will be controller in accordance with the* [State of Connecticut’s energy code](https://portal.ct.gov/DAS/Office-of-State-Building-Inspector/Connecticut-State-Building-Code/Regulations).

Enter text

* 1. **Other considerations**

*Harmonics consideration and mitigation techniques?*

Enter text

*List any special research equipment loads and criteria.*

Enter text

*List all sound level ratings for the applicable electrical equipment (i.e., transformers, variable speed drives, generators, etc.).*

Enter text

*Describe any other electrical system connections that are not previously identified.*

Enter text

* 1. **Electrical drawings**

*Include all the electrical drawings for each system identified in this section as part of   
the appendix.*

* *One-line drawings*
* *General arrangement/layout drawings*
* *Equipment list*
* *Cable/conduit schedules*
* *Panel schedules*
* *In/out list (with alarms and trips)*
* *Grounding one-line diagram and grounding details*
* *Three-line schematics*
* *Loop diagrams*
* *Communication architecture diagram*

1. Plumbing systems
   1. **Domestic water service and system**

*Will a new water service be provided? If so, describe its location, number of service entrances, sizing, and meter sizing. Also, identify the backflow preventer location and type that will be installed.*

Enter text

*If connecting to an existing system(s), identify the tie-in point and capacity evaluation.*

Enter text

*Will booster water pumps be necessary? In either case, identify how this was determined, including the pressure requirements of existing areas as well as new areas served.*

Enter text

*What piping installation methods will be utilized for domestic water service?*

Enter text

*Will irrigation be installed as part of the project? If so, describe the connection, location, and method of control for the system.*

Enter text

* 1. **Domestic hot water service**

*Describe the source of domestic hot water for the project and how that decision was made. Please address zero carbon-ready approaches as well.*

Enter text

*What piping and installation methods will be utilized for domestic hot water service?*

Enter text

* 1. **Sanitary, waste, and vent system**

*Provide a general description of the proposed scope for installation of new, or modifications made to existing sanitary, waste, and vent systems.*

Enter text

*How is sanitary currently discharged from the building?*

Enter text

*Will this sanitary discharge be modified? If so, explain.*

Enter text

*Are the storm and sanitary discharge points separated?*

Enter text

*Are storm and sanitary utility mains separated outside of the building?*

Enter text

*Is the sanitary system gravity discharged, or are there pumps? If a combination, please describe. What changes will the project make to this system?*

Enter text

*Describe how fats, oils, and greases (FOG) will be handled for collections, separation,   
and discharge.*

Enter text

*How is hot water discharge from the process systems cooled before being discharged to   
the drain?*

Enter text

*What piping installation methods will be utilized for sanitary, waste, and vent service?*

Enter text

* 1. **Storm water system**

*Provide a general description of the proposed scope for installation of, or modifications to storm water systems.*

Enter text

*Describe changes for the installation of storm retention systems as part of the project and identify the sizing criteria.*

Enter text

*What piping installation methods will be utilized for storm service?*

Enter text

* 1. **Reclaimed water system**

*Provide a general description of the proposed scope for installation of, or modifications to reclaimed water systems.*

Enter text

* 1. **Plumbing fixtures**

*List the different types of plumbing fixtures to be installed, including design water flow, automatic flush/operation, and other unique features for each type.*

*Urinals:* Enter text

*Water closets:* Enter text

*Sinks (list all as appropriate):* Enter text

*Showers:* Enter text

*Will trap primers be installed? If so, identify the locations.*

Enter text

*Will mixing valves be installed? If so, identify where, what type, and for what service.*

Enter text

*What safety-related plumbing fixtures will be installed such as eyewashes or emergency showers? Identify the locations and criteria that was used to determine quantity, type,   
and location.*

Enter text

*Explain how cross contamination (unwanted mixing of hot and cold water at sinks) or submerged connections that exist as part of the design will be handled (i.e., backflow preventers, check valves, etc.).*

Enter text

* 1. **Other specialty plumbing systems**

*Provide descriptions and design criteria for the following systems, as applicable.*

*RO/DI systems:* Enter text

*Hazardous biological waste contaminant/discharge:* Enter text

*Water treatment:* Enter text

*Specialty drain piping:* Enter text

*Other:* Enter text

* 1. **System one-line drawings**

*Include all the plumbing one-line drawings for each system identified in this section within   
the appendix.*

1. Fire protection systems
   1. **Sprinkler systems**

*Will the project include installation of an automatic sprinkler system? If so, generally describe the system and approach. If not, describe reasons why.*

Enter text

*List all the applicable design standards and codes utilized.*

Enter text

*Description of the system:*

*What is the source? Identify the tie-in point and sizing of interconnection.*

Enter text

*Was a main pressure and flow test conducted? If yes, identify the results.*

Enter text

*Has the latest data been obtained by the Regional Water Authority?*

Enter text

*Does a fire pump exist, or is a new pump required? If so, provide the   
capacity calculations.*

Enter text

*Identify the design criteria, specifically addressing classification, coverage, density, and water supply duration for each space.*

Enter text

*Describe the piping system and components to be used.*

Enter text

*How has future expansion of the system been taken into account? Have mains been sized for future expansion and fitout of the floor?*

Enter text

*List all the specialty systems and areas served. Include a description of the systems specified (INERGEN, pre-action, kitchen hoods, etc.).*

Enter text

* 1. **Fire alarm**

*Will the project provide a new fire alarm system or connect to an existing system? Identify what system will be used.*

Enter text

*Describe the proposed fire alarm system, functionality, and components to be installed.*

Enter text

*Is a voice evacuation system being provided as part of the project?*

Enter text

*Where will the main fire alarm panel be located?*

Enter text

*How has the design addressed the need for alarming unique spaces like sound booth rooms, animal holding, etc.?*

Enter text

*Are there any conditions and/or activities in any of the spaces that make maintenance, operation, or testing of the fire protection systems challenging (i.e., high ceilings, semi-concealed locations, etc.)?*

Enter text

*List all the other systems that are integrated in the fire alarm system and the method of integration, including HVAC, purge exhaust, etc.*

Enter text

*Will there be any standalone devices that are not tied into a central system? If so, where and what service will be provided?*

Enter text

*Describe the connection of the fire alarm system to emergency power and battery   
back-up capabilities.*

Enter text

*Will fire and/or smoke dampers be installed? If so, what type and location(s)? How will access be provided for inspection and maintenance? Will each fire and/or smoke damper be tied into the fire alarm system?*

Enter text

1. Building automation systems
   1. **Building automation equipment**

*Will the project interface with the existing building automation system (BAS)? If so, what system will be used? Please identify any existing BAS controllers or communication that will require updates as part of this scope of work.*

Enter text

*What third-party controllers will be installed as part of the project? List all the equipment and identify how communication will be handled between Yale’s BAS and the controller. Fill out the following table for all third-party controllers.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Third-party controller | Equipment served | Controller type | Communications method | Yale BAS communications | Remote monitoring (Y/N) |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

*Will there be any local control that will not be tied into Yale’s BAS? If so, describe   
the control.*

Enter text

* 1. **Sequence of operations**

*Include a detailed sequence of operation for all systems and equipment as an appendix.*

* 1. **Metering**

*Please describe how building-level metering and sub-metering will be provided.*

Enter text

* 1. **Monitoring-based commissioning**

*Will the project include monitoring-based commissioning? What provisions have been provided to perform this task? Please describe the overall approach.*

Enter text

* 1. **Alarms**

*Has a list of alarm points and parameters been developed?*

Yes

No