NORTHWESTERN
UNIVERSITY

DESIGN GUIDELINES
AND
TECHNICAL STANDARDS

Date of Issuance: January 1, 2014

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INTRODUCTION

General

The Design Guidelines and Technical Criteria included in this manual identify the standards and preferences of Northwestern University (NU) Facilities Management Department. The Design Guidelines are organized by subject matter while the Technical Criteria generally follow the numbering system suggested by the Construction Specification Institute (CSI).

It is intended that these General Guidelines and Technical Criteria serve as a reference for consultants providing architectural and engineering services for NU design and construction projects. The Guidelines do not include “standard” or “master” specifications for any construction material or system.

The translation of these General Guidelines and Technical Criteria into contract documents is left to the individual consultant. In no instance shall a direct referral to these Design Guidelines and Technical Criteria be included in contract documents prepared by design consultants, nor shall any portion of the Technical Criteria be reproduced in project specifications without being specifically tailored to the individual project.

Since requirements of applicable ordinances, codes, statutes, and regulations are subject to change, it is the responsibility of the design professional to determine independently that the project fully complies with all applicable ordinances, codes, statutes, and regulations at the time of design. If, in the opinion of a design professional working on a specific matter, a requirement of these guidelines is inconsistent with a requirement of an applicable ordinance, code, statute, or regulation that compliance with this manual would violate the applicable provision, the design professional should comply with the applicable ordinance, code, statute, or regulation and should also advise the NU Project Representative in writing of the apparent inconsistency and the reasons that the guideline may not be followed.

Modification and Waiver

Users of this guideline, including Facilities Management staff who have suggestions for modifying or expanding the subject matter covered in these guidelines are encouraged to submit their suggestions in writing to the Facilities Management representative coordinating these standards. A form for providing such input is provided in the Appendix to the manual, although any form of written communication or email is welcome.

Application for waivers to any section of these guidelines shall be made, in writing, by the Architect/Engineer of Record to the Director of Design and Construction, copying the NU Project Manager.

The origination date of these standards is January 1, 2014. This guideline is to be reviewed annually for modification or expansion as determined during the course of the year by Facilities Management. The period of review of this guideline will be the last quarter of the calendar year. All modification requests received by October 1 will be reviewed by the Guidelines Review Committee within 30 to 90 days, with recommendations to be incorporated into this guideline by the annual date following the origination date.

Related Northwestern University Standards

The following University Standards are listed below by reference:

1. Building Infrastructure Requirements for Communications Facilities, January 2010.
2. Required Architect/Engineer Services and Deliverables.
3. Facilities Management – Planning – AutoCAD Standard Layers, 2006.
4. DDC Standards.

Single Source and Preferred Items

1. Products, materials, and equipment described herein establish a guideline for the required function, dimension, appearance, and quality. When a single item or source is described, the design professional shall specify only that item.
2. Substitutions are not permitted without written permission from the University.
3. When more than one item is specified or the item is described as “preferred,” substitutions may be considered by the University, if equal to the specified standards.
4. The University may obtain a written agreement of “lowest commercial price” from single source vendors, suppliers, or manufacturer’s named in these Design Guidelines and Technical Standards.

PART 1 – DESIGN GUIDELINES

Site, Civil, and Grounds

1. Sites:

    a. Buildings shall integrate with the existing campus, surrounding buildings, long-term stewardship goals, and the campus master plan.

    b. Review historic districts and specific requirements with the NU Project Manager at the beginning of the project.

2. Streets and Drives:

    a. Review specific site parking requirements, exterior directories, and refuse collection points if located outside of loading dock areas.

    b. Study vehicular requirements for buildings affected by the work/project to determine design requirements.

    c. Provide truck turn studies are required for all uses.

    d. Designers shall include design of temporary roads and walks necessary to complete the work.

3. Sidewalks and Bike Paths:

    a. Building entrances shall be strongly influence by Universal design, without steps if possible. Ramps shall strive for 1:20 slopes as 1:12 slopes are very difficult for most people with physical differences.

    b. Design walks with landscape between curbs and walks such that wheel stops are not required and to allow for favorable ADA access.

4. Site Lighting and Emergency Telephones:

    a. Minimum Illumination: Provide light levels as recommended by code and authorities having jurisdiction. Review specific requirements with NU Project Manager during the design phase of the project.

    b. NU Standard Light Fixture: Phillips Lumec. See Appendix for additional information. Do not use bollards for site lighting without review with NU Project Manager.

    c. NU Standard Emergency Telephone: Provide products by Ramtel Corp. See Appendix for additional information.

    d. Design Review: NU Project Manager and NU Police Department to review locations of exterior light fixtures and emergency telephones.

5. Building Exterior Lighting:

    a. Generally do not illuminate the building with up lighting.

    b. Review requirements for security lighting with NU Project Manager.

    c. Comply with LEED requirements with respect to light pollution.

6. Site Accessories:

    a. Bollards and Removable Bollards: Provide removable bollards as required to maintain Fire Department access. Review types and locations with local Fire Department.

    b. Exterior Benches: NU Standard benches are described in Appendix. See Appendix for additional information.

    c. Exterior Garbage and Recycling Cans: NU Standard receptacles are described in Appendix. See Appendix for additional information.

    d. Bike Racks: NU Standard bike racks are described in Appendix. See Appendix for additional information.

7. Storm Drainage:

    a. The storm sewer system on the Evanston Campus is a combination of draining to the City of Evanston's combined sewer system (storm and sanitary), draining directly to the soil, and to existing outfalls to Lake Michigan.

    b. Each project should evaluate the existing systems in place and maximize site retention back into the soil. Use of the existing City of Evanston system should be minimized to the extent possible.

8. Site Clearing and Erosion Control:

    a. Existing structures should not allow sedimentation from storm runoff to infiltrate the campus storm system, sanitary system, or open waters.

9. Sanitary Sewers:

    a. The Evanston Campus sanitary sewer system slopes from north campus and south campus to central campus where it is pumped west via lift stations. The existing system on the north and central campus is approaching the limits of good design practice.

    b. A new north campus sanitary sewer discharge to the west and associated lift station should be considered when planning new buildings north of the Technological Institute Building.

    c. Properties adjacent to public ways typically have numerous connections directly to the Evanston sewer system.

Utility Systems

1. Vaults:

    a. General:

        i. Vaults are to have stainless steel sump pumps that are alarmed back to DDC.

        ii. Discharge water to pumped to city drain or French drain below frost line. Areas below lake level need to be pumped to a campus lift station.

        iii. Weatherproof lighting to be installed in vaults and areas where applicable.

        iv. Ladders are to be installed on the wall in vaults.

2. Steam:

    a. General:

        i. Requirements for stand-alone building heating plants, including boilers and boiler accessories shall be reviewed with the NU Project Manager prior to the start of the project.

    b. Evanston Campus: A framework master plan has been developed for steam utilities on campus and should be referenced with the NU Project Manager prior to the start of the design phase of the project.

        i. Steam produced in the Central Utility Plant (CUP) is available all year, except for the scheduled annual maintenance shutdown, which typically occurs over the Labor Day Holiday.

        ii. For the Evanston campus central steam is distributed at 230 PSIG and a second line distributed at 150 PSIG from the Central Utility Plant (CUP). Steam shall be metered and reduced in pressure after entrance of each building.

        iii. Systems are to be designed for operation at 150 psi if NU chooses to drop working pressure, but system has to be able to handle 250 psi systems. Specific requirements should be confirmed with the NU Project Manager prior to the start of the design phase of the project.

        iv. Each building typically has a low pressure pumped condensate return. Condensate is to be metered returned to the central plant 50 to 75 PSIG. Condensate metering preferred to steam metering, refer to NU Metering Standards.

        v. Each building and sometimes each department is metered for billing and management purposes. This should be confirmed prior to the start of the design phase of the project. See NU Metering Standards for additional information.

c. Chicago Campus:

i. Steam produced in the heating plant is available all year, except for the scheduled annual maintenance shutdown, which typically occurs over the Labor Day Holiday.

ii. For the Chicago campus central steam is distributed from the central plant 150 to 175 PSIG. Steam shall be metered and reduced in pressure after entrance of each building.

iii. Each building typically has a low pressure pumped condensate return. Condensate is to be metered and returned to the central plant 50 to 75 PSIG. Condensate metering is preferred to steam metering, refer to NU Metering Standards.

iv. Each building and sometimes each department is metered for billing and management purposes. This should be confirmed prior to the start of the design phase of the project. See NU Metering Standards for additional information.

3. Chilled Water:

a. General:

i. Each campus has a campus framework plan which shall be referenced for each project. Review specific requirements with the NU Project Manager.

ii. Each of the buildings on both the Evanston and Chicago campuses are that are connected to the Central Utility Plant (CUP) are to be metered.

iii. Chilled water and heating hot water piping is to have a side stream filter and pot feeder. A chemical pot feeder shall be installed across the hot water pump.

iv. Requirements for stand-alone building chiller plants, including cooling towers and chillers shall be reviewed with the NU Project Manager prior to the start of the project.

b. Evanston Campus: Chilled water is produced in the Central Utility Plant.

i. The piping should be designed for a working pressure of 150 psi.

ii. Chilled water is currently distributed at 80 psi to 100 psi leaving the Central Utility Plant with a 6 to 8 psi differential pressure at the extremities.

iii. The chilled water temperatures are as low as 42 degrees F on peak cooling days and reset upwards to 50 degrees F under winter economizer cooling operation. Cooling coils should be selected for a minimum 16 degrees F temperature differential.

iv. Return chilled water temperature needs to be designed for 54 degrees F.

v. Pumping on campus is typically accomplished through the Central Utility Plant's secondary distribution of pumps. The use of tertiary pumps shall be reviewed with the NU Project Manager and the NU FM Operations Staff Engineer.

c. Chicago Campus:

i. Chilled water is produced in a distributed satellite CHW plant configuration.

ii. The chilled water temperatures are as low as 42 degrees F on peak cooling days and reset upwards to 50 degrees F under winter economizer cooling operation. Cooling coils should be selected for a minimum 16 degrees F temperature differential.

iii. Project integration into this system shall be reviewed at start of design process with NU Project Manager and NU FMO Staff Engineer.

4. Geothermal:

a. The use of geothermal is to be reviewed with the NU Project Manager on a project specific basis.

b. The costs associated with the installation and energy savings payback as well as the ability to have steam and chilled water delivered to the site should be reviewed.

5. Domestic Water:

a. Evanston Campus:

i. Domestic water is metered at a few locations entering campus and is mostly a private distribution system within campus.

ii. Domestic Water service to buildings must retain and/or create new water loops to eliminate dead end runs.

iii. Each building and sometimes each department is metered for billing and management purposes. This should be confirmed prior to the start of the design phase of the project.

b. Chicago Campus: Review specific requirements with NU Project Manager.

6. Natural Gas:

    a. Evanston Campus:

        i. Natural gas is metered at a few locations entering campus and is mostly a private, low pressure (5-inch), distribution system within campus. Some limited high pressure (30-pound) natural gas lines are available.

        ii. Each new load needs to study the existing systems and potentially plan for extensions or new distribution and service as necessary.

    b. Chicago Campus: Review specific requirements with NU Project Manager.

7. Laboratory Services:

    a. Review requirements for specialty systems including the following:

        i. Process Chilled Water:

            1. Used for laboratory equipment that requires continuous cooling.

            2. Labs are to use stainless steel braided hose when connected to process chilled water rated for 175 psi. Connections are to be threaded.

        ii. Tempered Water.

            1. Used for emergency showers and eyewash. Design to correct temperature and flow rate per applicable codes.

        iii. Compressed Air.

            1. House systems to be filtered and oil free.

        iv. Specialty Gases including nitrogen and helium capture.

            1. House systems to be filtered and oil free.

8. Fire Protection:

    a. Evanston Campus:

        i. Several separate fire protection loops are distributed throughout campus for service to many buildings and may be part of the solution for any new building.

        ii. Some existing buildings will require evaluation of existing systems and requirements for extension and/or new fire pumps.

    b. Chicago Campus: Review specific requirements with NU Project Manager.

9. Electrical Service:

    a. ComEd: A/E shall work with NU and local utility providers to determine scope of the project.

    b. ComEd will typically provide and install primary wire and equipment and contractor will typically provide secondary wire and equipment.

    c. A/E shall provide bid documents for conduit ductbanks, manholes, and transformer pads in locations that comply with ComEd design standards for Contractor to install.

    d. Include ample time for ComEd design, review, and approval.

10. Emergency Generators:

    a. Each of the major buildings on campus utilizes an emergency generator.

    b. For new buildings or replacements, diesel fueled emergency generators are preferred. An alternate to use natural gas emergency generators should be considered where diesel fueled emergency generators are less desirable.

    c. Review existing generator loads and capacity for remodeling projects and/or additions to existing buildings, including the following:

        i. Life safety;

        ii. Essential loads including pumps and exhaust fans; and

        iii. Research loads.

<u>Building – General</u>

1. Exterior Campus Palette: Both the Chicago campus and Evanston campus share a similar palette of exterior materials.

    a. Indiana Limestone, standard buff color.

    b. Lanon Stone, module and pattern to be reviewed.

2. Interior Finishes: Both the Chicago campus and Evanston campus share similar expectations for interior materials and finishes.

    a. Materials: Materials and products are selected based on durability; maintenance requirements, and timeless qualities.

    b. Polished Concrete: The use of polished concrete as a finish material shall be reviewed with the NU Project Manager.

    c. Matrix of Finishes: A matrix of proposed finishes is included for information and reference. Materials and finishes shall be reviewed with the NU Project Manager

as part of the design phase of the project. Additional reviews with the user group(s) should be anticipated. See the Appendix for additional information.

3. Room Planning Criteria: Both the Chicago campus and Evanston campus share similar expectations for space planning.

    a. General:

        i. Exit corridors shall remain clear of any obstructions. Do not plan for items such as microwave ovens, copiers, or other similar office equipment in exit corridors.

        ii. Rated walls shall extend to the underside of structure as required to maintain fire ratings. Penetrations shall be sealed with appropriate firestopping.

        iii. Unrated walls shall typically extend to the underside of structure as required to maintain acoustic performance. Penetrations shall be sealed with appropriate sealant or acoustic sealant.

    b. Office and Classroom Spaces:

        i. Hinge side of doors to be placed a minimum of 12-inches from the wall to allow for shelving behind the door.

        ii. Structural columns should not be placed in the mid span of interior demising walls. Maintain an uninterrupted rectangular room shape as much as possible.

        iii. The latch side of doors shall be the typical location for light switches, occupancy sensors, fire alarm devices or strobes, and thermostats.

    c. Restrooms:

        i. Wall hung fixtures including water closets, urinals, and lavatories are preferred.

        ii. A shelf or counter shall be provided at each mirror for personal items.

        iii. Coat hooks shall be provided on a wall near the door.

        iv. Toilet partitions shall typically be floor to ceiling and hooks shall be provided in the interior of each stall door.

        v. Provide a required number of unisex and/or family assistance restrooms in new construction. Consider including a required number of unisex and/or family assistance restrooms in major renovations.

        vi. Trash receptacles shall be free standing and typically provided by NU. Design bathrooms such that free standing trash cans are located at the back wall adjacent to the latch side of the door so that paper towels can

be used to open the door and dropped into the trash receptacle at the door location without blocking the exit path.

vii. Tile walls shall typically be full height.

viii. Shower stalls shall be either full height tile or other durable materials.

d. Mechanical Rooms:

i. Mechanical rooms located above occupied floor levels shall be curbed, room floors waterproof sealed, and all floor penetrations sleeved to 2" above the floor to prevent liquid spills and leaks from traveling out of the space.

ii. Mechanical Rooms shall be well lit, maintaining a minimum of 25 foot-candles. Lighting shall be switched at each exit. Power at least 25% of mechanical room lighting from standby generator power source where it is available. Provide 120VAC convenience outlets in mechanical rooms to provide for ready servicing of equipment.

iii. Provide adequate number of floor drains in mechanical rooms; drains are to be connected to the sanitary sewer system, not to storm sewer. Locate drains to avoid running of condensate drains and other similar equipment across mechanical room floors. Provide trap primers as required per Code.

iv. Locate all floor-mounted major mechanical equipment on concrete housekeeping pads.

v. Mechanical rooms typically do not need to be painted. Review specific requirements with the NU Project Manager.

vi. Where mechanical interstitial space is required, provide adequate head room for maintenance staff to walk upright.

vii. Mechanical rooms shall have adequate heating, cooling to maintain reasonable space temperatures.

viii. Consider insulation on walls and ceiling of mechanical rooms to minimize heat transfer to adjoining spaces.

ix. Provide telephone in mechanical rooms.

x. Provide minimum of 3 spare data jacks per mechanical room.

xi. NU has a preference for mounting of air handler temperature control valves and piping system isolation and control valves for serviceability from the floor without the use of ladders; maximum height 6 feet above finished floor. Where service valves are mounted 8 feet or higher above the floor, provide service platform, catwalk, or valve chain wheels and

safety-trimmed chains. Do not block equipment access when locating valves.

e. Data Network Centers:

i. All data center units are to have N + 1 redundancy for cooling. Units that are critical need to have domestic water piped for emergency backup.

4. Signage: Signage is typically provided by NU. Review specific requirements with the NU Project Manager prior to the start of the design phase of the project.

5. Vertical Transportation / Elevators:

a. NU typically hires a third party, independent elevator consultant for assistance with the reviews related to elevators and conveying equipment.

b. Review the specific requirements for elevators and vertical transportation with the NU Project Manager prior to the start of the design phase of the project.

c. Provide at least one C2 class elevator in each building. Consider tall doors for all elevators.

d. Passenger elevator locations shall have more than one passenger elevator for ADA redundancy while one car is out of service or being maintained.'

e. Consider energy capture technology.

6. Mechanical Systems:

a. The Architect/Engineer shall develop the Basis-of-Design (BOD) as part of the Schematic Design submittal. The BOD shall be refined and further developed as part of the Design Development and Construction Document submittals.

b. NU welcomes innovation in design. Systems or components not addressed in these Design Guidelines and Technical Standards should be reviewed with the NU Project Manager as early in the process as possible.

c. Systems shall be durable and low maintenance with particular focus to be placed on the operability and maintainability of the installed systems.

d. A Life Cycle Cost Analysis is typically required for major mechanical systems. Review specific requirements with the NU Project Manager prior to the start of the design phase of the project.

7. Electrical Systems:

a. General:

i. Review minimum size requirements for electrical and telecommunication rooms and closets with the NU Project Manager prior to the start of the project.

ii. Electrical and telecommunication rooms and closets shall typically be painted. Review requirements for plywood equipment panels with NU Project Manager prior to the start of the project.

b. Coordinate with ComEd early in the design process for both temporary construction service, conflict relocation, and new permanent service.

c. Renovation projects require a load study and arc flash study.

d. Review the following basic information with the NU Project Manager and Chief Electrician prior to the start of the project:

i. General Requirements:

1. Codes Applied: NEC, NESC, ANSI C2, 70E, NU Standards.
2. System Voltages.
3. Variations in Supply Voltage.
4. System Power Factors.
5. Supply Capacity.
6. Short Circuit Ratings.
7. Electrical Protection and Control.
8. System Grounding.
9. Electrical Supply Facility for Safe Guards.

ii. Normal Equipment Requirements:

1. Switchgear.
2. Transformers.
3. Motor Control Center (MCC).
4. Electrical Motors.

iii. Cables and Wire Requirements:

1. Ampacity will be in accordance with NEC.
2. Special requirements such as voltage drop, fault current, and environment shall be taken into consideration.
3. Flame retardant cables.
4. MV cables.

5. Grounding.
6. Raceways and Equipment.
7. Duct Banks, Man Holes, and Hand Holes.

iv. Lighting Requirements:

1. Classroom and Laboratory Lighting.
2. Office and Meeting Room Lighting.
3. Corridor Lighting.
4. Parking Lot Lighting.
5. Street Lighting.
6. Sidewalk Lighting.
7. Exterior Lighting at entrances, stairs, ramps, signage, and landscaping areas.
8. Bicycle Rack Lighting.
9. Emergency Lighting.
    a. Provide emergency lighting as required by the applicable codes. In addition, provide a minimum of one emergency light fixture in each public restroom.
10. Lighting Controls.

v. Power Requirements:

1. Convenience Outlets.
2. Metering Equipment.
3. Grounding.
4. Substations.

vi. Motor Requirements:

1. Review the following recommendations:
    a. 1/3 HP to less than 1/2 HP = 120v
    b. 1/2 HP to 249 HP = 480v
    c. 250 HP and larger = 4160v

vii. Emergency Requirements:

1. Generators.
2. Battery Systems (invertors) / Battery Lighting.
3. Life Safety Emergency Systems.
4. Essential Systems.
5. Critical Operations Power (COP) Systems.
6. Uninterruptable Power Supplies (UPS) (Flywheel).
7. Fire Pumps.
8. Fire Alarms.

viii. Grounding and Lightning Protection System Requirements:

1. Testing Requirements.
2. Document and Drawing Requirements.

Sustainability

1. Introduction:

a. This portion of the Design Guidelines and Technical Standards includes the sustainability guidelines to be followed by the Project Managers, Consultants, Architects, and/or Engineers in the course of a project at Northwestern University.

b. Northwestern University recognizes that the environmental impact of our facilities and infrastructure is significant and that it has implications for the local community and the world beyond our borders. We are committed to reducing this impact by reducing materials and waste during construction, designing buildings that conserve energy and water use, planning and designing infrastructure that encourages walking and alternative forms of commuting like cycling and public transit, and creating built environments that provide opportunities to enhance the performance of the occupants.

c. These guidelines are designed to support Northwestern University's commitment to sustainability as stated in the Strategic Plan and to fulfill the President's commitment to position Northwestern University as a national leader in sustainability. These guidelines will help Northwestern University to place clear parameters and identify measureable results around what it means to be truly sustainable. The goal is to incorporate sustainable principles, materials, and actions into building design, construction, and maintenance.

d. These guidelines should be considered at every decision point and economic and environmental assessments done when necessary to make the right decisions for the stewardship of Northwestern University campuses.

e. For questions, please contact the Office of Sustainability at sustainability@northwestern.edu.

2. Sustainability and Integrated Design:

a. The optimal way to ensure that sustainability occurs is by focusing on the environmental, economic, and social impacts of planning, design, construction, operations and maintenance to improve resource conservation and create healthy work and living spaces in a way that is meaningful for the people who study, teach, work, or live in our buildings.

b. Application of whole-systems design approach is crucial for sustainability. The sustainability categories and strategies are interdependent; none stand in isolation. Decisions made in one area may affect the performance in another. A single design improvement might simultaneously improve several building systems' performance.

c. It is essential that all members of the project team work together and consider all sustainability categories in order to be aware of the influence of their decisions on the overall sustainability performance of the building in each category. In addition, not all strategies suggested here are relevant for every project and certainly not all strategies will be implemented in every project.

d. These decisions are not made in isolation but rather they should recognize the interactions and tradeoffs of a particular project. Northwestern University's sustainability guidelines outline an integrated design approach. The process steps are identified to establish performance goals and to ensure that decisions are made in a collaborative and informed manner. The maximum benefits to the programmatic mission can be achieved when sustainability is incorporated at every point along the project delivery process.

3. Planning and Project Initiation:

a. Translate academic or departmental initiatives into potential facility needs to determine if a capital construction project is necessary. As part of that effort, sustainable features should be discussed in a preliminary sustainability working session and document by the Northwestern University Project Manager and stakeholders so that they can be incorporated as the project is developed.

b. Incorporate the sustainability initiatives discussed into the Request for Proposal (RFP) and Owner's Project Requirements (OPR) outlined in the Design Guidelines and Technical Standards. Understand any costs or savings that may be incurred in order to create an more sustainable building.

4. Programming:

a. During the programming phase, the programming requirements should be further developed to incorporate sustainability goals as they pertain to the user needs and design parameters.

b. As the project team develops or verifies the project program, summary schedule, and preliminary budget, the FM Project Manager should arrange a Sustainability Working Session (SWS) to review the options and the underlying principles of sustainability as they relate to the building design, construction, and operation.

c. Programming Consultant is to begin development of the Basis of Design (BOD) and LEED Checklist in response to the Owner's Project Requirements (OPR) and results of the sustainability working session.

5. Schematic Design:

a. The largest resources impacts of the project should be identified, prioritized, and discussed at design meetings and should include energy, water, materials, and people. The consultant should be prepared to discuss major mechanical systems and alternatives like geothermal.

b. Modeling tools such as DOE-2, eQUEST, or ENERGY-10 should be used to evaluate energy efficient design alternatives and refine the project's sustainability goals for energy usage. The results are to be incorporated into the BOD document and LEED Checklist.

6. Design Development:

a. During the Design Development (DD) phase, the approved schematic design begins to include a level of detail necessary to work out a clear, coordinated description of all aspects of the project. Because the DD Phase is one of the last opportunities for the User Group to become fully involved in the design, it is crucial that sustainability principles from each of the LEED categories be fully discussed and implications be understood and integrated as appropriate.

b. Design and construction costs associated with the sustainable attributes of the project should be clarified. Sustainable component cost metrics (capital and life cycle) should be developed and cost and/or savings decisions evaluated against performance and life cycle cost considerations. The results are to be refined within the BOD document and LEED Checklist.

c. The project team should ensure that the project schedule allows adequate time for implementing the activities that may lead to a more sustainable project, such as commissioning, demolition waste diversion, and training.

7. Construction Documents:

a. During the Construction Documents (CD) phase, a comprehensive, fully coordinated set of construction documents and technical specifications are issued to obtain the necessary permits and construct the project. A review of sustainability elements should be included in the preliminary CD review (such as

50% CD review) along with any update of the BOD document and LEED Checklist. This review should specifically address materials selection.

8. Construction:

    a. At the start of the construction phase, a representative from the Construction Manager (CM) and/or General Contractor (GC), each subcontractor, and Sustainability Team (FM, FMO, FM OoS), and the Architect/Engineer should attend the pre-construction meeting. The sustainability goals and design features of the project should be discussed at this meeting and a review of the project LEED requirements should occur if applicable.

    b. Contractor ideas and opinions should be encouraged during these discussions to allow for innovations and efficiencies during construction.

Sustainability Guidelines

1. These guidelines are for use by NU Project Managers and consultants on projects of all scales. Although Northwestern sets LEED Gold as a target for larger projects, each project should follow these guidelines when applicable.

2. These guidelines are organized into the following categories:

    a. Sustainable Sites.

    b. Energy.

    c. Water.

    d. Materials and Resources.

    e. Indoor Environmental Quality.

    f. Human Centric.

3. In view of the environmental concerns associated with buildings, sustainable design embodies certain goals within each category. The discussion of each sustainable category begins with a set of goals, followed by a list of suggested strategies to be used in achieving those goals.

4. The sustainability strategies included here are not comprehensive; these guidelines are intended to provide ideas and not exclude any from consideration. The project team is encouraged to develop additional strategies and refer to current documents published by the United States Green Building Council (USGBC) at www.usgbc.org.

Key Sustainable Guidelines for all Projects

1. Sustainable Sites:

    a. Promote development that relates well to both natural systems and existing infrastructure.

    b. Promote walking, cycling, and the use of alternative transportation.

    c. Maintain and enhance the biodiversity of natural systems and/or the existing character of the site.

2. Energy:

    a. Maximize energy performance of building systems to reduce total building energy consumption and peak electrical demand.

        i. Design Team to propose Energy Usage Intensity (EUI) in Kbtu/SF/year for each type of building. Design Team shall provide code compliant baseline EUI and subsequent proposed building EUI's for evaluation during the design phases of the project.

        ii. Review project specific goals with the NU Project Manager prior to the start of the project.

    b. Reduce greenhouse gas emissions and contributions to climate change.

    c. Achieve energy cost and related savings through infrastructure upgrades and system design and operation (e.g. labs).

    d. Calculate life cycle costs of alternative systems for payback of investment.

3. Water:

    a. Increase the harvesting and recycling of all available water resources in both buildings and landscape projects.

    b. Reduce the consumption of potable water.

    c. Maintain the aesthetics of the campus landscape and botanic garden.

    d. Minimize impacts to natural resources from the discharge of storm water.

4. Materials and Resources:

    a. Reduce consumption and depletion of material resources, especially nonrenewable resources.

    b. Minimize waste generated from construction, renovation, and demolition of buildings.

    c. Minimize waste generated during building occupancy.

d. Encourage better management of waste (e.g. strategic planning of recycling containers).

5. Indoor Air Quality:

   a. Provide and maintain acceptable indoor air quality.

   b. Monitor and avoid indoor air quality problems during renovation, demolition, and construction activities.

   c. Provide occupants with operational control of lighting and HVAC systems where practical.

6. Human Centric:

   a. Incorporate attributes of ergonomic, human factors, biophilia.

   b. Incorporate attributes of universal design.

   c. Incorporate attributes that support and enhance learning and creativity.

   d. Incorporate attributes to enhance security and crime prevention through environmental design (CPTED).

END OF SECTION