# Owner's Projects Requirements and Bases of Design Report Format

## <Project Name – U-M Project Number>

### <Building Name – U-M Building Number>

**<Design Phase>**

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## Executive Summary

***Include descriptive narrative of the project scope. Narrative shall be limited to one-page and shall include a clear and concise explanation of the project background, scope and goals.***

## Project Team

*List key project team members. Include the role and organization of each member.*

**<Project Name>**

**<Design Phase>**

# Owner's Project Requirements (OPR)

***The OPR shall define the project intent, functional requirements and operation expectations. The OPR along with room data sheets, shall contain the qualitative objectives necessary to inform the project design and Basis of Design (BOD) document. Specific information included in the room data sheets are not to be repeated in the OPR.***

***Do not describe requirements as "per U-M Design Guideline," if this is the case summarize the Design Guideline in the description.***

***The numbering system used in this OPR/BOD Template shall remain consistent. Should additional sections be required, these sections shall be added using the same numbering system.***

***The OPR/BOD document shall be updated at each project phase. Revisions between project phases shall be demonstrated using "track changes" located under the "review" tab in Microsoft Word.***

## Project Information

Project Description

1. Project Location *At a minimum include project address, campus name (Ann Arbor Central Campus, Dearborn Campus, etc.), project site adjacencies and, if applicable, include the building in which the project is located.*
2. Type of Project *Indicate if the project is a new building, addition or renovation project.*
3. Total Gross Square Footage *Include project total gross square footage of renovated and new construction areas.*
4. Project Delivery Method *Indicate project delivery method used on the project. Include special construction processes required such as phasing, occupancy during construction, protection of adjacent spaces, fast-track, etc.*
5. General Design Objectives *Provide a brief description of the project scope. At a minimum, include owner's desired aesthetic and major design elements to be included.*
6. Limitations *Describe project constraints that may have an impact on the overall design (i.e. existing floor-to-floor heights, tight construction schedule, etc.)*

7. Existing Building Information *Provide information on the existing building in which the renovation and/or addition will take place. If existing building(s) are to be demolished in preparation for the project, include a brief description of building(s) slated for demolition and identify any significant features. Remove if non-applicable to project scope.*

8. U-M AEC Project Goals Document included in Appendix. *Attach U-M AEC Project Goals Document to Appendix.*

## Space Requirements

1. Summary of Tabular Program. Reference Appendix for detailed program summary. Insert high-level program summary in table format and include detailed summary in Appendix.

2. Refer to room data sheets for detailed space requirements on a room-by-room basis. Room data sheets located in Appendix.

3. The following additional space requirements, not indicated on the room data sheets, shall be provided:

    a. *Include any additional space requirements that cannot be expressed on room data sheets,* ***if none, insert the word "None."***

4. Provisions for Future Expansion *Describe how project is preparing for future needs (i.e. shell space, increased load-bearing capabilities, etc.).* ***Should provisions not be part of the project, insert the word "None."***

## Occupancy

1. Special Occupancy Use Requirements *Describe spaces where occupancy may vary widely due to special events or circumstances. Also, include this information in the room data sheets under Maximum Code Occupancy and Maximum Design Occupancy.*

2. Full-Time Equivalent (FTE) *Provide FTE number for building and include calculations.*

3. Building Hours *Indicate building occupancy hours for each day of the week*

4. Seasonal Variation *Describe seasonal variations of building occupancy****, if none, insert the word "None."***

## Major Project Assumptions

1. BFS Space *Indicate Bureau of Fire Safety Involvement and include type(s) of BFS spaces (i.e. classroom, dormitory, health care, child care),* ***if none, insert the word "None."***

2. Schedule and Sequence *Include durations (number of months, not actual dates) for start of construction, substantial completion, temporary relocation, etc.)*

3. Logistics *Include unique situations and coordination activities that need to occur before and/or during project construction. For example environmental impact, social events around the site and infrastructure.*

4. Design and Construction Phasing *Describe project phasing if applicable**, if none, insert the word "None."***

5. Building Occupancy During Construction *Indicate if building will be occupied during construction and, if so, describe occupancy requirements)*

Special Requirements

1. *List and describe special requirements (i.e. vibration, noise transmission, etc.).* ***Should there be no special requirements, insert the word "None."***

## Codes and Standards

Applicable Codes

***Name code version used for the codes listed. The edition of building codes is to be as listed in this section as of the beginning of the design development phase of a project unless construction documents are submitted to the university for final review more than a year after adoption of the new version of the code. Only list codes applicable to the project scope.***

1. Building Code
2. Mechanical Code
3. Electrical Code
4. Plumbing Code
5. Life-Safety Code
6. Energy Code
7. Elevator Code NOTE: Elevator Code is locked in when contractor pulls permit.

## Sustainability Requirements/ Goals

Energy Conservation Goals

*Refer to the Basis of Design for a detailed description of how energy conservation goals will be met.*

1. *Indicate energy conservation goals (i.e. stretch goal above ASHRAE 90.1 baseline, EUI target, etc.),* ***if none, insert the word "None."***

Water Conservation Goals

*Refer to the Basis of Design for a detailed description of how water conservation goals will be met.*

1. *Indicate water conservation goals (i.e. indoor water reduction goals, irrigation reduction, greywater system, etc.),* ***if none, insert the word "None."***

LEED Goals

*Refer to the Basis of Design for a detailed description of how the LEED goals will be met.*

1. *Indicate LEED certification goals (include LEED version and certification level),* ***if none, insert the word "None."***

Carbon Reduction Goals

*Refer to the Basis of Design for a detailed description of how carbon reduction goals will be met.*

***1. Include carbon reduction goals (i.e. meet U-M maximum carbon emissions target, carbon-neutral-ready, percent reduction in embodied carbon through material use), if none, insert the word "None."***

Other Sustainability Goals

1. *Include any other sustainability goals (i.e. designed per Passive House Standards, designed to earn ENERGY Star, WELL Building certification, Net-Zero Building etc.),* ***if none, insert the word "None."***

## Project Site Requirements/ Goals

Building/ Site Relationship

***Refer to the Basis of Design for a detailed description of the building and site relationship of the design.***

1. U-M Campus Planning Principles document included in the Appendix. ***Include Campus Planning Principles document in Appendix, when available.***

2. Relationship to Surrounding Environment

    a. *List and describe requirements, limitations and restrictions in response to existing structures, site elements and greenspace on, and around, the project site.* ***Do not include information based on A/E's design judgement or that is required by UM non-building users, these should be described in the BOD.***

3. Building Height Restrictions

    a. *List and describe height requirements and/or restrictions.* ***Do not include information based on A/E's design judgement or that is required by UM non-building users, these should be described in the BOD.***

4. Main Entrance Location *Indicate location of main entrance(s) if provided by U-M.*

Parking and Circulation

***Refer to the Basis of Design for a detailed description of the parking and circulation design.***

1. *List and describe impacts to roads, sidewalks, right-of-way (impacts including traffic and parking, changes in hardscape and projections into the ROW such as canopies, stairs and rails), bus stop changes/additions, vehicular access, passenger drop-off, parking space requirements (ADA, service vehicles, van/carpool, etc.), loading docks, etc. Also, when applicable, include major parking features (i.e. under-ground parking, parking structure, structural connection to parking, drop-off canopy, etc.).* ***Do not include information based on A/E's design judgement or that is required by UM non-building users, these should be described in the BOD.***

Landscape and Hardscape

***Refer to the Basis of Design for a detailed description of the landscape and hardscape design.***

1. Landscape *Describe desired landscape aesthetic. Include description of trees of significance, if relevant, and maintainability and irrigation requirements.*

2. Hardscapes *Describe requirements for pedestrian walkways, gathering areas, etc.*

### Stormwater Management

***Refer to the Basis of Design for a detailed description of stormwater management systems.***

1. National Pollutant Discharge Elimination System (NPDES) Requirements *Indicate if a project is required to meet NPDES requirements and include any goals to exceed NPDES requirements.*

2. List other goals as directed by U-M EHS/ U-M Campus Planning ***Remove section if non-applicable to project scope.***

## Architectural Requirements/Goals

### Building Massing

***Refer to the Basis of Design for a detailed description of the building massing.***

1. General Massing Requirements/ Goals *Describe shape, form and scale requirements (i.e. building geometry, orientation of the principal mass of the building, relation of façade(s) and skyline(s) to street edge, roof shape). Include goals related to daylight harvesting, solar shading, solar energy production, etc.*

2. Window-to-Wall Ratio Limitations *Include ratio goal provided by U-M.*

### Building Envelope

***Refer to the Basis of Design for a detailed description of building envelope systems.***

1. General Building Requirements *Provide a summary description of general, Owner specific requirements (i.e. desired building aesthetic, durability, maintainability, etc.).*

2. Exterior Wall Requirements *Provide thermal performance goals such as R-values. For renovation projects include existing envelope analysis, reports to be included in Appendix (i.e. adding insulation to existing walls, etc.).*

3. Fenestration Requirements *Provide a summary of areas, room-types or activities where particular fenestration types (clerestory, vision, daylight, etc.) are desired. Also, include thermal performance goals such as U-value, SHGC, VT. For renovation projects include existing fenestration analysis, reports to be included in Appendix.*

4. Roof Requirements *Provide thermal performance goals such as R-values. For renovation projects include existing envelope analysis, reports to be included in Appendix (i.e. adding insulation to existing walls, etc.).*

### Interior Architecture

***Refer to the Basis of Design for a detailed description of the building interior architecture.***

1. General Interior Requirements *Provide a summary description of the general, Owner specific requirements (i.e. desired aesthetic, durability, maintainability, etc.).*

2. Circulation Requirements

3. Focal Points

4. Furniture

# Mechanical Requirements/Goals

***Where a requirement is still to be determined, indicate TBD.***

## HVAC Requirements

***Refer to the Basis of Design for a detailed description of HVAC systems.***

1. Refer to the room data sheets for the required temperature, humidity, equipment heat gains, air change rates, pressure relationships, air filtration, noise classification level, cleanliness class and any special HVAC requirements, on a room by room basis.

2. The following additional HVAC requirements, not indicated on the room data sheets, shall be provided:

    a. ***Any additional HVAC requirements shall be added here, if none, insert the word "None".***

## HVAC System Requirements by Space Type

*Refer to the Basis of Design for a description of the HVAC system that will serve each space type*) *Describe specific Owner HVAC system requirements in this section*. ***Include the subparagraphs shown under the sample space (Offices) for each space type applicable to the project. Add and delete space types as applicable to the project.***

1. Offices
    a. Hours of Operation *Include the typical hours of operation for weekdays and weekends.*

    b. Building User Redundancy Requirements *The objective is to assess the impact of an equipment failure on the building user's daily operations and then provide a level of redundancy appropriate to the risk. The A/E must help the user understand the type of failures, the probability of each occurring, and an estimate of the time it will take to effect repairs, so that the user can make an informed decision regarding redundancy needs.* ***Do not include redundancy provided based on the A/E's design judgement or that is required by UM non-building users, these should be described in the BOD.***

    c. Number of Spaces per Thermostatic Control Zone *Describe number of spaces for thermostatic control zone even if per U-M Design Guideline.*

    d. Building User's Future Capacity Requirement ***Include the subparagraphs shown under the sample space for each space type applicable to the project. Add and delete space types as applicable to the project.***
2. Classrooms
3. Atria
4. Kitchens
5. Dining Areas
6. Residential Rooms
7. Laboratories

8. Vivaria
9. Lobbies
10. Loading Docks
11. Trash, Recycling, Composting Rooms
12. Stairwells
13. Data Closets

## Mechanical System Requirements

***Refer to the Basis of Design for a detailed description of mechanical systems.***

1. Cooling Systems/Source *Provide a summary description of the cooling system including Owner specific requirements, e.g. Geothermal system, chiller plant located in the building, chilled water from a central chiller plant located in building X, DX, VRF, heat pumps, etc.*
2. Heating Systems/Source *Provide a summary description of the heating system including Owner specific requirements, e.g. Geothermal system, HHW generated by steam from the university's tunnel system, condensing boilers located in the building, VRF, heat pumps, etc.*
3. Humidification Systems/Source *Provide a summary description of the humidification system including Owner specific requirements, e.g. provided by steam from the university's tunnel system, steam boiler in the building, clean steam generator in the building, local self-contained humidification system, etc.*. ***If none, state none.***
4. Special Mechanical Systems *Provide a description of any special mechanical systems required for the project, including the design criteria for the system. Detailed descriptions of the design provided to meet these requirements shall be reserved for the BOD.* ***Add or delete from the below list as required for the project.***
    a. Exhaust *Describe if hazardous or other special exhaust systems are required, e.g. fume hood exhaust, general lab exhaust, acid exhaust, kitchen exhaust; including any User specific redundancy or other requirements.*
    b. Process Cooling *E.G. lab equipment hydronic cooling. Include design criteria, e.g. required supply water temperature, pressure, water quality requirements, etc. including any User specific redundancy or other requirements.*
    c. Smoke Control *Describe what, if any smoke control is required for the building, typically driven by building code. Detailed descriptions shall be reserved for the BOD.* ***If not required, state "not required".***
        i. Building *Including but not limited to a description of any impacts on the HVAC system due to fire zones.*
        ii. Atrium
        iii. Stairway
        iv. Elevator Hoistway
        v. Other
    d. ***Add headings as required.***

5. Control and BAS Strategy *Provide a summary description of the controls approach for the project, including any special controls.*
    a. General Building Controls
    b. Laboratory Controls
    c. Other Controls
    d. BAS Requirements

## Laboratory Equipment

***Revise this section to include a description of laboratory systems or equipment that impact the mechanical, plumbing, or fire protection systems. Examples of topics to be covered are provided below. Where a requirement is still to be determined, indicate TBD. Delete this section if it does not apply.***

- *Environmental rooms and cold rooms*
    - *Air or Water-cooled condenser?*
        - *Location of condenser*
    - *Emergency Power requirements*
    - *Cooling backup requirements*
    - *Other special requirements*
- *Fume Hoods*
    - *Fume hood types (bench or floor-mounted)*
    - *Sash types (horizontal, vertical, combination)*
    - *Face velocity*
    - *ASHRAE 110 testing (As Installed)?*
- *Bio-safety cabinets and/or laminar flow hoods*
    - *Types*
- *Gas cabinets and cylinders*
- *Ventilated animal racks*
    - *Direct-connected to house system or with fan packs?*
    - *Fan pack mounted on supply or exhaust of rack?*
- *Cage/rack washers*
    - *Steam and condensate*
    - *Chemical treatment*
- *Sterilizers, glass washers*
- *Other equipment*

## Special Mechanical Systems

*Revise this section to include a description of special requirements or systems that impact the mechanical, plumbing, or fire protection systems. Examples of topics to be covered are provided below. Where a requirement is still to be determined, indicate TBD.* ***Delete this section if it does not apply.***

- *BSL-3 lab*
- *Laser lab*

- *Animal bedding dispensing and collection*
- *Animal watering*
    - *Central system vs. bottling system*
    - *Distribution*
    - *Room level piping, PRV stations, controls*
    - *Rack water system automatically flushed at each rack or flush valve common to all racks?*
- *Aquatics lab*
    - *Water conditioning concept*
    - *Air conditioning and dehumidification*
- *Special lighting*
- *Greenhouse*
- *Darkroom*
- *Laundry*
- *Paint spray booth*
- *Radon mitigation*
- *Etc.*

## Plumbing Requirements/ Goals

*Where a requirement is still to be determined, indicate TBD.*

Plumbing Systems Requirements

***Refer to Basis of Design for a detailed description of plumbing systems.***

1. Domestic Water (Hot and Cold)
    a. Source *Include the utility connection if not known indicate TBD*
    b. Temperature
    c. Distribution
        i. Fixture types and Requirements *E.G. water closets/1.28 GPF/dual flush; urinals/1/8 GPF battery operated flush valve; lavatories/battery operated hands free;* ***repeat for all general fixture types.***
2. Sanitary Waste
    a. Source *Include the utility connection if not known indicate TBD*
3. Stormwater
    a. Refer to Project Site Requirements/Goals section for additional Owner requirements related to stormwater management
    b. Source *Include the utility connection if not known indicate TBD*
4. Irrigation
    a. Source *Include the utility connection if not known indicate TBD*

### Special Plumbing Systems

*Provide a description of any special plumbing systems required for the project, including the design criteria for the system. Detailed descriptions of the design provided to meet these requirements shall be reserved for the BOD.* ***Add or delete from the below list as required for the project.***

1. High Purity Water Systems
    a. Softened Water
    b. Deionized (ID) Water
    c. Reverse Osmosis/Deionization (RODI)
2. Special Waste Systems
3. Vacuum
4. Compressed Air
5. Specialty Gases
6. Special Water Systems *(e.g. animal, plant, etc.)*

### Natural Gas

***Describe specific Owner natural gas requirements in this section.***

1. Utility Connection *Describe source (e.g. DTE)*

## Fire Protection Requirements/ Goals

***Where a requirement is still to be determined, indicate TBD. Refer to the Basis of Design for a detailed description of fire protection systems.***

### Water Source

1. *Identify source*

### System Types

***Location and type such as wet type, dry pipe, pre-action systems***

1. Special Fire Protection Requirements *e.g. "clean agent"/waterless type systems*

## Electrical and Telecom Requirements/Goals

*Where a requirement is still to be determined, indicate TBD*.

### Electrical System Requirements

1. *Refer to the Basis of Design for a detailed description of electrical systems.*
2. Primary Power Distribution
    a. Source *Identify source of power (U-M CPP or DTE)*
    b. Redundancy *The objective is to assess the impact of a loss of power on the building user's daily operations and then provide a level of redundancy appropriate to the risk. The A/E must help the user understand the type of failures, the probability of each occurring, and an estimate of the time it will take to effect repairs, so that the user can make an informed decision regarding redundancy needs.* ***Do not include redundancy provided based on the A/E's design judgement or that is required by UM non-building users, these should be described in the BOD.***

*i.* Unplanned loss of power *Describe issues associated with unplanned loss of power and preferred method to deal with the loss of power (i.e. dual primary feeds, generators, UPS, etc.).*

*ii.* Planned loss of power *Describe issues associated with planned loss of power and preferred method to deal with the loss of power (i.e. single-end substation, double-end substations, etc.)*

c. Unit substation location

i. Accessibility for replacement *Describe Owner specified requirements. Do not include requirements provided based on the A/E's design judgment or that is required by manufacturer and/or code, these should be described in the BOD.*

ii. Relationship to sensitive areas and/or equipment *Identify locations and/or equipment that would need to be distanced from the substation.*

3. Secondary Power Distribution

a. Refer to room data sheets for the location of equipment as well as electrical voltage needed.

b. The following additional requirements, not indicated on the room data sheets, shall be provided:

i. Panelboards and associated equipment *Describe requirements for each space. Add and delete space types as applicable to the project,* ***if none, insert the word "None".***

1. Electrical Rooms
2. Mechanical Rooms
3. Corridors
4. Classrooms
5. Laboratories

ii. List equipment requiring special/ non-standard voltages *Include name of equipment and a description of the special requirement (i.e. DC power, 240VAC, 415VAC, 50HZ, etc.),* ***if none, insert the word "None".***

1.

iii. List equipment and/or areas requiring Uninterruptable Power Supply System (UPSS)

1.

iv. Metering *List spaces and/or equipment that require dedicated metering and identify the metering needs (i.e. billing, energy usage, etc.)*

4. Emergency/ Standby Power

a. Power source preference *(i.e. generator, central battery unit, individual battery packs, etc.)*

i. Fuel source for generator *(i.e. natural gas or diesel).* ***Remove section if non-applicable to project scope.***

ii. Generator location *Indicate owner's preferred/tolerant location due to generator sound, vibration exhaust, accessibility, etc.*

b. Occupancy, duration and operational requirements during power outage *Explain anticipated number of occupants that would need to remain, what activities would need to continue and for what duration.*

c. List loads requiring stand-by power *(i.e. power, lighting, mechanical, lab equipment, etc.)*

d. Tolerance of power bumps during transition from normal power to generator power during monthly testing and maintenance *(i.e. ATS open or closed transition, by-pass switch or no by-pass switch)*

5. Renewable Energy *Revise this section to describe the type of renewable energy desired (wind, solar, thermal) and at what level (percentage of electricity or energy use).* ***Delete this section if it does not apply.***

    a.

6. Special Loads *Revise this section to include a list of equipment that requires additional consideration and their requirements (i.e. isolation power transformers, harmonic mitigation, stage and performance power, copper-shielded rooms, mandated lighting levels, RFI/EMI concerns, etc.). Where a requirement is still to be determined, indicate TBD.* ***Delete this section if it does not apply.***

    a.

## Lighting System Requirements

***Refer to the Basis of Design for a detailed description of lighting systems.***

1. Interior Lighting

    a. Refer to Room Data Sheets for specific interior lighting and control requirements for each space type.

    b. Special Lighting Requirements. *List areas requiring special lighting requirements with a brief description (temperature, CRI, Controls, etc.). Add and delete space types as applicable to the project,* ***if none, insert the word "None".***

        i. Laboratory

        ii. Classroom

        iii. Reception

2. Exterior Lighting

a. Facade Lighting *Describe building façade lighting and lighting control needs*

b. Heightened Security and Safety *Describe areas of concern (example paths of travel to and from the project that require heightened security and safety lighting levels*

c. Sign Lighting *Describe sign lighting and control needs*

3. Lighting Controls

a. Refer to the room data sheets for occupancy, daylight and other lighting controls, on a room by room basis.

b. The following additional lighting controls, not indicated on the room data sheets, shall be provided:

i. ***Any additional lighting control requirements shall be added here, if none, insert the word "None".***

### Fire Alarm System

***Refer to the Basis of Design for a detailed description of fire alarm systems.***

1. Mass notification *Indicate if mass notification system is required (Required or Not-Required).*

***Security Systems List required security systems and locations (i.e. Access control requirements (perimeter, interior space, etc.), Camera (CCTV) requirements, Limited access spaces due to types of materials stored, Point of service security requirements, Security telephones/blue light phones, door lock-out systems)***
***Refer to the Basis of Design for a detailed description of security systems.***

### Special Systems

*List special systems required and locations (i.e. snow melt, equipment tracking, intercom system, pneumatic tube, etc.)* .***Delete this section if it does not apply.***

1.

### Telephone/ Data Systems

***Describe requirements and locations (i.e. Wi-Fi coverage areas, POTS vs Voice Over IP, Separate telephone system requirements (critical care, emergency use, etc.), etc.)***

## Audio Visual Requirements/ Goals

***Refer to the Basis of Design for a detailed description of Audio/Visual systems.***

1. Refer to the room data sheets for the required functionality on a room by room basis.
2. The following additional A/V requirements, not indicated on the room data sheets, shall be provided:

a. ***Any additional A/V requirements shall be added here, if none, insert the word "None".***

### AV System Requirements by Space Type

***Refer to the Basis of Design for a description of the AV system that will serve each space type, if applicable.***

*Describe specific Owner AV system requirements in this section.* ***Include the subparagraphs shown under the sample space (Offices) for each space type applicable to the project. Add and delete space types as applicable to the project.***

1. Offices
2. Conference Rooms
3. Classrooms
4. Auditoriums/ Lecture Halls
5. Multi-Purpose Rooms
6. Huddle Rooms
7. Scheduling Systems
8. Digital Signage
9. Etc.

## Training Requirements

***List training requirements for new systems and equipment that U-M may not be familiar with. This is not meant to be a complete list of all training needs.***

1. *Example: One week classroom training at U-M for training for on X.*
2. *Example: Send 2 building maintenance staff to the X factory for training on the X controls.*

**<Project Name>**

**<Design Phase>**

# Basis of Design (BOD)

## Project Information

***Reference Owner's Project Requirements for Project Information***

## Codes and Standards

Summary and Analysis

***Explain how project will respond to codes. Include variance requirements when applicable***

Occupancy Classifications

***Include implications of each classification (e.g. sprinkler system, height restrictions, travel and exit requirements, fixture counts, etc.)***

## Sustainability Narrative

Energy Conservation

1. Refer to U-M Energy Conservation Measures (ECM) Report and Energy Impact Statement for detailed information related to individual ECMs. U-M Energy Conservation Measures (ECM) Report and Energy Impact Statement located in Appendix.

2. Energy Savings

    a. *List energy saving measures included in the project with a brief description.*

Water Conservation

***1. List indoor and outdoor water saving measures included in the project with a brief description***

LEED

1. Refer to LEED Checklist located in Appendix.

Carbon Reduction

1. Building Use Type *(Remove section if project is not required to meet U-M Maximum Building Emissions Target)*

    a. *Document the percentage of each building use type and breakdown of programmatic spaces included with each building type.*

2. Maximum Building Emissions Target *(Remove section if project is not required to meet U-M Maximum Building Emissions Target)*

    a. *Include weighted average calculations per guidance in DG 3.6 Carbon Reduction*

3. Refer to Carbon Reduction Backup (Energy Model Output and Calculations) located in Appendix. ***(Remove section if project is not required to meet U-M Maximum Building Emissions Target)***

4. *List measures included in the project to help to University meet Carbon Reduction goals.*

Other Sustainability Measures

1. *List additional sustainability measures included in the project.*

## Project Site Narrative

Building/ Site Relationship

1. Relationship to Surrounding Environment *Describe how the project building design relates to the site.*

2. Building Height

3. Main Entrance

Parking and Circulation

1. Describe how project is meeting parking and circulation requirements.

Landscape and Hardscape

1. Landscape

2. Hardscape

Stormwater Management

1. National Pollutant Discharge Elimination System (NPDES)

2. U -M EHS/ U-M Campus Planning Narrative *Describe how the project responds to EHS and Campus Planning goals. Remove section if non-applicable to project scope.*

## Architectural Narrative

Building Massing

1. General Massing

2. Window-to-Wall Ratio

Building Envelope

1. General Building Envelope *Include description of overall building aesthetic and envelope systems. Discuss material transitions and how the transitions will be addressed, air-leakage rates pursued and sealing efforts implemented to obtain air-leakage rates.*

2. Wall System *Include descriptions of each wall type. Include, at a minimum, the materials that make up each above-grade and below-grade wall system, the insulation type and R-value and the overall u-value of each wall type. Describe air and vapor barriers. Describe the wall*

***construction in terms of the location of the insulation, air/vapor barriers, and air spaces within the wall.***

3. Fenestration *Include description of each glazing type used on the building envelope. Include, at a minimum, assumed basis of design product, coatings, tints, frits, SHGC, VT and u-value. If applicable, describe permanent architectural shading devices and the impact on the performance of the window, dimensions and number of light shelves, etc. Discuss how exterior window type and placement (i.e. floor-to-ceiling, clerestory, opaque, etc.) meet the project scope (what type of windows, lighting and transparency is required for different program spaces) and the impact on daylighting and occupant comfort. Describe how glazing will address bird deterrence.*

4. Roof *Describe roof structure and materials. Include insulation type, r—value and reflectivity (if applicable).*

### Interior Architecture

1. General Interior
2. Circulation
3. Focal Points
4. Furniture

## Mechanical Systems Narrative

This section provides overview descriptions of the mechanical systems that will be provided to deliver the owner's project requirements, which are described in the OPR and the room data sheets. Refer to the room data sheets for the temperature, humidity, equipment heat gains, etc., that the systems described below will deliver.

### General Design Conditions

1. Outside Climatic Design Conditions
2. Additional Design Conditions *e.g. for a project with a vivarium, the heat gains from various animals might be listed here, if not provided on the room data sheets.*

***HVAC Systems by Space Type Provide a description of the HVAC system for each major space type in the building. Include the subparagraphs shown under the sample space (Offices) for each space type applicable to the project Add and delete space types as applicable to the project.***

1. Offices

    a. Concept *e.g. central station VAV air handlers, chilled beams/DOAS/heat recovery, fan coils, VRF, heat pumps, roof top DX/indirect gas etc. Describe the components that will be included in the associated air handlers, fan coils, etc. e.g. economizer, filtration, energy recovery devices, coils, fan wall, etc.*

b. Design Supply Air Conditions *Provide dry bulb temperature. Also, provide the wet bulb temperature when it will be controlled to provide the conditions required by the room data sheets.*

c. Redundancy Provisions *e.g. "Each air handler will include a fully redundant fan".*

d. Additional Capacity *Provided for Future Use e.g. "No additional capacity is provided for future use". "10% additional air handler capacity is provided for future use."*

e. Location of Major System Components *e.g. roof, penthouse, basement mechanical room, above ceiling, floor mounted in a linear equipment room, etc.*

2. Classrooms
3. Atria
4. Kitchens
5. Dining Areas
6. Residential Rooms
7. Laboratories
8. Vivaria
9. Lobbies
10. Loading Docks
11. Trash, Recycling, Composting Rooms
12. Stairwells
13. Data Closets
14. Etc.

## Mechanical System Requirements

*Provide a detailed description of the mechanical systems that will be provided to meet the Owner's requirements.*

1. Cooling Systems/Source

    a. Concept *Describe the cooling system including all major components and associated pump loops. Provide for all the applicable systems listed below.*

    b. Design Criteria *Provide the supply water temperature conditions that the plant will deliver (or that the project will receive if connecting to an existing plant) and that any sub-loops will provide. Include temperatures provided under all plant modes, e.g. during "free cooling" mode. If connecting to an existing plant, cite the source of the temperature information.*

c. Peak Diversified Load and Basis *Provide the estimated peak diversified load and a description of how it was determined and what factors were assumed when determining it.*

d. Redundancy Provisions

e. Additional Capacity Provided for Future Use

f. Location of Major System Components

2. Heating Systems/Source

    a. Concept

    b. Design Criteria

    c. Peak Diversified Load and Basis

    d. Redundancy Provisions

    e. Additional Capacity Provided for Future Use

    f. Location of Major System Components

3. Humidification Systems/Source

    a. Concept

    b. Design Criteria

    c. Peak Diversified Load and Basis

    d. Redundancy Provisions

    e. Additional Capacity Provided for Future Use

    f. Location of Major System Components

4. Special Mechanical Systems

    a. Exhaust

        i. Concept

        ii. Design Criteria

        iii. Peak Diversified Flow Rate and Basis *Provide the estimated peak diversified flow rate and a description of how it was determined and what factors were assumed when determining it.*

        iv. Redundancy Provisions

        v. Additional Capacity Provided for Future Use

vi. Location of Major System Components

b. Process Cooling

i. Concept

ii. Design Criteria *required supply water temperature, pressure, water quality requirements, etc.*

iii. Peak Diversified Load and Basis

iv. Redundancy Provisions

v. Additional Capacity Provided for Future Use

vi. Location of Major System Components

c. Smoke Control *Describe each smoke control system including basic operation, mechanical and architectural components (fans, dampers, motorized windows, etc.) including locations.*

i. Building *Including but not limited to a description of any impacts on the HVAC system due to fire zones, etc.*

ii. Atrium

iii. Stairway

iv. Elevator Hoistway

v. Other

d. Etc. *Add additional systems following same sub-paragraph format*

i. Concept

ii. Design Criteria.

iii. Peak Diversified Load and Basis

iv. Redundancy Provisions

v. Additional Capacity Provided for Future Use

vi. Location of Major System Components

5. Control and BAS Strategy *Provide a summary description of the controls, including any special controls.*

a. General Building Controls

b. Laboratory Controls

c. Other *Example: Vivarium controls.*

d. BAS Requirements

6. Other mechanical systems *Add headings as required.*

    *a. Use sub-headings as required, similar to above*

Mechanical, Plumbing or Fire Protection Systems for Laboratory Equipment

*Reserved for special circumstances. Any M/P/F systems that accommodate lab equipment should be described in the other pertinent sections of the BOD, so generally this section can be deleted.*

Mechanical, Plumbing or Fire Protection Systems for Special Systems

*Reserved for special circumstances. Any M/P/F systems that accommodate special systems should be described in the other pertinent sections of the BOD, so generally this section can be deleted.*

## Plumbing Systems Narrative

***Provide a detailed description of the plumbing systems that will be provided to meet the Owner's requirements. Delete non-applicable sections.***

Domestic Water (Hot and Cold)

1. Concept
2. Design Criteria *i.e. water temperature; pressures at most remote fixture.*
3. Redundancy Provisions *e.g. "Three domestic hot water pressure booster pumps at 50% design capacity each." "Each DHW heater is sized for 2/3 or the peak diversified load."*
4. Additional Capacity Provided for Future Use ***If none, state none.***
5. Location of Major System Components

Sanitary Waste

1. Concept
2. Location of Major System Components

Storm Water

1. Concept
2. Location of Major System Components

Special Plumbing Systems

1. High Purity Water Systems
    a. Softened Water
        i. Concept
        ii. Design Criteria *Include the volume of water the system is sized to produce per day.*
        iii. Redundancy Provisions

iv. Additional Capacity Provided for Future Use

v. Location of Major System Components

b. Deionized (DI) Water

i. Concept

ii. Design Criteria *Include the volume of water the system is sized to produce per day.*

iii. Redundancy Provisions

iv. Additional Capacity Provided for Future Use

v. Location of Major System Components

c. Reverse Osmosis/Deionization (RODI)

i. Concept

ii. Design Criteria *Include the volume of water the system is sized to produce per day.*

iii. Redundancy Provisions

iv. Additional Capacity Provided for Future Use

v. Location of Major System Components

2. Special Waste Systems

a. Concept

b. Design Criteria

c. Redundancy Provisions

d. Additional Capacity Provided for Future Use

e. Location of Major System Components

3. Vacuum

a. Concept

b. Design Criteria

c. Redundancy Provisions

d. Additional Capacity Provided for Future Use

e. Location of Major System Components

4. Compressed Air

a. Concept

b. Design Criteria

c. Redundancy Provisions

d. Additional Capacity Provided for Future Use

e. Location of Major System Components

5. Specialty Gases

    a. Concept

    b. Design Criteria

    c. Redundancy Provisions

    d. Additional Capacity Provided for Future Use

    e. Location of Major System Components

6. Special Water Systems (animal, plant)

    a. Concept

    b. Design Criteria

    c. Redundancy Provisions

    d. Additional Capacity Provided for Future Use

    e. Location of Major System Components

Irrigation

1. Concept
2. Design Criteria

Natural Gas

1. Concept
2. Design Criteria

Other Plumbing Systems

***Delete section if not applicable.***

1. *Add headings as required*

    a. ***Use sub-headings as required, similar to above***

## Fire Protection Systems Narrative

*Provide a detailed description of each type of fire protection systems that will be provided to meet the Owner's requirements.* ***Delete non-applicable sections.***

1. Wet Systems

    a. Concept *Include water source, fire pump description, sprinkler head types, etc.*

b. Location/Coverage

2. Dry Systems
    a. Concept
    b. Location/Coverage
3. Special Fire Protection Systems *e.g. "clean agent"/waterless type systems*
    a. Concept
    b. Location/Coverage

## Electrical and Telecom Narrative

*Provide a detailed description of the electrical systems that will be provided to meet the Owner's requirements.* ***Delete non-applicable sections.***

Electrical Systems

1. Primary Power Distribution
    a. Concept
    b. Design Criteria
    c. Redundancy Provisions
        i. Unplanned loss of power
        ii. Planned loss of power
    d. Additional Capacity Provided for Future Use
    e. Unit substation location
2. Secondary Power Distribution
    a. Concept
    b. Design Criteria
3. Emergency/ Standby Power
    a. Concept
    b. Design Criteria
    c. Generator location
4. Renewable Energy
    a. Concept
    b. Design Criteria
5. Special Loads *Add headings as required.*

Lighting Systems

1. Interior Lighting
    a. Concept
    b. Design Criteria
2. Exterior Lighting
    a. Concept
    b. Design Criteria
3. Lighting Controls
    a. Concept
    b. Design Criteria

Fire Alarm System

1. Concept
2. Design Criteria

Security Systems

1. Concept
2. Design Criteria

Special Systems

***Delete section if not applicable.***

1. *Add headings as required*

***b. Use sub-headings as required, similar to above***

Telephone/ Data Systems

1. Concept
2. Design Criteria

## Audio/ Visual Narrative

1. Concept
2. Design Criteria

**<Project Name>**

**<Design Phase>**

# Appendix A

*Delete non-applicable sections and insert required.*

Room Data Sheets

Carbon Reduction Backup (Energy Model Output and Calculations)

ECM Report

Energy Impact Statement

LEED Checklist

Facility Condition Assessment (FCA)

Design Deviations

Detailed Program

Include detailed report to support the high-level summary table included in the OPR. Include most current and previous version(s).

U-M AEC Project Goals Document

# Appendix B

Study Reports

***1. List study reports included. Include relevant study reports such as Soil Borings, Dispersion, Exterior Sound, Interior Sound, etc.***

# Appendix C

Sample Cut Sheets

*U -M Design Manager to determine to what sample cut sheets are to be included in the OPR/BOD.*

***1. List Cut Sheet Packages included.***