

Northwestern

FACILITIES

Design Guidelines

January 2024

Northwestern

FACILITIES

Design Guidelines

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Introduction

Northwestern Facilities is responsible for the publication of this document. Please direct any questions or comments about this document to:

Northwestern Facilities
2020 Ridge Avenue, 2nd floor
Evanston, IL 60208

Evanston Phone: 847-491-5201

Chicago Phone: 312-503-8000

Website <https://www.northwestern.edu/fm/index.html>

Email facilities@northwestern.edu

Version

The Design Guidelines will be updated periodically in whole or in part. The update will be posted on the NU Facilities webpage. To ensure the most current information, please visit:

<https://www.northwestern.edu/fm/contractors/design-guidelines-appendices.html>

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Steve Burke

Deborah A. Burkhart

Julie C. Cahillane

Stephen A. Camburn

Nathan Chalik

James H. Cira

Dan DeBosschere

Jim Giuseffi

Kevin J. Grzyb

Scott Hayworth

Anthony R. Hicks

Bonnie Humphrey

Bruce Jaime

John T McDonagh

James McKinney

Rick Nemec

Jim Niedzwiedz

Richard Painter

Muqueeth Raheem

Kit Ramos

Joseph Rybak
Mike Slimp
David B. Stone
Dave Vandas

Jonathan C. Weiss
Carrie Jo West
Samantha Westerhof
Gary R. Wojtowicz

Teri Wright
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Chapter 1: General Requirements

Purpose of the Design Guidelines

Northwestern University Facilities' Mission is to "build and maintain a Northwestern that educates, enriches and engages." Northwestern Facilities provides the physical environment, utilities, and support services necessary to promote the educational and research activities of the University. Our values address both the physical campus and the occupants that teach, research, learn, participate, and work here. The values include Customer Oriented, Stewardship, Commitment, Communication, Teamwork, Respect, Empowerment, Diversity, and Integrity.

To further these goals, the Northwestern Design Guidelines establish guidelines and criteria for new buildings, repairs and alterations, modernizations, and work in historic structures. This document contains both performance-based standards and prescriptive requirements to be used in the programming, design, and documentation of Northwestern buildings.

These guidelines were developed to ensure that each project meets the following goals:

1. Architectural Appearance
2. Functionality
3. Sustainability
4. Maintainability

Application of the Design Guidelines

Overview

The Northwestern Design Guidelines is Northwestern's mandatory facilities standard. It applies to design and construction of new facilities, major repairs, and alterations of existing buildings. The specific scope of a project will determine the extent of the applicability of the Design Guidelines to a project.

Projects at Northwestern may be administered by a Northwestern Facility Planner, Project Manager, or a Facility Shop representative. For simplicity, in this document all these point-of-contact positions will be referenced as Project Manager. The Project Manager represents all of Northwestern University, regardless of the Facilities Management group with which they are associated.

These guidelines, in conjunction with other resources described elsewhere, set forth Northwestern's preferred standards for its own building systems and is not intended to supersede any applicable regulations or codes nor is it intended to stand as a representation of industry standards. Northwestern makes no express or implied warranties with respect to the fitness for any particular purpose or accuracy of information provided in this guideline. Users of the Design Guidelines are required to fulfill their legal and professional obligations and to meet all applicable municipal, state, and federal codes and regulations.

The Northwestern Design Guidelines must be used in conjunction with the governing codes and standards referenced elsewhere, the Northwestern [Supporting Resources](#), and the building program for

each project. If conflicts exist between the guidelines, a supporting resource and a specific program or project requirement, contact the Northwestern Facilities Project Manager.

The Design Guidelines cover requirements for most common conditions that occur on our campuses. By necessity, the University has many unique and varied spaces that require a specific design solution to achieve the necessary appearance and functionality. Those spaces may not be addressed within these Design Guidelines. Therefore, consultation with the Northwestern Facilities Project Manager may be necessary to address conditions that are outside this document.

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

Northwestern is interested in maintaining and further developing these guidelines in response to technological and design advances. All parties are encouraged to submit recommendations for revisions to keep these standards current. Please use the Variance Request Form, which can be found in the Appendix for this.

New Facilities

These Design Guidelines, as well as other Northwestern [Supporting Resources](#) apply to all new construction projects. New construction includes additions to existing facilities.

Renovations, Repairs and Alterations

Renovations, repairs and Alterations are improvements made to existing facilities. Generally, building systems need only be upgraded to correct deficiencies, unless the entire building is being renovated. For any project where existing materials must be removed, the new material must match the existing in texture, color, and pattern, or system performance. Continuity of appearance and function must be maintained. These Design Guidelines, as well as other Northwestern Supporting Resources apply to any Renovation, Repair and Alteration project.

Historic Preservation

Northwestern's rich history is reflected in the built environment. Alumni memories and historical events occurred in some of these buildings. Respect for this history and these structures is expected when working on either campus. Historic properties will be reused to the greatest extent possible. Rehabilitation will preserve their character. Exceptions to these Design Guidelines may be necessary. The Northwestern Facilities Project Manager will provide guidance on the extent of historical accuracy each project is to incorporate.

Northwestern Campuses Applicability

The guidelines are written predominantly for the Northwestern Evanston Campus, with a secondary emphasis on the Northwestern Chicago Campus. These guidelines do not necessarily apply to the Northwestern Qatar Campus or to satellite facilities in various cities across the world. Where specific requirements differ between the Evanston and Chicago Campuses, they are identified. Not all variations may be listed herein. Consult the Northwestern Facilities Project Manager if there are any questions.

General Information

Supporting Resources

[Northwestern Facilities Mission & Values](#)

[Northwestern Facilities Policies](#)

[2009 Campus Framework Plan](#)

[Northwestern Master Specifications](#)

[Environmental Health and Safety](#)

Drawings, Specifications, Reports, Testing Results and Basis of Design Documents may be available from Facilities Management Archives.

Abbreviations

The following abbreviations are used in this document:

NU	Northwestern University
PM	Project Manager or Point of Contact
EV	Evanston
CH	Chicago
NUPD	Northwestern University Police Department
AHJ	Authority Having Jurisdiction

Organization and Navigation

The NU Design Guidelines is loosely based on the CSI Format.

An effort was made to eliminate redundancy with hyperlinks to sources within the document and to online sources. If a link is not functional, please advise the NU Facilities PM.

Laws, Codes, Regulations, and Standards

The Design and Construction of all projects for Northwestern are expected to meet all applicable Building Codes, Laws, Regulations and Standards that are in effect at the time of the design and construction. It is not the intent of NU to violate laws, codes, regulations, and standards: the code must be followed. Please inform the NU Facilities PM if content needs to be updated. If these Design Guidelines contain content that is allowed, but different than the laws, codes regulations and standards in effect, the more stringent criteria apply.

Accessibility

Northwestern Facilities is committed to creating a welcoming and accessible environment for students, faculty, staff, and visitors. We strive to accommodate all members of our community. Please see our Accessibility Policy Statement: <http://www.northwestern.edu/fm/about/policies/accessibility.html>

Compliance with the [US HUD Fair Housing Laws and Presidential Executive Orders](#), the American with Disabilities Act and the ADA Accessibility Guidelines ([ADAAG](#)), and the Illinois Accessibility Code, are considered minimum design standards. Where possible and practicable, these should be exceeded. See also [Universal Design](#) elsewhere in this document.

<https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/183-ada-standards>

Occupational Safety and Health Regulations

As a building owner and operator, NU must provide a safe place for its employees and contractors to work. Therefore, to assure safe and healthful working conditions for working people, buildings and sites must be designed in compliance with both Federal and OSHA requirements.

<https://www.osha.gov/laws-regs/regulations/standardnumber/1910>

<https://www.osha.gov/dcsp/osp/stateprogs/illinois.html>

FM Global

Northwestern believes that most losses can be prevented. Because FM Global insures Northwestern University, design teams are expected to incorporate best practices and recommendations made by FM Global into the building designs.

Zoning

For the Evanston campus, there are ten different zoning districts governing use of University properties. Three principal districts currently affect the core campus, including University Housing (U1), University Athletics (U2), and University Campus (U3). Of these, the least restrictive is U3, permitting any university purpose to be built to a height of 85 feet. The historic heart of the Northwestern campus is located within this U3 district, which extends eastward from Sheridan Road to Lake Michigan, and northward from Sheridan to Lincoln Street. See the [2009 Campus Framework Plan](#) for more details.

For the Chicago Campus there are seven different zoning districts governing use of University properties. Most of the Chicago Campus buildings, including Northwestern Hospital buildings, are in Zone PD-3.

Historic Preservation

Many projects for the Evanston Campus are subject to the Evanston Historic Preservation program. Regardless of which campus, the design team must verify the status of each project thus:

1. The building is or is not a local Historic Landmark
2. The building is or is not a Federal Historic Landmark
3. The building is or is not in a local Historic Landmark District

4. The building is or is not in a Federal Historic Landmark District
5. The building is or is not on a lot of record with a Historic Landmark Building.
6. The building is or is not on the east side of Sheridan Road within 250'0" of the Sheridan Road Right of Way.

Sustainability

Northwestern 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 and sites 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. Sustainability as applied to our facilities and landscape is understood to include: optimizing the use of our current facilities, reducing greenhouse gas emissions, conserving water, enhancing walkability and the use of public transportation, addressing our local climate and ecological features, celebrating the local landscape, preserving our open spaces, minimizing use of toxic materials, respecting the limits of our utilities infrastructure, reducing, recovering and recycling waste, and nourishing our plants, animals and soils – while maintaining the historic and aesthetic character of our campus.

Our sustainNU programs cover the Built Environment, Transportation, Resource Conservation, Experiential Learning, Communication and Engagement and Annual Reports.

<http://www.northwestern.edu/sustainability/program-areas/index.html>

Designs for Capital Programs are expected to support these initiatives.

Energy Usage Intensity Requirements

Northwestern University will set and publish energy performance targets, represented as energy use intensity (kBtu/SF), and will monitor and evaluate performance levels monthly as part of the Facilities Management business review. Northwestern's goal is to reduce its building portfolio energy use intensity by 20% by 2020 from the 2010 baseline. Energy conservation goals are to be revisited annually to evaluate operational challenges and opportunities that will impact performance in the longer term.

Energy Analysis and Modeling:

Conduct an energy simulation modeling of the whole facility for new facilities greater than 10,000 SF, or major renovations greater than 10,000 SF, where at least 50% of mechanical systems are being replaced.

Complete the Energy analysis in the Schematic Design Phase and update it during the Design Development Phase, and, then again, in the Construction Document Phase, as needed to inform design decisions utilizing a DOE-2 energy analysis computer program.

Use the energy analysis to evaluate energy efficiency measures and inform design decisions, as well as simulating energy performance of mechanical and electrical system loads, equipment sizing and selection. Demonstrate compliance with University's energy performance goals and provide calculated emissions. Target a whole building energy simulation model that demonstrates 50% improvement for a new building compared to the ASHRAE/IESNA 90.1 2010. The Commissioning Agent may be requested

to confirm that the building performs per the energy model during the Commissioning Close Out process.

Greenhouse Gas Accounting

Northwestern is committed to reducing its greenhouse gas emissions directly tied to the energy usage reductions calculated in the energy model.

LEED

For new construction and major building additions or renovations, Northwestern targets LEED Gold using the current version of LEED. See also the Northwestern Facilities Sustainable Building and Renovation Policy:

<http://www.northwestern.edu/fm/about/policies/docs/NU%20Sustainable%20Building%20and%20Renovation%20Policy.pdf>.

Bird Friendly Campus

The University's locations on the shores of Lake Michigan makes this work especially important. Millions of migrating birds pass along the lakeshore and through the greater Chicago area every spring and fall. Northwestern's campuses sit squarely in the corridor where birds want to move and rest during their migration.

NU works with the community and experts from the American Bird Conservancy to use state of the art solutions to keep birds from dying in collisions with glass walls and windows. Design professionals are expected to support this effort through designs that utilize bird friendly designs.

<https://abcbirds.org/get-involved/bird-smart-glass/>

Inclusivity

Universal Design

*"Universal Design is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. An environment (or any building, product, or service in that environment) should be designed to meet the needs of all people who wish to use it. This is not a special requirement, for the benefit of only a minority of the population. It is a fundamental condition of good design. If an environment is accessible, usable, convenient and a pleasure to use, everyone benefits. By considering the diverse needs and abilities of all throughout the design process, universal design creates products, services and environments that meet peoples' needs. Simply put, universal design is good design."*¹

Please reference <http://universaldesign.ie/Home/>

The campus environment is the first physical impression of an institution and is continually sending symbolic as well as functional messages. Today the University's inventory includes more than 200 buildings, with approximately 125 built before 1955. Buildings have been designed to comply with the

¹ <http://universaldesign.ie/What-is-Universal-Design/>

established code of their vintage, however with a goal of achieving excellence, each project must be designed to thoughtfully transition our campus facilities into inclusive and welcoming environments.

The University's facilities must allow for the best possible experience for all students, staff, faculty, alumni, and visitors. Therefore, Northwestern considers compliance with ADAAG and other similar codes, standards, and laws to be a minimum standard. Wherever possible, these standards should be exceeded. For example, if a ramp can be a sloped walk, it should be designed as a sloped walk.

Gender Neutral

Northwestern is committed to fostering a more diverse and inclusive community, by providing safe and private restroom facilities for transgender and gender non-conforming campus community members, individuals with disabilities with special needs and/or with different-gender personal care attendants and family members with different gender children. This commitment applies to University-owned facilities as well as rental facilities used for university-related purposes, where feasible. The guidelines address new construction as well as existing facilities, including those undergoing substantial renovation. Design these spaces consistent with applicable building codes, and architectural accessibility guidelines, including and the current edition of the ADA Standards for Accessible Design.

Lactation Rooms

As part of our commitment to Inclusivity and in compliance with the Patient Protection and Affordable Care Act, NU provides Lactation Rooms to assist women with returning to work after a birth. Please see [Lactation Rooms](#) for the specifics of the design.

Security and Safety

Emergency Alert System

Members of the larger community (including parents, visitors, contractors, vendors and external community members) can enroll in AlertNU by texting "AlertNU" to 226787. You will receive a confirmation text indicating that you have successfully subscribed. To be removed from the system, simply text "stop" to the same number.

For those that will be on campus for a shorter duration of time, you may subscribe for 7 days by texting "AlertNU7" to 226787 or for 30 days by texting "AlertNU30" to the same number.

Physical Design

Northwestern promotes a safe environment for students, faculty, staff, and visitors. Project designs, whether for buildings or sites, should support this philosophy by providing a safe and secure environment for living, learning, and working.

Northwestern is committed to serving the University community and the surrounding area by utilizing a proactive approach to crime prevention. Concepts that could be referenced to accomplish this through our physical environment may be found thru Crime Prevention Through Environmental Design. <http://www.cpted.net/>. Implementation of any environmental strategy to reduce crime must still promote an open and accessible, public-focused vision for the campus.

In addition, OSHA and the Northwestern Environmental Health and Safety office have criteria that impact the physical design of our buildings and open spaces. Please see:

<https://www.northwestern.edu/environmental-health-safety/facility-safety/contractor-safety.html>

See also [Signage](#) and [Emergency Communications & Building Surveillance](#)

Campus Culture and Behavior

For overall behavior expectations, please see the NU Policies “Standards for Business Conduct” page: <http://policies.northwestern.edu/all-policies/standards-for-business-conduct/index.html>.

NU has a “No Smoking” policy that conforms to the LEED BD+C v.4 Prerequisite Credit.

Safe Access and Fall Protection

Please see Appendix Document “Fall Protection”.

All facades and roofs must have provisions for safety precautions. Design this access to meet the needs and requirements of the project, as well as achieve the following goals:

1. Provide the highest level of safety and health for the end-user by adhering to industry codes and best practices. LB will utilize its extensive knowledge base and industry contacts to explore options beyond the codes in instances where safety is a concern.
2. Provide 100% access to the building envelope (interior and exterior) for all types of maintenance including but not limited to cleaning, repairs/refurbishment, and inspections.
3. Maximize the efficiency of the system to reduce the façade maintenance cycle time (FMCT) and to reduce the cost of building maintenance to the owner.
4. Minimize the visual impact of the FAE to maintain the aesthetics of the architectural design.

Hazardous Materials

Whether it is before or during construction, Northwestern typically procures testing of suspected Hazardous Materials. When removal is required, abatement may be through a contract directly held with Northwestern or through the prime contractor. When abatement occurs thru the prime contractor, NU will provide the design documents for inclusion in the Contract Documents.

Work associated with Hazardous Materials in research/laboratory spaces will be coordinated with Northwestern Research Safety. All other spaces will be coordinated by Environmental Health and Safety.

Methodologies

Media Protocol

Northwestern is hopeful that our projects attract attention from professional organizations, other peer institutions and the media at large. Please direct any inquiries to Northwestern Media Relations. Permission to correspond and/or share photos /videos of NU owned property must be granted prior to publication. Our goal is to increase our visibility in our community, and we view these inquiries as opportunities.

Branding

For Branding including colors, fonts, and use of the Northwestern seal, see [Signage](#) and <http://www.northwestern.edu/brand/brand-assets/index.html>

Project Communications

Northwestern designated Project Manager is the central point of contact for the project. All communication between the design team and NU is to be routed thru/include the PM.

Procurement

Northwestern procures services and products through many purchasing programs. These include, but are not limited to, awarding to a Preferred Vendor or a Pre-qualified Vendor, and inviting bids for both services and products.

Prime contracts typically held by NU are:

1. Design team, which is typically an Architect or Engineer.
2. Graphic Design, if not part of Design team
3. Furniture Design, if not part of the Design team
4. Furniture Vendor
5. Signage Vendor
6. Owner Provided Testing. See [Owner Provided Testing](#) below.
7. Hazardous Material Abatement Design
8. Commissioning Agent
9. Distributed Antennae System (DAS) Designer/Installer
10. FM Global
11. Construction

Review specific requirements with the NU Facilities Project Manager prior to the start of the project and/or during the design phases.

Each procurement method has a different process to award. Please see the following for more information:

1. NU Preferred Vendors: <https://www.northwestern.edu/procurement/purchasing/purchasing-strategic-sourcing/preferred-vendors/>
2. Pre-qualified Vendors: <https://www.northwestern.edu/procurement/vendors/opportunities.html#prequalified>
3. Bidding: <https://www.northwestern.edu/fm/contractors/bidding-guidelines.html>

All General Contractors, Subcontractors, Sub-subcontractors and Suppliers engaged to perform work on Facilities Capital Projects must participate in the NU Facilities Supplier Diversity Plan Process. Please see:

<https://www.northwestern.edu/fm/contractors/docs/FM%20Supplier%20Diversity%20Plan%20Process.pdf>

For Capital Projects in Evanston, Northwestern has partnered with the City of Evanston on the City of Evanston's Workforce Development Program. This program gives Evanston residents a clear path to qualify for and attain employment on campus construction, renovation, and maintenance projects. For more information, please visit: <https://www.northwestern.edu/fm/contractors/evanston-workforce.html>

Owner Reviews

Northwestern's projects have many stakeholders, from the end user who occupies the space, to the prospective student, or next researcher, to the person who maintains the building for its intended use. Consequently, NU Facilities has a very rigorous document review policy and procedure. Please see: <http://www.northwestern.edu/fm/about/policies/document-review-policy.html>

Internal reviewers, depending upon the scope of the project, will include, but not be limited to, the Board of Trustees, University Leadership, the Facilities Operations Technicians, N IT (Data, DAS and AV), NU Police Department, Environmental Health and Safety, Office for Research Safety (for lab projects), and various third-party vendors, for example, food service. In addition, NU routinely hires third party specialists to review documents. These areas of expertise can include FM Global, and Commissioning, Costs.

All design teams are expected to fully participate in reviews and respond to comments from any reviewer. The NU Facilities PM will advise on the review process.

The Northwestern design review and comment process does not limit the liability of the design professional for quality control and quality assurance for the project, nor does it relieve the design professional from adherence to all applicable building codes and regulatory requirements.

Building Efficiency & Space Measurements

The area of a project ultimately impacts the cost of the project. Project areas should be as efficient as possible but recognize that unassigned spaces are valuable places for informal communication and learning. A balance must be maintained between the area and the cost and monitored throughout the design phases.

Northwestern University calculates space in terms of Gross Square Footage (GSF), Net Assignable Square Footage (NASF), and Non-Assignable Square Footage (NSF) as defined by the National Center for Education Statistics' Postsecondary Education Facilities Inventory and Classification Manual (FICM) located at: <https://nces.ed.gov/pubs2006/ficm/content.asp?ContentType=Section&chapter=3>. To prove that the Plans meet the Program, the design team will calculate space using this method.

Building and Space Identification

Unique identification of buildings and spaces is critical to space documentation and tracking methods. A list of buildings owned and leased by NU is maintained by NU FM. The building and room numbers are used for space management, wayfinding, equipment inventories, maintenance programs and life safety systems. The building number is assigned at the beginning of a project by NU. Once the floors plans are set at the end of Schematic Design, NU Facilities Planning will provide the final room numbers. The room numbers will be ordered in a logical way for wayfinding based on the building design and floor layout. The Construction Documents will use these room numbers in the material and equipment

schedules. They will ultimately be realized in wayfinding, equipment labels and fire alarm panel displays, etc. If a change occurs after these room numbers are established which causes a room to become out of sequence, the design team is expected to reengage Facility Planning to approve any changes to room numbers, and then renumber all documents associated with this change. Room numbers will not be changed once the Construction Documents are Issued for Construction.

NU Master Specifications

In 2017, Northwestern published a Master Specification. It is intended for use in the design and construction of new and renovated facilities for all Northwestern locations. It is to be used by Architect/Engineering firms in the preparation of Construction Documents for all facility types. Use of the NU Master Specifications, in whole or part, does not relieve the design team of their professional responsibility. Please see: [NU Master Specifications](#)

The use of these Specifications is mandatory for all design or maintenance projects. Deviations are discouraged. If project conditions arise which require a deviation, it should be thoroughly documented by the user and submitted to the Northwestern University for review and approval using the Variance Request Form, which can be found in the Appendix. Additionally, all Northwestern University staff, Architects, Engineers, and Contractors are encouraged to participate in the ongoing development of these Specifications by communicating any suggestions by use of the Variance Request Form.

Throughout the specifications, bracketed, bold text indicates optional requirements which may be selected/deleted as determined by project requirements. Carrotted text is explanatory information and must be deleted prior to issuance.

The Northwestern Design Guidelines and Master Specifications are meant to be complementary. The Design Guidelines are addressed to a design team and describe the “why and/or where” of a material or system, and the Master Specifications are addressed to the construction team and describe the “what”, “who” and “how” of a material or system. However, there is by necessity cross over. For each specific project, the design team will edit the Master Specifications. The Master Specifications have implications for the design of a project. ***The design team must familiarize themselves with the content of the NU Master Specification in order to incorporate items from the Master Specifications that impact the drawings into the drawings.*** Please also note that content that impacts the design may be found in an unexpected Master Specification section, i.e., concrete pads for low voltage switchgear is described in section 26 2300. Coordination between design disciplines is required.

Efforts have been made to coordinate content between the Design Guidelines and the NU Master Specifications to avoid duplication and conflict. However, due to the volume of detail in each document, there may be conflicts between the NU Design Guidelines and the NU Master Specifications. If a conflict is found, please advise the Northwestern Facilities Project Manager with whom you are working, so that a resolution can be found.

NU Master Specification Product Selection

Where products are sole sourced in the NU Master Specification, it is usually done to minimize inventory, to use products that have proven themselves on our campus and to ensure familiarity with a product for ease of maintenance and repair.

The general purpose of each Specification is to provide minimum criteria for construction materials at Northwestern University facilities regarding Code compliance, warranty, approved products, execution, and uniformity. The Specifications are used to prepare specific project Contract Specifications. They are intended to be used to address system design aspects of equipment that Northwestern University desires to standardize among facilities and identify prohibited materials and construction practices. Use of these Specifications will help A/E's meet the Northwestern University's primary goal of providing a safe, reliable, and energy efficient installation and ultimately successful project outcome.

Utility Providers

The source of our utilities is listed below for each campus. See also the [Civil Chapter/Site Utilities](#).

Evanston

1. Power
 - a. Transmission: ComEd
 - b. Energy Supplier: Constellation
2. Natural Gas:
 - a. Transmission: Nicor
 - b. Energy Supplier: Twin Eagle
3. Water: City of Evanston
4. Sewer: City of Evanston
5. Chilled Water: NU Central Utility Plant
6. Steam: NU Central Utility Plant
7. Hot Water: NU Central Utility Plant

Chicago

1. Power
 - a. Transmission: ComEd
 - b. Energy Supplier: Constellation
2. Natural Gas:
 - a. Transmission: Nicor
 - b. Energy Supplier: Twin Eagle
3. Water: City of Chicago
4. Sewer: City of Chicago
5. Chilled Water: Interconnected Satellite Chilled Water Plants
6. Steam: Central Plant Production, transitioning to Satellite HHW plants

Building Life Safety Program

The goal of NU's Building Life Safety program is to incorporate into all projects fire protection and life safety systems that are effective in improving overall building occupant safety. The primary goal is to protect human life. The secondary goals are to reduce Northwestern's potential losses from damage (i.e., protect real and personal property, maintain University mission continuity, and control environmental impact).

See Life Safety Systems Checklist in the Appendix.

Owner Provided Testing

Northwestern will engage independent testing and inspection agencies for materials and/or systems that include, but are not limited to, soils, hazardous materials, concrete, steel, welds, bolted connections, fire proofing, penetration fire stopping and paint.

The final Testing, Adjusting and Balancing contractor will typically be procured directly by Northwestern or through the Commissioning contract. Review specific requirements with the NU Facilities Project Manager prior to the start of the project and/or during the design phases. See also [Building Commissioning](#) and [Commissioning](#).

Surveys & Site Information

Surveys are typically procured by Northwestern and provided to the design team for use and incorporation into the Contract Documents.

Northwestern also maintains an electronic record of site characteristics. This record can be used for reference, but should not be used in lieu of a stamped survey, or public utility records.

Existing Conditions Consideration

All NU projects occur within the context of a larger, active, and operating environment. This is true regardless of the scale of the project. Consequently, all design and construction activities must consider the impact to the surrounding environment. For example, ultra-sensitive lab equipment can be damaged by vibration or electrical noise from buildings hundreds of yards away. Access for convenience or for life safety can be impaired for spaces adjacent to the actual construction location. Building systems could be overextended with the addition of new programmatic requirements. The design team is expected to “think outside the box” and address these impacts within the scope of the project.

In addition, if work is being done in an existing building or with an existing system, labeling for additional components to that building or system should add on to the existing. For example, if an AHU 1 exists, do not label a new air handler AHU 1 as well. Call it AHU 2.

Vibration

Equipment which normally operates within a building and construction can cause vibration that negatively impacts research. Consider mechanical, elevator, and electrical equipment design, including location within the building, as part of a vibration analysis during the Design Phases. Determine with NU Facilities Project Manager prior to completion of Design Development Phase whether vibration monitoring will be required during construction for the project.

Robustness and Resiliency

Robustness is the attribute of a *system* that allows it to withstand a threat in the normal operating state. *Resilience* allows that the capacity of a *system* may be exceeded, forcing the *system* to rely on the remaining attributes to achieve recovery.

Various programs and building systems on the NU campuses require various levels of robustness and resiliency. Discuss both attributes and cost implications with the Project Manager to determine the appropriate level of disruption and recovery allowed for a given system.

Basis of Design

Develop a Basis-of-Design (BOD) as part of the Schematic Design submittal. Refine and further develop the BOD as part of the Design Development and Construction Document submittals. Provide a description of the design concept for each major building system, including energy and water efficiency design strategies. Parameters shall include seasonal, time of day space conditions such as temperature, humidity, relative space pressure relationships, ventilation requirements, vibration, noise requirements, etc. Include summary of load assumptions in design calculations for lighting, equipment, people, ventilation, etc.

The design team and commissioning teams are required to provide training to the FMO staff on the building design intent prior to the Operations and Maintenance Training required in the specifications. The material presented should cover project systems overview and performance plans and goals. Three presentations are required that correspond to the three shifts of work at Northwestern University.

Temporary Considerations during Construction

If construction is for an existing building that will remain occupied, the design team will provide the design of temporary roads and walks that remain in place for the duration of construction. The Contractor is responsible for temporary roads and walks that are relocated due to construction sequencing. Design will address temporary roads and sidewalks necessary to maintain personal safety (life safety egress from the building, ADA accessibility, and first responder access), minimize inconvenient pedestrian and bicycle movement, and to allow operations on the campus to proceed without interruption (pedestrian access for daily operations, facility access to maintain the building, including waste removal and deliveries).

Sedimentation from storm runoff during construction or because of the final design should not infiltrate the campus storm system, sanitary system, or open waters. Each construction site is required to have an erosion control plan within the construction fence, and without, if run off is not contained within the construction limits.

NU complies with the requirements of the USEPA Spill Prevention Control & Countermeasure Regulations and the MWRD Sewage and Waste Control Ordinance. Contractor shall be prepared to respond to an accidental spill or discharge on the project site. Additionally, in the event of an accidental spill the Facilities Project Manager must be notified immediately for communication to the University Response Coordinator.

All construction equipment used on the Northwestern campuses is required to have Tier 4 Final emissions control technology.

Construction Fencing is to be provided per the NU Master Specification Fencing section. When the General Contractor is not on the construction site, gates are to be locked. The General Contractor must identify the person (by name) who is responsible for locking gates at the end of the workday.

For safety, temporary site lighting which meets the permanent site lighting criteria must be provided by the contractor during construction. No light shall be removed without replacement with a temporary light fixture in the same location to maintain safe lighting levels for pedestrians and vehicles.

Construction activities are limited during certain Campus Events:

1. Graduation: No large Deliveries or Material Removal is allowed on Thursday thru Saturday. And no exterior work is allowed on Friday and Saturday.
2. Student Move In: No large Deliveries or Material Removal is allowed on Thursday thru Saturday.
3. The Contractor is required to provide adequate security for Dillo Day.
4. Other special events

Controls

Northwestern University has many Controls systems on campus for energy conservation, maintenance monitoring, class scheduling, etc. Please check with the Facilities Project Manager for those which apply to the project. Select controls systems are described below.

Building Automation System (BAS): For projects with energy-using systems, include a BAS or control the system with an existing BAS.

New construction projects and renovation projects will include the installation of Direct Digital Control (DDC) systems integrated into the central BAS platform. Refer to the NU Direct Digital Control (DDC) Standards in the Appendix for Northwestern Standards for Building Automation (BAS), Building Management Systems (BMS), Automatic Temperature Control (ATC) standards including control diagrams, sequences, and equipment.

Consideration should be given to providing individual thermal comfort control to the maximum number of occupants. Where possible, provide greater than 50% of all permanent occupants with localized means to control their thermal comfort. Provide individual room thermal comfort control for all multi-occupant spaces, such as classrooms and conference rooms.

Lighting: See [Lighting Controls](#).

Metering

Fully integrate measurement, metering, and monitoring systems into campus-wide systems. NU Facility Operations requires system metering at the building level. LEED and/or other Sustainability initiatives may require further subdivisions of the metering.

Minimum items to be metered:

1. System level outside air, Exhaust Air, and Return Air
2. Building level chilled water cooling
3. Building level steam or hot water heating.
4. System level heat recovery
5. On Site Generation
6. Building level electrical subdivided by lighting and power
7. Building level domestic water
8. Domestic water supply to closed loop systems.

Preferred Metering/Submetering

1. Metered energy and water usage data is essential to assist with benchmarking building use and demand, identify anomalies that signal operational deficiencies.
2. Utility supplies to each building shall be metered or sub metered (if multiple buildings are served by one meter): Electricity, Natural Gas, Oil, Chilled Water, Steam, Condensate, domestic water, or hot water, etc.
3. Data from sub meters should be electronically collected and stored on an interval basis (5-10 min interval) through a Building Management System.
4. Review [ENERGY STAR Submetering Energy Use in Colleges and Universities](#)

Energy Cost Recapture: Temporary meters may be required during construction for energy cost recapture as an internal accounting procedure. These meters can be the permanent meter installation. In existing buildings, metering can reuse existing meters. Meters for energy cost recapture should be installed as early in the project as possible. Consult with the NU Facility PM for the scope of metering on a project. Temporary meters are needed for the following types of capital projects:

1. New Building Construction
2. Renovations in vacant buildings
3. Large renovations in mostly vacant buildings

Utilities to be measured are:

1. Electric
2. Steam
3. Gas
4. Chilled water

Building Operations & Maintenance

Building Operations and Maintenance of a facility play a crucial role in its continued successful contribution to the NU mission. To serve our NU clients, we strive to provide cost effective and responsive service for maintenance and operation of facilities, grounds, utility services, and other related support functions that enable the instructional, research, and public service functions of NU.

The NU Facilities Operations are responsible for the day-to-day running of a facility, and billions of dollars' worth of assets. The NU Facilities Shops are rooted in the preservation of these assets and ensuring they are optimized for the maximum lifespan possible. Preventative maintenance is a key aspect of this care, a practice that is part of our proactive approach to solving issues in their infancy.

10% of a building's lifetime cost is in the construction budget; 90% of the total cost of a building ownership is in the operating cost. It has been reported that between 70% and 85% of the building maintenance and operation costs can be influenced during the design stage, which is a significant part of the total building life cycle costs. A design team is expected to think about the lifetime expenses and ease of maintenance over the life of a facility when the facility is in the design phases.

Indicate the required path for equipment removal and replacement to the exterior of the building on the floor plans with the design and layout of HVAC equipment. This equipment is defined as equipment

too large to fit through a standard 30" x 84" door such as AHU sections, pumps, chillers, boilers, large fans, heat exchangers and electric switch gear, generators, transformers, etc.

Provide adequate clearance to all things that require maintenance or access to operate the building. It is understood that Construction Document systems drawings may be diagrammatic, and that means and methods factor into the final physical installation. However, the documents can and should set an example by showing items in accessible locations.

See also [Furniture](#) and [Access Panels](#)

Pest Prevention

Follow the Design Guidelines as recommended by San Francisco Environment Department, "Pest Prevention by Design": [HTTPS://www.sfenvironment.org/media/5497](https://www.sfenvironment.org/media/5497)

Asset Tagging

To assist with maintenance schedules, NU utilizes an asset tagging system. Asset tags are required on all new equipment items that require scheduled maintenance or inspections. It is equally important to add and record new asset tags as it is to remove and record assets taken out of service. NU maintains a record of existing assets. The A/E is required to obtain this record to identify existing assets to be removed or modified. White tags are used where the tags may be visible to the public, faculty, staff, or students. Yellow tags are utilized elsewhere.

Asset tagging may be procured in three ways:

1. Through the Commissioning Agent
2. Through the Construction Contractor
3. As a direct contract with Northwestern University.

Asset Tags are proprietary to Northwestern University and are either provided by Northwestern University or procured thru

Facilities Survey Inc. (FSI)
Michael Hunt
Director, Operations
email: mhunt@fsiservices.com
phone: 412-567-4070 x127 mobile.724-713-7785
400 Penn Center Blvd., Suite 552
Pittsburgh, PA 15235

A list of items that should have an asset tag if it is included in a project is included in the NU Master Specifications, 01 3513 Special Project Procedures, NU Asset Tag Checklist. Any item with an asset tag must have a corresponding entry on the NU New Equipment Template.

Coordinate this scope with the Facilities PM early in the design phases.

Life Cycle Costing

Life Cycle Cost Analysis (LCCA) are required when evaluating energy and water-using products and systems. In general, LCCA is expected to support selection of all building systems that impact energy

use: thermal envelope, passive solar features, fenestration, HVAC, domestic hot water, building automation and lighting. It is very important to recognize the significance of integrated building systems design in the overall efficiency of the design. The building systems should be analyzed for appropriateness during the first stages of the Design Development Phase. A commitment on direction for the systems needs to be made at this time, and any further LCCA studies focused on detail within each system.

The cost benefit analysis for energy and greenhouse gas reductions will calculate net present value of relative design options, accounting for operating costs over the lifecycle of the major building systems, including energy, water, and maintenance.

Review specific requirements with the NU Facilities Project Manager prior to the start of the design phase of the project. Include options that were considered and all relevant assumptions in the calculations as part of design phase milestone submissions.

Building Commissioning

Consistent with our Building Operations and Maintenance philosophy, NU is committed to verifying, all (or, depending on scope, a representative sampling) of the subsystems for mechanical (HVAC), plumbing, electrical, fire/life safety, building envelopes, interior systems (example laboratory units), cogeneration, utility plants, sustainable systems, lighting, wastewater, controls, fire suppression, indoor lighting, emergency power, and building security to achieve our project requirements.

The extent of commissioning for each project will be communicated by the NU Facilities PM. In most cases the Commissioning Agent contract will be held by NU. Design and Construction teams are expected to fully participate.

Prior to end-user occupancy of any new facility, or repair or alteration to an existing facility, the Office of Environmental Health and Safety must conduct a documented inspection to ensure the facility does not contain any environmental safety or health hazards. Any hazards identified in the inspection must be remediated prior to end-user occupancy, or a plan must be agreed upon to address the hazards within a reasonable amount of time.

Chapter 2: Campus Development and Landscape Design

Campus Planning

2009 Campus Framework Plan

In 2009, NU developed a comprehensive Campus Framework Plan for the Evanston Campus. This document offers a framework to guide the future development of Northwestern's Evanston campus. The Campus Framework Plan covers some concepts and subjects included in this document, but in much more detail. Topics covered in the Campus Framework Plan, include, but are not limited to, Campus Site History and Context, Open Space Framework, Pedestrian and Bicycle Circulation, Land Use and Capacity, Vehicular Circulation, and Development Strategies. Please refer to the 2009 Campus Framework Plan for this detail.

<http://www.northwestern.edu/fm/campus/planning-studies.html>.

Building and Site Designs are expected to support the 2009 Campus Framework Plan. Development has occurred and City of Evanston regulations have changed since the publication of the 2009 Campus Framework Plan. Specific details in the 2009 Campus Framework Plan must be verified. If there is a conflict between the content of the 2009 Campus Framework Plan and this document, please let the NU Facilities PM know. So that a resolution can be found.

Campus Planning Standards

For future planning and design, the Evanston campus is divided into geographical districts with potential building sites identified. Please see the Campus Planning Design Guidelines in the Appendix.

Landscape Design Standards

Refer to the Northwestern University Evanston Campus Landscape Design Guidelines in the Appendix. In addition, this chapter contains supplementary information for softscape and hardscape.

Building Vocabulary

Integrate buildings with the existing campus, surrounding buildings, long-term stewardship goals, and the 2009 Campus Framework Plan.

Because the campuses are land locked, building designs should reach the maximum height allowed by zoning or be designed to accommodate a future project to reach the maximum height allowed. To maximize development, building footprints should make efficient use of the land, and plan for future additions. Discuss the budget impact of this goal with the Facilities PM.

Buildings should create well-defined public spaces.

The consistency of the fabric of buildings on campus should be respected by exceptions that create local focus as well as campus-wide focus. Allow for stylistic variation, but contextual.

Even as structures on the campus grow, they should maintain a human scale.

Buildings should accentuate and make visible the vitality and richness of campus life. Activity / activation, especially at the ground floor.

The architectural character of new buildings on the campus should depict the university as a progressive and future-oriented institution.

New buildings should provide informal observation of pathways, i.e., “eyes on the street,” through the use of windows, lobbies, and active courtyards.

Utility Corridors

Maintain the proposed utility corridors. Install building systems that are compatible with the future MEP intent of each respective campus. For example, decentralization of Chicago campus steam and the future Evanston Central Heating Plant.

Historic Districts

A portion of the NU EV Campus resides in a Historic District. Review historic districts and specific requirements with the NU Facilities Project Manager at the beginning of the project.

Site Development

Project Boundaries

Northwestern will establish the limits of construction. Designers are expected to consider the site and how the project fits within the vocabulary and systems (pedestrian, utilities, etc.) surrounding it. We should always be looking to improve the greater campus whole.

Walkability / Bikeability

Walking and biking to/from and on campus is encouraged. It reduces the carbon footprint, provides health benefits, and enhances the community experience. The core of the Evanston Campus is considered a pedestrian friendly environment.

Northwestern is committed to supporting a comprehensive bicycle program for the University community. NU’s Bicycle Policy can be found here:

<http://www.northwestern.edu/fm/about/policies/bicycle-policy.html> Designs should support this policy, with special consideration for the Bike Parking, Divvy and Evanston Campus Bike Path Goals. See also [Bike Parking](#) and [Site Lighting](#).

Accessible Routes

An accessible path should be provided to each building on campus. In the spirit of our Universal Design Policy, the most desirable accessible path will be to the front door of the building. Whenever possible all public building entrances should be accessible. Exterior spaces should also accommodate accessibility and universal design goals as much as possible.

Design building entrances that are strongly influenced by Universal design, without steps if possible. Strive for 1:20 slopes on ramps where feasible as 1:12 slopes are very difficult for most people with physical differences.

Transit Use Encouraged

Both NU Campuses are within walking distance of commuter train and bus systems. In Evanston, the services are the Chicago Transit Authority trains and busses, Pace busses, and the Metra train system. In

Chicago, the campus is served by multiple Metra trains, and CTA trains and busses. These transit stops link residents, visitors, students, faculty, and staff with the metropolitan Chicago region, and have become nodes for commercial and residential activities. Site development, including accessible paths, should recognize and encourage transit use.

Parking and Traffic

As part of the Evanston Campus Framework Plan, parking lots have been strategically relocated to the perimeter of the campus to enhance the safety of pedestrians and bicyclists.

The overall quantity of parking spaces is mandated by the Evanston Zoning regulations. To ensure compliance with city zoning requirements, parking space count are tracked and reported by Facility Planning. Because the campus is managed as a whole, individual projects may or may not impact the campus parking requirements. Major campus projects will require a parking count zoning submission to the City of Evanston.

In addition, the NU EV Campus works very closely with the City of Evanston to manage traffic impact to the residential community surrounding campus.

Parking, if included or impacted as part of a project, must be carefully considered to align with these goals. Coordinate specific parking space usage including ADA, departmental vehicles, and alternative vehicles with the Facility PM.

Exterior Connections & Gathering spaces

Meaningful connections and memories are made not only inside NU facilities, but also through interactions in outdoor spaces, and recreational areas. The physical environment of a college campus provides the context for learning and social interactions. These interactions lead to involved students, which help build community, and contribute to academic success. Both making connections in campus spaces and enjoying solitude in campus spaces should be provided. Therefore, exterior physical spaces should be designed to encourage gathering and interaction, and to help to facilitate campus involvement.

First Responder & Emergency Access

Designs should accommodate First Responder access to buildings. Safety of building occupants must be designed into the site planning. The routes that an emergency vehicle takes to serve the building must also be coordinated with supporting functions inside the building, such as the location of the Fire Command Room or Fire Alarm Annunciator Panels. Multiple Fire Alarm Annunciator Panels may be required to accommodate First Responder approaches to a building, depending upon its size and/or vehicular accessibility.

Northwestern has worked closely with the City of Evanston to establish Emergency Access routes for the City's First Responder Vehicles. These routes are designed to accommodate vehicles physically. The routes provide additional building access when there is minimal public street access to a building. The routes also allow multiple directions to approach a building. Designs are expected to respect, reinforce and/or enhance these routes when possible.

Site Accessories / Amenities

The design team will review the locations of site furnishings with the Northwestern Facilities Project Manager during the design phases.

The design team will survey the campus around the project site to determine the locations of the existing site amenities. The locations of adjacent existing site amenities will be considered when locating the new project site amenities.

Bike Parking

Bicycle parking should be considered in any site design. Consult the NU Facilities PM for specific bicycle parking count requirements and if a bicycle repair station is required. Locate bike parking so that it is visually screened, but in a location that is easy to find along a bike route and provides security. Lighting of the bike parking should match the foot-candle levels of the adjacent bicycle paths. Where possible the area of the bike parking should have camera surveillance for crime deterrence. Refer to the NU Evanston Campus Landscape Design Guidelines for the NU standard bike rack.

Trash Cans

Site trash/recycling containers will be provided by NU and installed by the contractor. The following site trash/recycling container has been approved for use on both campuses: Victor Stanley, Inc., Dynasty 236 in black with custom lid and graphics. Please see the NU Evanston Campus Landscape Design Guidelines.

Fencing

New fencing on the Evanston Campus should be consistent with existing fencing. Typically, on the grounds, this is black wrought iron. And individual houses may require a fence that is consistent with the architectural character of the house. Please see the NU Evanston Campus Landscape Design Guidelines for other fencing types.

Benches

Please see the NU Evanston Campus Landscape Design Guidelines.

Bollards

In addition to the information herein, refer to Northwestern University Evanston Campus Landscape Design Standards in the Appendix.

Suggested spacing is indicated in the Northwestern University Evanston Campus Landscape Design Standards. However, the intent is to place bollards sufficiently far apart for bicycle traffic and close enough to prohibit automobile traffic. Through the spacing distance allow easy access for cyclists and strollers to pass through. When determining the dimension consider the width of "cow horn" handlebars and the sway of a cyclist riding through. Determine the number of bollards by location and circumstances.

The Evanston Fire Department requires two rows of reflective tape to be placed at knee height on all bollards. Depending upon the bollard height, the first row could be 2-inches down from the top of the bollard, and the second row 2-inches below the first strip. Place removable bollards in a removable concrete band with troweled joints to avoid expansion cracks. Tooled joints should be provided

between bollards and not from the recessed sleeves. Concrete band is to be flush with its surroundings. A sealed expansion joint is to be provided between the concrete band and asphalt pavement or adjacent roadway.

Provide removable bollards as required for operations, and to maintain Emergency Response access. If removable bollards are provided in an Emergency Response access path, review the types and locations with local Fire Department. The criteria which follow meets the requirements of University Police, Environmental Health and Safety and Evanston Fire Department. For one possible manufacturer, see Appendix attachment: 32 3900 Removable Bollard & Storage Pad.

1. The handles are positioned in the line of travel so pedestrians and cyclists do not run into them.
2. Northwestern provides a standard padlock for a removable bollard. The padlock is keyed in a specific manner. All bollards on the Evanston Campus are keyed alike.
3. The padlock retainer is on the bollard. This enables the retainer to be completely flush with the ground when the bollards are not in place.
4. Place removable bollards in a removable concrete band with troweled joints to avoid expansion cracks. Tooled joints should be provided between bollards and not from the recessed sleeves. Concrete band is to be flush with its surroundings. A sealed expansion joint is to be provided between the concrete band and asphalt pavement or adjacent roadway.
5. Each location is to have an adjacent "retainer" pad installed to take the same number of bollards as installed. This pad can be set in a group or straight line, dependent upon field conditions. It can be installed in hardscape or softscape. When installed in hardscape an expansion joint is to be provided on all sides, preferably with a caulked top surface. This applies to the linear mounting strip of concrete for the bollards as well.
6. Any modifications to the bollard type, mounting details etc., require approval by all affected parties: Facilities, University Police, Environmental Health and Safety, and the local Fire Department.

Handrails & Guardrails

Refer to Northwestern University Evanston Campus Landscape Design Standards and the Northwestern [Fall Protection Program](#).

Site Lighting

See [Site Lighting](#) in Chapter 3: Civil.

Emergency Phones and Cameras

Provide custom products by Ramtel Corp. See the NU Master Specification and Appendix for additional information.

A fully accessible, barrier-free, solid surface is required at the approach to the emergency telephone to accommodate wheeled conveyances. Locations will be reviewed with the Northwestern University Police. Ideally, Emergency Phones and Cameras are located near pedestrian intersections, and within a travel line of site. Because of the bright blue light, consider views from buildings and onto campus when locating the cameras. The final determination of their location will be made by the NU PM.

Building Services

Service Area / Loading Dock

Building deliveries and waste removal need to be accommodated in each building. However, each building / site may not require a dedicated loading dock. Coordinate the building service needs with the NU Facilities PM. If a loading dock is provided, design the road to support the necessary vehicles and equipment for the waste removal. When necessary, provide turn around space for these vehicles. Truck Turn studies are required if a loading dock is provided.

Waste Equipment

Provide each building with a location for waste **and** recycling collection containers for the building being served. Quantity and size are dependent on building occupancy and use. Please consult with the NU Facilities PM and sustainNU to determine the needs. Visually screen dumpsters and allow adequate space for serving the dumpsters: both to load them conveniently from the building and for pickup. Avoid gates or doors on the dumpster enclosures.

Dumpster wheels are abrasive to hardscape and movement can damage adjacent walls. Carefully select materials along the path that a dumpster must take to minimize damage to walls, curbs, bollards, and the hardscape. Provide minimum 8" thick concrete on the approach and dumpster pad. Provide an exterior water hose bib and a drain in the area of the dumpster for easy clean up. Slope drainage away from the building.

Electrical Equipment & Emergency Generator

Where reasonable, electrical equipment and emergency generators are located within a building. The impact of operating and maintaining these systems on adjacent buildings must also be considered when locating them. If it is necessary to locate electrical equipment and emergency generators outside a building, then they must be visually screened; and adequate service area, including vehicular access, must be provided. The NU Facilities PM must provide permission for electrical equipment and emergency generators to be located outside a building. Modelling the impact of noise, electrical interference, etc. may be required.

Window Washing

Crisp, bright, and clean windows send a message of pride to our students, employees, and visitors. Therefore, it is imperative that all exterior windows have a safe accessible way to be cleaned. Each window should be evaluated for the ability to be washed from inside the building, the roof or from equipment on the ground. Where possible, avoid high work where it is reasonably practicable to do so, for example by accommodating telescopic water fed poles or by ground mounted equipment.

The Northwestern Window Cleaning vendor will provide ground mounted equipment that can reach up to 3 stories, depending upon the configuration of the building. A hardscape surface must be provided to support the ground mounted equipment to avoid damaging landscaping.

Where window cleaning at a height cannot be avoided, consider using a place that is already safe (i.e., no fall hazards), for example, cleaning from inside windows, an adjacent roof or from a balcony. If a safe place does not exist, provide suitable access equipment as part of the permanent base building

construction. A structural engineer must design the anchoring system and the parapet to carry the loads created by the lines and the window washer. Consideration must be given to rooftop operations and maintenance fall protection requirements when designing anchoring systems for window washing. Roof mounted equipment is required to comply with OSHA.

See also Safe Access and [Fall Protection](#)

Campus Wayfinding / Site Signage

Permanent

Please refer to [Exterior Signage](#).

Temporary Signage during Construction

Northwestern will provide Temporary Construction Signage to announce the project. Temporary signage needed for directing vehicles, bicycles and/or pedestrians is the responsibility of the construction contractor.

Landscape

Existing Vegetation

Extend site restoration the project construction fence, to the nearest natural boundary (e.g., hedgerow, path, sidewalk, neighboring building, etc.). This is intended to provide for a consistent appearance at turnover of the project.

Softscape

See the NU Evanston Campus Landscape Guidelines

Irrigation

New planting beds require water hydrants or other watering provisions within 100'-00" of the planting bed.

Irrigation is allowed to operate on campus from 12 midnight to 6am typically. Some sensitive areas are more restrictive. The existing irrigation system has inadequate taps for water sources, and low static pressure. The campus static pressure ranges throughout campus. Booster pumps are typically needed.

Irrigation designs must include:

1. Low flow golf, spray, turf and shrub bed heads for directional sprinkling optimization as determined by location.
2. Best available control technology meeting adaptive landscape design for lowest water use encompassing advanced rain gauge and soil sensing devices, sub-metering (water and power), integrated control system for potable and gray water utilization (including harvesting rainwater) with transition sequence of control.
3. Booster Pump and its location
4. Water tap and its location.

5. Maintainability and winterizing capability and accessibility for system components; pumps, main and branch lines, sprinkler devices and RPZs (if not installed in environmentally controlled space) and electrical isolation devices.
6. Coordination of an individual building's irrigation needs with the overall campus irrigation plan.
7. Installation of all underground sprinkler piping with tracer wire. Coil tracer leads at the feed source.

Hardscape

Snow Removal

All hard surfaces must be designed to allow snow removal equipment to efficiently operate. This includes providing adequate sidewalk widths and turning radii.

Snow Melt Locations

Snow melt systems are required at primary Building Entrances, including ADA ramps approaching the building entrance, and Parking Garage Ramps.

Sidewalks

Design sidewalks out of concrete or paver systems.

Concrete Sidewalks Design walks with landscape between curbs and walks such that wheel stops are not required and to allow for favorable ADA access. Concrete sidewalks are to be a minimum 5.5" thick. And have a broom finish.

Construct retaining walls adjacent to a sidewalk of materials that could withstand snow removal machines.

Provide smooth radii at intersections which are appropriately sized for the scale of the intersection walks. The radii should recognize that bicyclists as well as pedestrians use the sidewalks. Provide adequate site distances to avoid blind corners.

To minimize impacts to the environment, pervious materials should be used where appropriate. Pervious materials that are fully accessible should be investigated as options for paving material. Pathway material should be slip-resistant, stable, and firm with a smooth surface that is easy to walk or bike on, easy to maintain, and easy to clean in winter.

Pavement

See Chapter 3: Civil Requirements/Roads and Walks/[Pavement](#)

Accessible Ramps

Avoid ramps if a sloped walk is possible. Integrate accessible ramps into the site design.

Emergency Use Access Paths

Provide a hardscape path in the following locations:

1. Between an exit door and the right-of-way.
2. The path to a Siamese connection. Do not locate landscape to obstruct access to the Siamese connection.
3. At Bluelight emergency phone locations

Chapter 3: Civil Requirements

Site Utilities

Existing Conditions Documentation and Records

For all site work on either campus follow the ASCE model standards “Standard Guidelines for Investigating and Documenting Existing Utilities”, ASCE/UESI/CI 38-22, and “Standard Guideline for Recording and Exchanging Utility Infrastructure Data”, ASCE/UESI/CI 75-22.

Steam

General: Review requirements for stand-alone building heating plants, including boilers and boiler accessories, with the NU Facilities Project Manager prior to the start of the project.

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 in the Appendix for additional information.

Concrete Thrust Blocks are required.

End Seals and Gland Seals:

1. Terminal ends of conduits inside manholes, to be equipped with end seals consisting of steel bulkhead plate welded to pipe and conduit. Where there is no anchor within 5'-0" of terminal end, conduits to be equipped with gland seals consisting of packed stuffing box and gland follower mounted on steel plate welded to end of conduit. End seals or gland seals to be equipped with drain and vent openings located diametrically opposite on vertical centerline of mounting plate and to be shipped to job site with plugs in place. Terminate conduits 4" beyond inside face of manhole or building walls to protect any exposed piping insulation from damp wall condensation. Refer to drawing details for further construction and dimensional requirements.
2. Reinforce all end and gland seals with 12" long galvanized steel sleeve at the sealing surface to prevent compression of the outer jacket and insulation from modular wall sealing devices. Provide a protection sleeve that is a minimum 6-gauge thickness and outside of the HDPE jacket. Where the galvanized steel sleeve stops on the outside of the manhole, shrink wrap the sleeve to the HDPE jacket and seal it watertight.

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

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. Some facilities operate during this scheduled shutdown, i.e. Kellogg and athletics. When this occurs alternate sources of steam must be provided to support that building's program. Confirm this need with the NU Facilities PM.

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). Meter steam and reduce pressure after entrance to each building.

Systems are to be designed for operation at 90 psi. NU may choose to drop working pressure, but the system must be designed to accommodate a 250-psi working pressure. Specific requirements should be confirmed with the NU Facilities Project Manager prior to the start of the design phase of the project.

Chicago Campus: Steam produced in the heating plant is available all year, except for the scheduled annual maintenance shutdown.

For the Chicago campus central steam is distributed from the central plant 150 to 175 PSIG. Meter and reduce steam pressure after entrance to each building.

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 in the Appendix.

The Chicago Central Utility Plant is being phased out and all buildings will be served by decentralized boiler plants by 2020.

Geothermal

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

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.

Domestic Water

General: 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.

Evanston Campus: Domestic water is metered at a few locations entering campus and is mostly a private distribution system within campus. Domestic Water service to buildings must retain and/or create new water loops to eliminate dead end runs.

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

Natural Gas

Evanston Campus: 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.

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

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

Chilled Water

General: Each campus has a campus framework plan: reference it for each project. Review specific requirements with the NU Facilities Project Manager.

Review requirements for stand-alone building chiller plants, including cooling towers and chillers with the NU Facilities Project Manager prior to the start of the project.

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

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

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

The chilled water temperatures leave CUP as low as 42 degrees F on peak cooling days and reset upwards to 50 degrees F under winter economizer cooling operation. Chilled water temperature at a building entrance will be higher– up to 45 degrees on peak cooling days. Cooling coils should be selected for a minimum 16 degrees F temperature differential.

Meter each building connected to the Central Utility Plant (CUP).

Pumping on campus is exclusively accomplished through the Central Utility Plant's secondary distribution of pumps. Review the use of tertiary pumps with the NU Facilities Project Manager and the NU Facilities Operations Director.

Hydronically separate Central CHW from Process Cooling Loops.

Chicago Campus: Chilled water is produced in a distributed satellite CHW plant configuration.

The chilled water temperatures at the entrances to the building shall be as low as 44 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 54 degrees F return water temperature.

Review the Project integration into this system at start of design process with NU Facilities Project Manager and NU FO Staff Engineer.

Storm Sewer

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. 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.

Sanitary Sewer

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 systems on the north and central campus are approaching the limits of good design practice.

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.

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

Hot Water

The Evanston campus has a hot water distribution supply and return that is generated and returned to the central utility plant. There is a small network that is navigated through utility tunnels and direct bury piping. Valves are in vaults that are in some instances, shared with steam.

Compressed Air

There are 3 distinctive loops on the Evanston campus that supply compressed air. The 1st loop is located near the sciences research facilities and supplies air to research buildings. It is operated between 100 and 110 psi and is primarily used for research. The 2nd loop is near Southeast campus and is used primarily for temperature controls. The 3rd loop is in the central campus area and is also primarily used for temperature controls. The compressors for all three are housed in a combination of Central Utility Plant and Technological Building.

Electric

See [Electrical System Design](#)

Fiber

In Evanston, the Fiber network is comprised of direct bury and in underground utility tunnels.

Site Lighting

General: Meet the standards for college and university illumination set by IESNA. In particular, ensure that stairways, ramps, and bike parking areas meet appropriate and code-compliant light levels at a minimum. Design Light levels at pathways to meet IESNA standards for maximum security, so that it is possible to raise light levels for life safety emergencies; lights may be dimmed through the controller system to achieve lower light levels for daily use. Experience at the University has determined that significantly higher levels than are required by IESNA standards (in the range of 0.5 foot-candles minimum) are considered acceptable by the campus community.

Design Lighting to achieve a uniform lighting level throughout the campus to avoid blind spots when moving from bright to low lighting. Illuminate all paths, sidewalks, bike parking locations, service areas and roadways. Illuminate bike parking locations to the same level as the adjacent sidewalks.

Increase lighting levels at pedestrian and service entries to the building and place these light fixtures on the emergency lighting circuit/system.

Design Site lighting to reduce night sky light pollution. Do not illuminate a building with up lighting.

Match existing light fixtures when adding or replacing small quantities. Where fixtures cannot be used or matched, comply with LEED requirements for light pollution and provide LED lighting. Review specific requirements with NU Facilities Project Manager during the design phase of the project.

Full cut off lighting is not required, but lights should have a BUG Rating with a U Rating (Uplight) of 3 or less, and a G Rating (Glare) of 1 or less.

Do not use Bollard lights, recessed ground-mounted lights, and tree-mounted lights as a general practice, as these fixture types are often damaged by mowers and snowplows. Exceptions will be made for unusual and "special" exterior passive contemplative spaces and gardens.

Step lights and embedded wall lights are acceptable for use in circumstances where post-top pedestrian lighting is not adequate to light the area in question. Use cut off type fixtures for step and wall lights. Use products with non-corrosive and corrosion resistant material.

Provide convenience outlets in exterior light poles. Identify these locations to the NU Facilities PM.

For lighting controls see [Lighting Controls](#) in the Electrical System Design Chapter

Evanston Campus: Install the Campus standard site lighting fixture outside of a 5' offset from any campus building. Any nonconforming light fixture beyond this limit will require approval. See the NU Evanston Campus Landscape Guidelines for the approved light fixture.

Comply with City of Evanston municipality lighting standards for any lighting located within the City right-of-way. Show the FTC spread into City walkways for lighting within City property.

Tracing Utility Lines

Tracer Wire is required on all site utilities with above ground locating terminals clearly marked. See also the NU Master Specification.

Fire Loops

Fire suppression systems must be designed with redundancy and no dead ends. Design for buildings to be isolated from the fire suppression loop without interrupting the fire suppression loop. Some existing buildings will require evaluation of existing systems and requirements for extension and/or new fire pumps.

Evanston: 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. The fire suppression network is direct buried and inside of utility tunnels.

Chicago: Review specific requirements with NU Facilities Project Manager.

Roads and Parking Lots

The Evanston campus roads and walks consist of asphalt pavement, PCC concrete pavement, brick pavers and pervious pavement. When replacing any hard surface be mindful all ADA requirements and consult NU Facilities project manager.

Air entrain all exterior concrete to 5% (+/- 2%). Provide reinforcing wire in accordance with ACI 318. Fiber reinforcing is not allowed.

Pavement

Pavement types are PCC concrete, asphalt, brick, and architectural stamped pavement. Provide a concrete curb around any utility structure located in brick or architectural stamped pavement.

All roads must be properly sized for the vehicles using it. See also [Service Area / Loading Dock](#)

In Evanston, Fire lanes (size, bearing capacity, turning radius, location, etc.) must comply with the Evanston Fire Prevention Bureau criteria: [Fire Prevention Bureau Information Package](#). These will be reviewed with the City of Evanston.

Chapter 4: Structural Requirements

The preferred structural system is poured-in-place reinforced concrete. Other systems will be considered if detailed cost comparisons are made. Concrete structures are preferred for their long-term integrity. Maintenance costs are low. They are inherently fire proofed: overtime fire proofing on steel becomes damaged and not repaired, which compromises the occupants. An exposed structure is possible which may become an Architectural feature.

Space Specific Criteria

Lab design

See [Lab Design](#) in Chapter 5: Architecture and Interior Design

Cast in Place Concrete

Concrete Design Criteria:

1. Except for lean concrete, which is typically used for backfill, provide a minimum 28-day concrete strength of 3,000 psi for below grade construction, and 3,500 psi for slabs-on-grade and above-grade construction.
2. Provide a minimum air content of 4.5% for Concrete exposed to freeze / thaw.

Design Considerations:

1. Do not place conduit in concrete slabs without approval by the University.
2. Epoxy coat all reinforcing in exterior permanently exposed face of concrete.
3. Coordinate brick ledges and exterior grades so that soils are not placed against exterior façade materials (e.g., stone, precast concrete, or masonry).
4. Patch form tie depressions on all vertically formed concrete surfaces that are either exposed to view or are to receive damp-proofing or waterproofing.
5. Provide, at minimum, fluid-applied damp-proofing at all perimeter foundation walls. Waterproof foundation walls that form the perimeter of an elevator pit, basement, or crawl space. Provide a footing / wall water stop at waterproofed locations.
6. The minimum reinforcing for slab-on-grade and slab-on-deck concrete shall be WWF 6x6 – W1.4 x W1.4, with the WWF supplied in sheets, not rolls.
7. Provide a minimum 12 mil reinforced polyethylene product (“Moistop” or approved equal) vapor barrier under interior slabs-on-grade. Seal the joints in the vapor barrier with the manufacturer’s recommended tape.
8. Provide all concrete slabs (exclusive of mud slabs) with a minimum of a float finish; if indicated to be broomed, float and then broom the slab.
9. Provide a 4-inch-high concrete housekeeping pad for floor mounted equipment above grade. Use a 6-inch-high concrete housekeeping pad for locations below and at grade.
10. In new construction that includes wet rooms (restrooms, locker rooms, shower rooms, kitchens, etc.) provide a three inch depressed structural slabs over the entire area, wall-to-wall, to allow for floors in these rooms to be properly pitched to the floor drains.

Tolerances: The University requires proper forming, placement and finishing to meet the following:

1. ACI 347-78, except as noted below.
2. The following are recommended tolerances for finished slab surfaces:
 - a. Trowel Finish: For surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint, or other thin film finish coating system: Achieve level surface plane so that depressions between high spots do not exceed 1/8" under a 10-foot straightedge.
 - b. Lab Designs may have more stringent requirements. Confirm this with the NU Facilities PM.
 - c. Floor Leveling: Contractor, at his own expense, shall provide floor leveling, to the satisfaction of the University, in areas where the above tolerances are not achieved.

Structural Steel Framing & Decking

Structural Steel Design Considerations:

1. Bar joists are not allowed for floor construction.
2. Consideration must be made for effects of hanger loads from M/E/P systems, hung stairs, etc., on building structure.
3. Galvanize exterior lintels and shelf angles.
4. Stainless steel should be considered for areas that are permanently exposed to the elements.
5. Composite metal deck must be a minimum thickness of 20 gauge.

Chapter 5: Architecture and Interior Design

Design Philosophy

See also [Building Vocabulary](#)

Building Enclosure

Both the Chicago campus and Evanston campus share a similar palette of exterior materials which is predominantly Indiana Limestone, Lannon stone and glass. On the Evanston Campus, brick with limestone trim is used on Residence Halls. Building designs should maintain this character. See also [Laws, Codes, Regulations, and Standards](#)

Performance Criteria

The exterior building enclosure is one part of the larger issue of energy conservation and sustainability. Analysis of the building enclosure and the HVAC systems must be made together. LEED goals when they apply, will also influence the building enclosure design. A continuous Air Barrier system is required at the warm side of building insulation. A dew point analysis is required. If no other criteria govern, provide the following minimum R values: Walls: R20; Roofs: R30. Depending upon the project scope, envelope thermal scans may be taken at seasonal extremes to confirm envelope integrity. The design team is expected to review these scans and assist with remediation if necessary.

Access

See Safe Access and [Fall Protection](#)

Roof - General

When no other criteria are provided, the criteria within this section should be used.

Flat Roof Materials: Acceptable materials are:

1. Atactic-polypropylene (APP)-modified bituminous membrane roofing.
2. Ethylene-propylene-diene-monomer (EPDM) roofing system
3. Polyvinyl-chloride (PVC) roofing system

Roof Access: Provide permanent access to all parts of a roof (the use of portable ladders, scaffolding, mobile elevated work platforms, and similar equipment are not considered permanent means of access). Provide access to equipment that must be maintained on the roof from at least one stair which is located near the equipment. Access to a roof through a door is preferred over an operable window. The roof access must be sized to allow for tools, service equipment, and replacement parts to pass through.

Roof Mounted Equipment: Provide all roof mounted equipment with access for maintenance and repair. When feasible, roof mounted equipment should be located at least 15-ft away from all fall hazards. Provide anti-slip walking paths and surfaces that are safe and protect the roof: extend these walking paths and surfaces from the roof access point to the equipment (including any fall protection system components, such as lifelines or anchorages), and to access the equipment on all sides. When large equipment is mounted on the roof, provide stair access. Coordinate the walking surface material with the roof material, to maintain the roof warranty. Provide access that complies with OSHA Fall

Protection requirements. Provide clear dimensions in the path to the equipment to accommodate required maintenance tools/supplies and equipment replacement. Provide protection of the roof itself. See also [Roof Top Equipment](#).

Edge Protection: [See Safe Access and Fall Protection](#)

Visibility from Above: Consider whether or not a white or light-colored roof will be viewable from above. Over time these roofs look dirty. If the place from which the roof can be viewed is a prominent one, consider alternative roof materials or pavers to minimize this effect.

Bright reflections: Consider adjacent spaces where the reflectivity / glare from a white roof may be objectionable and utilize a light grey or provide options to address this concern and still meet energy / code requirements.

Slate Shingles: ASTM C 406 Grade S2 slate shingles, machine punched for two nails located for proper head lap and complying with the following requirements:

1. Type: Standard shingles.
2. Texture: Rough texture.
3. Colors: To be reviewed with the NU Project Manager during the design phases of the project.
4. Sample submittal is a minimum of three pieces of slate showing range of color.

Snow Guards: Prefabricated copper units designed for use with slate shingle roofing and complete with hook for installation onto slate.

1. Basis of Design:
 - a. Snow Guards as manufactured by Zaleski Snow Guards, Inc.

Roof – Polyvinyl Chloride (PVC) Roofing

Design Considerations:

1. Do not use single ply roofing in high traffic areas.

Roof System:

1. Single Ply Roofing Membrane:
 - a. Membrane Material: PVC sheet, minimum 0.060 inch (60 mils) thick. Review the option of 0.080 inch (80 mils) thick membrane with NU Facilities Project Manager.
 - b. Color: Manufacturer's standard white, unless noted otherwise. Consider adjacent spaces where the reflectivity / glare from a white roof may be objectionable and utilize a light grey or provide options to address this concern and still meet energy / code requirements.
2. Flashing: PVC 0.080 inch thick. Utilize pre-formed manufactured shapes where practical.

Quality Assurance:

Install roofing system, insulation, and cover board in accordance with local building codes, roof system manufacturer's written instructions, and FM Global and UL installation requirements.

1. Mechanically fasten the base layer of insulation. Remaining layers may be adhered per manufacturer's recommendations.
2. All metal components are to be stainless steel.

3. On concrete decks provide a modified bitumen base sheet set in cold adhesive under the insulation.
 - a. Alternatively, a torched down modified bitumen base sheet may be used where conditions permit. This provides a temporary roof system for re-roofing and provides a permanent vapor barrier. The bond between the concrete deck (lightweight or structural) should be tested if torched down.

Sheet Metal Flashing and Trim

Materials: Do not use galvanized metal in exterior applications. Use one of the following:

1. Stainless Steel Sheet: ASTM A 167, Type 316L, non-corroding. Finish: 2D (dull annealed).
2. Copper Sheet: ASTM B 370, of temper appropriate for use.
3. Terne Coated Stainless Steel Sheet: ASTM A 167, Type 304 sheet, coated both sides with terne alloy (80 percent lead; 20 percent tin); FS QQ-T-201F, Type II. Minimum coating weight: 40 lb., nominal (1.45 ounces per square foot total coating weight).
4. Fasteners: Provide stainless steel screw-type fasteners. Nail-in or driven type fasteners are not allowed.

Windows

Fixed windows are preferred and expected in Academic Buildings. Operable windows will be permitted in Residence Halls and under special conditions. For window replacements in historic buildings, the operation of windows will match the historic operation of that window.

In other than historic buildings, wood windows are not permitted.

Window Design: Operable ventilator/sash: Design so ventilator/sash can be removed from inside. In residence halls at first floors and other areas accessible from grade, and at upper floors with roof access, provide ventilating locks at 4" open position. Provide weather-stripping on all operable ventilator/sash in exterior walls. Provide a solid/durable water-resistant repairable material for windowsills. See also [Humidity](#)

Glazing Stops: Where glazing stops are indicated, design for re-glazing without removal or dismantling of ventilator/sash or frames. To match windows, screwed or snapped on. Maintain clearance from adjacent surfaces to permit re-glazing.

Sun Control Devices: Window treatments are typically provided as part of the base bid scope of work and not part of the furnishings, fixtures and equipment (FF&E). Review options with NU Facilities Project Manager during the design phase of the project and coordinate power and control requirements for motorized shades. For uniformity when viewing the exterior elevation, provide one solution for the visible portion of the sun control shade within a single building. In general, mid-range grey mini-blinds or roller shades provide a consistent look on the building exterior. Provide a maximum 3% openness factor on the same-colored fabric throughout the building. Vertical blinds are not allowed.

Horizontal Louvers attract insects which in turn attracts birds. The birds leave droppings on the horizontal plane. This combined with the naturally accumulating dirt makes them unsightly from inside the building.

Cleaning: see Building Services: [Window Washing](#)

Masonry

Both the Evanston and Chicago campuses utilize Indiana Limestone (e.g., Deering Library) and Lannon Stone (e.g., Tech Institute) for exterior Academic building envelopes. The pattern is Random Ashlar. Projections are limited to about ½”.

Residential Building envelopes are brick.

Limestone:

1. Color: Buff.
2. Variety: Indiana Limestone.
3. ILLI Grade: Select preferred, other grades may be used under special conditions.
4. Selection from three 12-inch by 12-inch samples.
5. Classification II, medium density.
6. Finishes: If shot sawn, also provide sandblasting at fabrication plant. Plucked finishes are not permitted.

Lannon Stone: Careful attention to texture, size and coursing is required.

Accessory Materials:

1. Stone Anchors in Direct Contact with Stone: Stainless steel, Type 304 or 316 unless specifically indicated otherwise.
2. Provide internal gutter system for draining water from stone cladding in accordance with the Indiana Limestone Institute Design Handbook.

To match existing stone bearing wall construction with modern cavity wall veneer stone technique, the following concepts/notes should be incorporated into the drawings/specifications:

1. Provide corner pieces that are “L” shaped units with heights and lengths of pieces given based on the project specific requirements.
2. Arrange corners with larger stones at the bottom, decreasing in size higher up the building.
3. Hand chip edges of all units to remove shelves at mortar joints.
4. Chip or saw vertical edges of the units to leave a uniform vertical mortar joint.
5. The horizontal mortar joints shall be emphasized, uniform in thickness, and be as long as practical.
6. Grey hued stone will buff over time. It is best to start a bit grey when trying to match existing older stone.
7. Most of the stone walls on the Evanston campus are a mixture of stone quarried from horizontal locations (tan in color) and vertical edge pieces (grey in color).
8. Where appropriate, specify an abrasive blast to match existing “weathered” stone finish.
9. Utilize tern-coated through wall flashings to avoid any shiny stainless-steel edges.
10. Limestone that needs to match existing needs to match the pattern, color range, finish, texture, joint size and type, and edge detail.
11. Two 5-foot by 7-foot mock-up wall samples will be required to confirm mortar color, stone color, and to set the limit on stone unit “rectangleness”.
12. Once in place, the mock-up shall be made to confirm stone layout patterns and limits on mortar joint uniformity. Once approved, the mock-up can remain in place.

Quality Assurance:

1. Single Source Responsibility: Design, fabrication, and installation shall be the responsibility of a single entity. Contractor shall require an engineer to perform structural design, determine the

testing program, and evaluate the test results. The engineer shall be licensed in Illinois and have experience in engineering stonework that has resulted in successful installation of stonework like that required for the project.

2. Safety factors: Use safety factor of 8. Design with redundant load paths, so that failure of one element (fastener, anchor, etc.) does not result in failure of any other element.
3. Normal Thermal Movement: Movement resulting from an air temperature range of 120 degrees F, solar heat gain, and nighttime re-radiation.
4. Horizontal Building Movement: Allow for horizontal building movement from floor to floor (interstory drift) not more than the floor-to-floor height divided by 400.
5. Individual Fasteners and Attachments: Design to withstand the stresses produced by the following loads applied separately, applied through the center of gravity of the element supported, each added to the stresses produced by thermal movement: Vertical: 4 times the weight of the supported elements. Horizontal: 2 times the weight of the supported elements.
6. Stone Testing: Test each variety of stone to show compliance with physical characteristics specified. Test limestone in accordance with ASTM C 568. For stone veneer thinner than 2-1/4 inches, perform modulus of rupture tests on specimens of the smallest thickness and with the finish to be used on the project.

Knox Boxes

Provide Knox Boxes at building entrances used by emergency first responders. Large buildings may have more than one entrance. On the Evanston Campus, these locations will be reviewed with the City of Evanston Fire Department. At a minimum, one Knox box is to be provided at the main entrance to the building which coincides with the official building address and exterior building signage.

Exterior Doors

Entrance doors regularly used by students, faculty and staff are to have electronic access control and be ADA compliant. Building mounted access control readers and ADA operators are preferred.

For high use doors subject to high wind loads, consider the use of balanced doors. Barriers to interrupt the wind patterns may be required to prevent damage to exterior doors.

Paired doors are discouraged. When paired doors are absolutely necessary provide removable mullions. Exception: No mullions are required at laboratory access and low use paired doors.

Select a door that will accept Northwestern standard hardware. For hardware, please see [Hardware](#). In-ground door closers are not allowed due to maintenance problems.

See also [Exterior Door Signage](#), and [Building Entrances](#)

Provide Hollow metal doors and frames for service and exit only doors.

Performance: wind studies for door protection are required. Determine Wind Loads in accordance with ASCE 7. Design system to withstand 150 percent of design wind load with no failure or permanent deformation greater than 0.2 percent of span.

Revolving Doors: Due to maintenance issues, wind damage and the inability to easily and cost effectively provide electronic access control, revolving entrance doors are not allowed on either the Chicago or Evanston Campus.

Material: Provide entrance doors of a material and design appropriate for the building and frequency of use, and with consideration of the statements below.

Service doors are to be galvanized hollow metal.

Wood doors are for interior use only and not for exterior applications, except when the use of a custom wood door is required for exterior applications in a historic building. Review specific project requirements with NU Facilities Project Manager.

Aluminum narrow style doors are not recommended.

Provide a minimum 12-inch-high bottom rail on glazed or louvered doors.

Avoid custom window and door trim.

Provide snap-on extruded aluminum glazing stops, designed to allow replacement of glazing without disassembly of frame. Provide non-removable exterior stops.

Weather-stripping is required on all exterior doors. Provide Weather stripping that is easily replaceable.

Schedule of Painting & Coatings

Schedule of Coatings for Exterior Surfaces:

1. Concrete Masonry Units - Filled Finish: Latex.
2. Ferrous Metal: Latex, gloss.
3. Galvanized Metal: Latex, gloss.

Space Specific Criteria

This section includes not only Architectural criteria but also Engineering criteria. The design team is expected to coordinate this information between disciplines. Unless noted within this section, the general criteria provided in the balance of the Design Guidelines apply. Also, this section is not meant to cover all conditions that may be found on our campuses. Specific Academic Units or a highly specialized space, such as a laboratory, for example, may have very specific criteria: those criteria will govern.

See also the NU Design Guidelines for Interior Finishes chart in the Appendix.

Common Spaces Program

To provide a consistent visual image across public and common areas across campus, regardless of the academic or support unit that it serves, NU has developed a Common Spaces Program. This program covers finishes, furniture, accessories, AV, Plumbing, Lighting and Branding/Signage for several space types:

1. Public Restrooms
2. Single Restrooms
3. Lactation Room
4. Communicating Stairs
5. Meditation Room
6. Corridor

The Common Space Program guidelines should be used when there are no other compelling criteria to override it. For example, a Toilet Renovation in a historic building should be sensitive to the existing Architectural vocabulary.

Please see the Common Space Program document in the Appendix.

Building Entrances

Provide canopies or building/roof overhangs at primary and secondary entrances for protection from the elements. Exit only doors do not require this protection.

Illuminate the exterior of all building doors. See also [Site Lighting](#) and [Security and Safety](#).

To reduce air infiltration and assist with energy conservation, entry vestibules are required at primary and secondary entrances. Heat and condition entry vestibules. Provide floors and walls that are easily maintained and waterproof. Slope approaches to buildings away from the building. Due to maintenance issues, drain pans in an entry vestibule are not allowed. See also the Common Space document.

Locate Trash/Recycling containers near the primary entry/exit, but in a discrete location. Coordinate with the NU Facilities Project Manager.

Secondary entrances should be visible from key pedestrian areas to integrate buildings into the pedestrian realm as well as to offer a sense of security.

The City of Evanston has required signage at all grade level doors. In addition, NU may have entrance signage requirements. Please see the City of Evanston requirements and [Chapter 6: Signage](#) for more information.

Exit Ways

Maintain Exit corridors that are clear of any obstructions. Do not plan for items such as furniture, microwave ovens, copiers, or other similar office equipment in exit paths.

Stairs

For interior and exterior public stairs, provide full length, non-slip nosings and treads. Avoid painted handrails. Use glass railings only in high profile locations and in locations approved by the NU Facilities PM.

Residential Services

Northwestern Residential Services has its own set of design standards that should be followed. Request this document from the Northwestern PM when working on any Residential Service project.

Laboratory Design

Please see the document “Northwestern Facilities Lab Design Guidelines” in the Appendix. In addition, the Northwestern Office for Research has its own set of design standards and safety requirements that should be followed. Request this document from the Northwestern PM when working on any laboratory project.

Classroom Design

See General Purpose Classroom Guidelines in the Appendix.

Office Design

Office Designs vary by department and position. Generally, the following applies to all offices:

1. Provide a 6" high Wall Base around the entire room in one color.
2. Paint all walls with an acceptable NU standard white. See [Interior Finishes](#). Accent paints are not allowed.
3. Locate the hinge side of the door about 15" from the adjacent wall to allow bookshelves or file cabinets behind the door.
4. Provide a sidelight the full height of the door. Provide a minimum 6" sill to protect the glass from floor cleaning equipment. Coordinate sidelight with room signage.
5. Structural columns should not be placed in the mid span of interior demising walls. Maintain an uninterrupted rectangular room shape as much as possible.
6. The latch side of doors shall be the typical location for light switches, occupancy sensors (when not ceiling mounted), fire alarm devices or strobes, and thermostats. These items should be located as close to the door frame as possible to allow furniture or wall mounted items between the door sidelight and the wall. They should be arranged in an organized way. If the office has a card reader or other device with a back box, the back-to-back back boxes need to be coordinated. Include an elevation with dimensions to locate these items in the Drawings.
7. If an office has four or more light fixtures, provide two lighting zones with separate switching to reduce ambient lighting and lessen the contrast with computer screen monitors.
8. Provide a coat hook on the back of the door. Reinforce the door as needed for this loading.
9. Provide blocking in the wall to support wall mounted shelving.
10. AV/Data: provide the N IT recommended quantity of data ports per workstation.
11. Coordinate power and data for furniture, so that the furniture does not have to be "powered", and cords are hidden from view.

Toilet Room Design - General

Provide the code required minimum number of toilets, urinals, and sinks. In addition, consult the NU Facilities PM for additional requirements, such as Single Occupancy and/or Family Assistance Restrooms in new construction. Consider including Single Occupancy and/or Family Assistance Restrooms in major renovations. The criteria within the Toilet Room Design – General section applies to new construction and renovations of existing toilet rooms.

Finishes: Walls within 2 feet of urinals, water closets, sinks, hand dryers, soap dispensers and paper towel dispensers should have a smooth, hard, nonabsorbent surface to a height of at least 4 feet above the floor. A painted surface is not acceptable.

All floor surfaces and wall base must be waterproofed and slope to a floor drain. Provide floor drain(s) in the toilet / urinal area and in the sink area if needed for ease of maintenance. Light colored grout is not allowed in the floor areas.

Mirrors: Provide adequate lighting at mirror(s) for detail work. Provide a full-length mirror in each Multi-person Toilet Room. Single person Toilet Rooms are not required to have a full-length mirror.

Hooks: Provide heavy duty hooks strong enough and large enough to support a backpack inside each toilet partition or toilet room; and near the sinks. If it is on the back of a door ensure that all components of the assembly (door, hinges, hook, etc.) are strong enough to support this load.

Baby Changing Station: Baby changing stations are required if the building will be used by the public. When provided, include a Baby changing station in both Men’s and Women’s Toilet Room, or in a Toilet Room accessible by all. Manufacturer’s branding is not allowed on the baby changing station.

Sharps Containers: Provide a location for a Sharps Container. The Sharps Container will be provided by Northwestern if needed.

Toilet Room Accessories: See [Consumable Product Dispensers](#). See chart for suggested quantities:

ITEM	LOCATION	PRODUCT
Soap Dispenser	One per every two sinks, one minimum	Owner Provided 1250ml GOJO Foaming Soap Push Dispenser
Toilet Paper	One per stall / room	Owner Provided Tork Bath Tissue Jumbo Roll Mini Twin Dispensing System
Paper Towel Dispenser	One per every four sinks, one minimum	Owner Provided Tork Matic Hand Towel Roll Dispenser
Electric Hand Dryer	One per every four sinks, one minimum	Provided and installed by the Contractor. See NU Master Specification.
Feminine Hygiene Dispenser	One each in both Men’s and Women’s Toilet Rooms.	Contractor Provided Dispense free product
Trash Receptacle	One minimum	Owner Provided. See Waste Handling
Sanitary Disposal	One per stall in both Men’s and Women’s Toilet Rooms, and one per Single Person Toilet Rooms	Owner Provided Rubbermaid 6140 Sanitary Napkin Receptacle with Rigid Liner

Toilet Room Design – Multi-person

Location: Men’s, Women’s, Single Person and Drinking Fountains all near each other.

Public Toilet Room Entry: Entry to public toilets should be designed with offset entries or vestibules capable of allowing entry and exiting without making physical contact with surfaces such as walls, or people. Occupants in waiting areas or halls should not be able to see through such entry area into the actual toilet room. Provide a lockable door to secure the Toilet Room during maintenance. See Hardware.

Toilet and Urinal Partitions: NU preference is solid plastic, recycled, high-density polyethylene (HDPE) floor mounted, overhead braced (floor to ceiling) units. Ceiling hung units are not preferred.

Wellness Room

Consult with the NU Facilities PM to determine the need for a Wellness Room. If a Wellness Room is needed, the following amenities may be provided:

1. Counter

2. Waste Bins
3. Washable Floor
4. Refrigerator
5. Chair
6. Millenium Access
7. Full length mirror
8. Electric Outlets

Lactation Rooms

Lactation Rooms should be easy to locate (potentially adjacent to a women's bathroom). See Common Space Guidelines in the Appendix.

Pantry / Vending Areas

Each project's program will have a unique pantry solution. They range from a small cabinet and countertop solution for coffee and lunch storage to vibrant, spacious break rooms for informal meeting. Regardless of the intent, the space must be functional and maintainable. Provide countertops with a backsplash. Sinks are optional and determined by the space program. Wall areas near the sink must be water resistant. Adequate power must be provided for appliances. Sufficient lighting is required for cooking and cleaning, i.e., provide a light fixture over the sink. [Branding](#) can be considered to personalize the space.

Please see [Appliances](#).

Vending areas require power, data, and/or plumbing for the vending machines. Coordinate the selection of the machines with the NU Facilities PM. Provide adequate space for the machines and allow for flexibility in the future to change machines. Locate light fixtures to adequately illuminate the contents of the vending machines.

Paper Towel dispenser: See [Consumable Product Dispensers](#).

Janitor's Closets

Provide a minimum of one Janitor's Closet per floor. The size of the building will influence this quantity and the size of the room. Larger buildings may require a larger separate room for storage of equipment and supplies. This room may also require water. Coordinate this with the Facilities PM.

Locate Janitor's Closets near Multi-person Toilet Rooms.

Provide doors that swing out 180 degrees.

Materials are to be hard cleanable durable surfaces, and white in color.

Protect all lights. Exposed lamps are not allowed.

Floor mount mop sinks in a corner and provide wall protection. Provide a floor drain. Provide both hot and cold water with a spigot that will accept a hose. In addition, the University utilizes Orbio systems, which require electrical and cold-water connections. Coordinate requirements, including locations for installation, with the NU Project Manager during design development.

Coordinate required shelving with the NU Facilities PM and the Custodial team. All shelving is to be vinyl coated metal.

Coordinate electrical plug-in requirements with the NU Facilities PM and the Custodial team.

Elevator Equipment and Machine Rooms

Elevator Mats: If Elevator Protective Mats are provided, also designate a storage location for them within the building where the elevator is located.

Elevator Machine Room: Provide conditioned elevator machine rooms for each elevator or bank of elevators. Where machine room less (MRL) elevators are specified, a dedicated and conditioned elevator machine room is still required for the controllers and disconnects. All elevator equipment is to be installed in a location where manufacturer environmental parameters are met.

Machine Room and Pit Finishes: See NU Design Guidelines for Interior Finishes in the Appendix.

Machine Room Data: Provide (1), 4 wire university standard data (USO) outlet for each elevator, located within 18" of elevator controller. Jacks will be used for emergency phone, camera, monitoring, spare. Use a patch cord to connect USO to telephone so there is a 'demark' – This is to allow troubleshooting to determine whether there is a problem with the elevator's telephone equipment or the Northwestern phone line.

Machine Room Temperature & Humidity Control: Provide each elevator machine room with a duct free split air conditioning system for environmental temperature control. Design the duct free split air condition system to maintain the required temperature and humidity control for the specified elevator.

Elevator Pit: Alarm the Elevator pump pit to DDC.

Mechanical Rooms

Mechanical equipment can be noisy and cause vibrations. Locate and design rooms with consideration of the impact it will have on surrounding spaces, not only on the same floor, but also above and below, if applicable.

Provide waterproof sealed floors with curbs in all Mechanical rooms. Sleeve all floor penetrations to 2" above the floor to prevent liquid spills and leaks from traveling out of the space.

Provide well-lit Mechanical Rooms, maintaining a minimum of 25 foot-candles. Provide light switches at each exit. Power at least 25% of mechanical room lighting and at least one outlet that is labeled as emergency power from standby generator power source where it is available. Provide GFI 120VAC convenience outlets in mechanical rooms to provide for ready servicing of equipment.

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. Slope the floor to the drain. Provide trap primers as required per Code.

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

Where mechanical interstitial space is required, provide adequate head room for maintenance staff to walk upright, and a minimum of 3'0" clear width.

In Mechanical rooms provide adequate heating and cooling to maintain space temperatures between 55 - 85° Fahrenheit.

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

Provide minimum of 3 spare data jacks per mechanical room.

When not in conflict with code, provide fire alarm heat detectors in Mechanical Rooms.

NU prefers mounting 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.

The path between a piece of equipment or replaceable part should accommodate the size of the equipment or part all the way from the original equipment's location to the exterior of the building.

Provide adequate access areas for equipment maintenance and replacement of equipment. Temporary removal of other equipment to allow for access is not acceptable. Access requirements apply to major equipment replacements as well as routine maintenance requirements; for example, replacement of major fan systems at end-of-life.

Electrical Rooms

See [Electrical Spaces, Vaults, Rooms and Closets](#)

Fire Alarm Equipment Rooms

See [Fire Alarm Equipment Spaces](#)

Access Control Rooms

Provide Access Control equipment with adequate space – much of the design will be dependent upon the wiring method that is selected. See also [Access Control](#).

Interior Construction and Interior Finishes: General Criteria

Both the Chicago campus and Evanston campus share similar expectations for interior materials and finishes.

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

These Interior Construction and Interior Finishes: General Criteria are to be used when there are no Common Space, Occupant or [Space Specific Criteria](#).

Firestopping: See 078400 Firestopping in the Appendix.

Interior Finishes

Review materials and finishes with the NU Facilities Project Manager as part of the design phase of the project. Additional reviews with the user group(s) should be anticipated. Select materials and finishes for ease of maintenance and the ability to not show dirt or stains, as well as for its aesthetic qualities. For historic buildings, provide interior finish schemes that are consistent with the existing historic conditions. See the Appendix for a matrix of finishes by typical space types on campus.

NU has a distinct color palette that includes neutral color schemes and complementary accent colors. White paints are limited to those listed in Wall Finishes. Each client group has input on the accent color group. All color schemes must work with purple even if the project is not initially designed with purple. For the acceptable purple color palettes, consult the Northwestern Branding criteria at <https://www.northwestern.edu/brand/visual-identity/color/>

Metal: Use metals to highlight, frame and protect important architectural features from wear and tear. Metals should be soft and smooth to the touch but should be able to withstand heavy impact.

Hardware: See [Hardware](#)

Wood: Use wood to elicit a sense of honesty and truth. Wood should be sealed but remain unstained to truly evoke its natural state. Where possible, specify natural oaks specific to the local region. Avoid the use of lighter blonde woods, red cherry woods, or dark wood.

Stone: Stone selections should tie in with any natural stonework existing on the inside or the outside of the building. Stone should evoke a calming, natural feel representative of the shorelines of Lake Michigan.

Tile: Whether wall tile or ceiling tile, keep it crisp and fresh with classic proportions and installation methods. Illuminate wall tile to hide the inherent lack of uniformity that results from hand setting the individual pieces.

Glazing: Transparency is a way for departments to communicate visually between each other and a way to expose users to natural light and views. Introduce varying levels of transparency to achieve specific privacy needs, while still maintaining a fresh, open feeling.

Textiles: Patterns and textures should be used on less permanent finishes, like fabrics, films, and wallcoverings. Allow subtle patterns to take cues from original architectural elements, and/or nature that celebrate the identity of place.

Details: Preserve the character of existing architectural details when possible and blend with Northwestern branding solutions, finish treatments and furniture selections to give rich depth to the legacy of Northwestern.

Flooring: Acceptable floor materials, include, but are not limited to, Carpet Tile, VCT, Sheet Vinyl, Rubber, Tile, Linoleum, Porcelain Tile, Terrazzo, Ceramic Tile, Stone, polished concrete, and Epoxy flooring. Do not use white grout on the floor. Carpet tile should be used in offices, conference rooms and office corridors due to its easy replacement. Broadloom may be used in Conference Rooms with

approval from the NU Facilities PM. Avoid light colored carpets and cut pile. The carpet pattern and color must not show wear.

Wall Base: Acceptable wall base materials, include, but are not limited to, Vinyl, Rubber, Wood, Stone, Ceramic Tile, Terrazzo, and Epoxy. The wall base within one room will be one material and one color. For floor maintenance equipment, provide a 6" minimum height wall base.

Wall Finishes: Acceptable wall finishes, include, but are not limited to, Tile, Paint, Wall Covering, and, in limited applications, Paneling. Northwestern has standardized on five Benjamin Moore white paints for walls:

1. Decorators White
2. Bone White
3. White Dove
4. China White
5. Linen White

Finish palettes are limited to these five white paints.

Ceilings: Acceptable ceiling materials, include, but are not limited to, ACT and Gypsum Board. Other materials may be considered for special functional or aesthetic needs. Ceilings are to be the maximum height possible. Ceiling access for maintenance must be maintained. See [Access Doors and Frames](#).

Select Modular Ceiling systems, such as Acoustic Ceiling Tile, with a size that can be handled by one person, i.e., 2'0" x 8'0" removable ceiling tiles are not allowed. Ideally, 2'0" x 4'0" is the maximum ceiling tile size.

For painted ceilings, the white colors in Wall Finishes and the color Superwhite may be used.

Provide moisture resistant ceiling materials in damp/wet areas.

For ceiling coordination see [Ceilings](#).

Partitions / Walls

Extend rated walls to the underside of structure as required to maintain fire ratings. Seal penetrations with the appropriate fire stopping.

Unrated walls are typically extended to the underside of structure as required to maintain acoustic performance. Seal penetrations with appropriate sealant or acoustic sealant.

Gypsum Board: Use a minimum 5/8" gypsum board on frame walls. In corridors and other high use areas, use vandal resistant gypsum board. In areas where moisture may be present, including near sinks; and adjacent to exterior walls, use moisture resistant gypsum board. Penetrations through drywall assemblies and items recessed into the assembly need to be detailed or specified to ensure that fire and acoustical performance of the assembly is not compromised. Do not locate electrical, data and other outlets back-to-back in the same framed space.

Show blocking required for wall mounted items on the drawings.

Provide corner guards in high abuse areas.

A level 5 Gypsum Board Finish is required for all walls used for the following:

1. Painted Writable Wall Surface
2. Down lit walls
3. Walls with graphics

Cement Board: Cement board or another non-porous substrate is required in areas with a high frequency of water contact, such as a shower.

Glass Walls: [Distraction Graphics](#) are required on glass walls.

Operable Walls: NU prefers not to use operable walls due to lack of acoustics, increased structure, maintenance, and unreliable operability.

Ceilings

Reflected ceiling plans are required to show all items mounted in the ceiling for proof of coordinated materials and assemblies. This includes, but is not limited to, lights, AV equipment (including LCD screens, video cameras, security cameras, projectors, screens, speakers, outlets and/or data jacks), light/occupancy sensors, smoke detectors, HVAC equipment (including supply, exhaust, return, chilled beams, radiant panels, etc.), emergency lights, WIFI, Fire Alarm AV devices, DAS antennae, exit signs, window shades, and access panels.

Provide a cut sheet of each ceiling mounted item to the NU Facilities PM for approval during the Design Development phase.

Concealed spline support systems are prohibited.

Verify and provide access to above ceiling equipment. Avoid gypsum board ceilings in areas that require access above the ceiling.

Interior Doors - General

Interior doors may be wood, hollow metal, aluminum, or all glass entrances.

For hardware, please see [Hardware](#).

Paired doors are discouraged. When paired doors are absolutely necessary provide removable mullions. Exception: No mullions are required at laboratory access and low use paired doors.

Floor mounted doorstops are preferred. However, there are instances where a floor mounted doorstop may cause a tripping hazard and a wall mounted doorstop may be necessary. Doorstops must be coordinated with the furniture to prevent conflicts with the floor stop location and the furniture item.

Provide a darker color on Door Frames to hide abuse.

Interior Doors - Wood

Design Considerations:

1. Natural finishes are preferred. Opaque finishes may be permitted under special conditions.
2. FSC Certified Wood - Review project specific requirements with NU Facilities Project Manager.

Wood Door Frames:

1. Steel frames are preferred. Wood frames are permitted only in special situations. Review requirements and options with NU Facilities Project Manager.
2. Fabricate frames in accordance with AWI Section 900 and casings in accordance with AWI Section 200. Same grade as door.

Hardware

For the Northwestern preferred door hardware sets, please see the two Hardware documents in the Appendix. One is for the Evanston Campus and one is for the Chicago Campus.

On the Chicago Campus, the only levers supported by the Lock Shop are the Corbin Russwin ML2000 series CSA or CSN lever or the Corbin Russwin ED500 series CSA or CSN lever. On the Evanston Campus, the only levers supported by the Lock Shop are the Sargent L, B, J and NU Lever. Evanston Fire Department prefers a lever with a return. Use of another lever design requires NU Facilities PM and Lock Shop approval. A 26D finish, Satin Chrome, is preferred because it maintains its finish better over time.

For security, the Northwestern Facility Lock Shop designs all keying systems. For openings with cores, the contractor provides and installs the cores.. The Lock Shop will provide, pin and install the permanent cylinders and cuts the keys.

For renovation projects, assess the existing hardware (hinges, locks, door closers, weather stripping, etc.) with the Lock Shop to determine if they are in good working order. Coordinate with the Facilities PM and replace items if needed.

NU has standardized on Millenium for Access Control. See [Access Control](#).

Millwork and Cabinets

Where the countertop may be subject to liquids, provide solid surface countertops. Provide all countertops with a backsplash at least 4" high. Lockable cabinets must conform to the NU lock specifications and guidelines.

Quality Assurance:

1. Single Source Manufacturing and Installation Responsibility: Require a qualified Manufacturer to assume sole responsibility for woodwork, including fabrication, finishing, and installation.
2. FSC Certified Wood: Review project specific requirements with the NU Facilities Project Manager.

Woodwork:

1. Woodwork: AWI "Custom" grade typical; "Premium" grade for door frames and sidelights and for laboratory casework.
2. Include the following for laboratory casework:
 - a. Five knuckle exposed hinges.
 - b. Solid wood drawer sides.
 - c. Plywood drawer bottoms with chemical/moisture resistant finish.
 - d. 150 lb. drawer glides with return.
 - e. Solid, epoxy resin tops.
 - f. Chemical resistant plastic laminate shelving.

- g. Under cabinet lighting.

Wood Materials:

1. General: Comply with applicable requirements of AWI Section 100.
2. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary AWI standard.

Schedule of Painting & Coatings

Schedule of Coatings for Interior Non-Traffic Surfaces:

1. Gypsum Wallboard & Plaster: Latex, eggshell on walls, flat on ceilings.
2. Concrete Masonry Units - Filled Finish: As scheduled, Latex, satin or Tile-like epoxy, low gloss.
3. Concrete and Masonry: As scheduled, Latex, satin or Tile-like epoxy, low gloss.
4. Wood: As scheduled, Latex, satin. Varnish, satin (stained wood).
5. Ferrous Metal: Latex, satin, low gloss.
6. Galvanized Metal: Latex, gloss.
7. In extraordinary cases, such as very high use doors or windows, or in laboratories, oil base or epoxy may be necessary. Request University approval prior to specifying.

Schedule of Coatings for Interior Traffic Surfaces:

1. Concrete: Epoxy floor enamel.
2. Wood: As scheduled, Alkyd/urethane floor enamel, gloss. Varnish, gloss (stained wood).

Access Doors and Frames

Design Considerations:

1. Architect to review locations for access doors and access panels with NU Facilities Project Manager during the design phase.
2. Show Access door locations on the drawings. This is required for coordination with other ceiling and/or wall mounted objects.
3. Size and locate access panels to provide easy access to and/or removal of valves, filters, dampers, ballasts, motors, etc. Consider not only the size of the item being serviced, but also the number of items served by one access panel, the obstacles between the access panel and the item being serviced and the size of the person providing the service.
4. Provide all access doors in a building, regardless of the equipment being served or the (sub) contractor providing them, from the same manufacturer.

Waste Handling

Review project requirements for trash and litter receptors with the NU Facilities Project Manager during the design phases. Accommodate both a waste and recycling receptacle of the appropriate size for the room function in the room plans.

Typically, the standard trash and litter receptors are provided and installed by Northwestern. These include, but may not be limited to:

Offices and Workstations:

1. RubberMaid, 2955 Wastebasket, Small, black
2. RubberMaid, 2956-73 Deskside Recycling Container, Medium with Universal Recycle Symbol, blue

Other locations:

1. RubberMaid, 3540 Slim Jim Waste Container, Grey, lid optional
2. RubberMaid, 3540-75 Slim Jim Recycling Container, Blue, lid optional

Multi-stall Toilet Rooms:

1. Bobrick Freestanding B-2280 21-gallon or 12.8-gallon square Stainless steel

With approval from the NU Facilities Project Manager, the following trash receptor may be used in select very public locations:

1. Forms + Surfaces, SLTRA-180 Transit Litter and Recycling Receptacle, tri-stream, Stainless Steel without Rain Cover. Provide Tri-stream graphics that are white lettering on a black background with the words:
 - a. Mixed Recycling (spanning the front of two recycling openings)
 - b. Landfill

Consumable Product Dispensers

NU purchases paper and soap products from our Janitorial Vendor. The dispensers for these products are owner provided for installation by the contractor.

For consumable product dispensers, whenever possible, provide surface mounted installations. This provides more flexibility for changing products or vendors in the future. Coordinate the location of the surface mounted products with ADA requirements. Typically, the grab bars, mirrors, and other accessories are to be furnished and installed by the Contractor.

For coordination with our Janitorial Vendor who supplies the products used in the Toilet Rooms, integrate owner provided Trash Cans, Soap Dispensers, Toilet Paper, Paper Towel Dispensers, and Sanitary Disposal into the Toilet Room Design.

Owner provided Consumable Product Dispensers may be required in additional spaces, such as Vending areas or Pantries.

Plans and elevations should show all dispensers/accessories in their mounting location and with the correct dimensions. Toilet Room plans and elevations are required to show all dispensers and accessories. This is to ensure compliance with ADA, that they fit, and that they are serviceable.

Sound Transmission

Room Acoustics

The minimum STC rating for a room is provided in the NU Design Guidelines for Interior Finishes chart in the Appendix.

With the introduction of energy efficient low velocity air distribution HVAC systems, such as chilled beams, the white noise background of a forced air system no longer exists. This allows more sound to be heard between rooms and thru closed doors. The design team must address these concerns thru construction assembly details, such as partition design, and coordination with the HVAC system selected.

When operable partitions are required, provide STC 52 or higher.

Chapter 6: Signage

The signage system is intended to guide the general public, students, faculty, staff, and emergency first responders.

Signage is typically provided by NU. But may be part of a design team's scope and/or provided and installed by the Contractor. Consult with the NU Facilities PM for the procurement strategy on a specific project.

Designs must accommodate code-required Signage, Room Signage, Wayfinding (on Campus and within a building), Safety (such as labs), Operations and Maintenance, Building and Floor Directories, and/or Donor Signage. Review specific requirements with the NU Facilities Project Manager prior to the start of the design phase of the project. All signage, regardless of the reason/source, must communicate effectively and have one aesthetic vocabulary, which is appropriate for the building or site in which it is located.

The location of ALL signage is to be shown in the Site and/or Architectural plans, reflected ceiling plans and elevations. Coordination with other disciplines, including but not limited to, Landscape, Civil, Structural (support), and Electric (power, lighting, and data) is required of the design team.

When considering signage, the goals must be met, but avoid unnecessary and redundant signage that clutters the visual landscape.

Additional concepts regarding interior signage and branding can be found in the Common Spaces document in the Appendix.

Laws, Codes, Regulations, Ordinances and Standards

Building signage, whether inside or outside of a building must comply with all [Laws, Codes, Regulations, Ordinances and Standards](#). These signs are not specifically addressed in this guideline.

The City of Evanston Fire Prevention Bureau has required signage which is described here: <https://www.cityofevanston.org/home/showdocument?id=522>. It impacts both the interior and exterior of a building. Plan surfaces and space to accommodate these requirements.

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specific spaces.

Donor Recognition

Donor recognition signage could be inside and/or outside the building. Interior spaces and exterior spaces must be designed to accommodate donor recognition signage.

For process and the impact of the donor gift on the size of sign that would be required, please see the Donor Recognition Guidelines in the Appendix.

Branding

Branding can be an easy way to stamp “Northwestern” or the occupant’s group on a space. This creates a sense of pride, belonging, and collegiality for the group. For detailed branding, content, and technical information, refer to [Northwestern Global Marketing Branding Guidelines](#).

Exterior Signage

Site / Campus Signage

Site / Campus Wayfinding Signage prototypes are in development. Please consult the NU Facilities PM for direction.

Traffic control and parking signage should comply with applicable standards and provide a safe environment for pedestrians, bicyclists, and motorists.

All exterior circulation paths should be evaluated for the need for exterior signage. This signage could be directed at cars, bicyclists, or pedestrians.

Exterior Door Signage

For compliance with Illinois State Law and Northwestern Policies a single sign has been developed to address “no guns”, no trespassing, no smoking, and building videography. Please see the Appendix for a sample.

For easy identification in an emergency, all doors that lead to grade must have a door location sign mounted on the strike side of the door on the exterior of the building. Review the door labeling / numbering scheme with the NU Facilities PM during the design phase. Show this location on all Architectural exterior elevations.

Interior Signage

Northwestern’s Preferred Signage Vendor is FastSigns. Our standard sign type is [Vista Curve Frame](#) or Scott Snap Plate System. Finishes and sizes are dependent upon the function of the sign. Signage designs are expected to complement the Architecture of the building in which they are located and communicate effectively.

Building Wayfinding

Interior spaces must be designed to accommodate building wayfinding.

Interior Wayfinding Signage may include the following:

1. Directories: located at the most prominent locations in the building, floor or section, and supply information about the entire building floor or section.
 - a. Main Floor Directory
 - b. Department Directory
2. Directional: visually directs to one destination when options for the path of travel exist
3. Room Signs: used at doorways to indicate a final destination.

Room Signage

Room numbers are used for Emergency Response Teams, Equipment Identification and Inventories, Maintenance Records, Fire Alarm Device locations and panel displays, etc. It is essential that the Bid Construction Documents (plans and schedules for all disciplines), match the final As-Built condition. Please also see [Building and Space Identification](#)

During the Construction Phase, a final coordination will be made between the room numbers on the plan, the text in the signage schedule, and the text on the Fire Alarm Panel display (which locates Fire Alarm Activation Devices), to ensure that they match.

Life Safety Evacuation Maps

As part of Northwestern's Life Safety Plan, Northwestern has standardized evacuation maps. These maps are required by OSHA and may be physically displayed in a building or distributed electronically. Therefore, provide Life Safety Evacuation Maps with each signage package. Please coordinate the form of communication that will be used to distribute them, and obtain the template from the Facility PM. If they are to be physically displayed coordinate locations and mounting with the building Architecture.

Distraction Graphics

Glass walls are popular at entries and conference rooms. They promote visually connectedness in public areas. The quality that makes the desirable, also makes them a hazard. Large expanses of glass or even unframed sidelights can be difficult to see. This is a safety concern. Therefore, any floor to ceiling installation of a glass wall is required to have distraction graphics. Distraction graphics may represent the aesthetic signature of the space or be an occupant branding opportunity. Standard patterns or custom designs are both options.

Operation and Maintenance Signs

Additional signs are required for ease of operating and maintaining a building. These signs include, but are not limited to:

1. Sprinkler Control Valves
2. Standpipe Control Valves
3. Elevator number on each floor
4. Fire Command Center: provide 1" high, bold red letters on the door to the Fire Command Center. If the FCC is not visible from the building entrance, provide additional ceiling or wall mounted signage to direct first responders to the Fire Command Center from the entrance.

Chapter 7: Equipment

General

Equipment may be provided from many sources: they may be part of the General Construction package or provided by an entity within NU. Equipment may be appliances, waste containers, lab equipment, sports equipment, AV equipment or many other things. When equipment is included in a project, regardless of whether or not the actual equipment is defined and procured thru the Design Team's scope, the Design Team is expected to obtain the necessary information to fully coordinate building systems and space allocations to ensure proper location and function of the equipment.

The design documents are expected to contain the area and infrastructure (water, waste, gas, electric, data, shut off valves, structural support, etc.) needed to support (for use and for maintenance of) this equipment. In some cases, this infrastructure is imbedded into the structure of the building, for example, floor mounted power, wall and/or ceiling blocking and data boxes in the middle of a conference room. Detailed coordination on the Contract Documents and during construction is expected of a design team to fully integrate these systems into a building.

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Appliances

Appliances may be provided through a Construction Contract or separately by NU. The NU preferred vendor is ABT. NU Facilities provides major appliances, such as refrigerators, and microwaves. Other major appliances may be included depending upon the Occupant needs. Small appliances, such as coffee makers and toaster ovens, are provided by the Occupant. These need to be identified by the design team early in the design process to ensure adequate infrastructure exists to support them.

Coordinate all locations where appliances are located so that the selected appliance fits, has proper structural support, and utilities (water, waste, power, data). Pay particular attention to the dimensions of refrigerator alcoves, and the structural support of microwave shelves.

Provide Energy Star Residential Appliances. Dishwashers and Refrigerator Ice Makers are discouraged because they are unreliable and require frequent maintenance.

Lab Equipment

See [Lab Design](#) in Chapter 5: Architecture and Interior Design

Audio Visual Equipment

The need for AV technology is exploding across the Northwestern campuses. AV equipment is in all sorts of rooms, including, but not limited to, classrooms, individual offices, conference rooms, lounges, workout rooms, and laboratories. The AV procurement package may be separate from or part of the General Construction package. Consult the NU PM for this procurement method. In either scenario, the

procurement needs to take advantage of the rapidly changing technology and newest AV equipment features.

Individual user groups will have input on the AV equipment in their areas. IT Services and Support will be consulted for spaces assigned to the Provost and for general feedback. See the [Function Specific Criteria](#) for additional information.

Projection Screens

Provide projection screens as part of the General Construction Contract.

Building Video Surveillance

Please see Northwestern's Video Recording and Surveillance Policy:
<https://www.northwestern.edu/up/docs/NorthwesternVideoPolicy.pdf>

See also [Emergency Communications](#)

Chapter 8: Furniture

Procurement

Furniture is procured thru our Preferred Vendors. For smaller projects, the furniture may be awarded to one of the vendors. For larger projects, the furniture should be bid.

Building Systems Coordination

Include furniture layouts in the design documents. Coordinate furniture utility needs across all disciplines. And coordinate furniture location and layout with the building to ensure that access to service and maintain equipment is provided. This includes, but is not limited to, power, data, perimeter heating equipment, etc. Wherever possible, feed the power and data to workstations from the wall via standard electrical devices, i.e., running wires thru the furniture system should be avoided. This will require that lower furniture panels be removed, removable furniture panels provided, and/or under desktop cable tray systems be installed.

Ergonomic Furniture

Provide chairs which are adjustable to support proper employees' posture, realign their spine, prevent arthritis, and reduce the number of work-related injuries overall.

Material & Finishes

The typical office furniture is metal with plastic laminate work surfaces.

Fabric selection should avoid light colors and pass a Wyzenbeek Test of 50,000 double rubs.

Coordinate the selected color palette with NU purple, even if NU purple is not in the initial palette.

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Chapter 9: Elevators

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. For new buildings, and for projects scoped to include new or replacement elevators, include an elevator consultant (licensed in Illinois as a Professional Engineer) on the design team. Include Construction Administration in the elevator consultant's scope to assure compliance with contract documents and national/state/local codes.

Elevator Service Modeling

Except in the smallest of buildings (as approved by Northwestern), provide each building with a minimum of two elevators. Model elevator service on industry standards (Average Service Response Time – Hall Call) to provide no less than FAIR service (24 second average system response time, with 70% of calls answered within 30 seconds, 90% within 60 seconds, and 98% within 90 seconds) when one elevator is inoperable.

Elevator Types/Classes

Recommend elevator types and classes based on building use. In most buildings (all research buildings), provide one car that is a class C1 (or heavier duty) service or freight elevator. Design sills of service and freight elevators for loading/unloading without the use of sill plates.

Subject to review by consultant the following are typical elevators used at Northwestern:

Passenger Elevators: Class A, 3000-pound, minimum door opening 3'6" x 7'0" center-opening.

Service Elevators: Class C1, 4000-pound, minimum door opening 4'0" x 8'0" side opening; OR Class C1, 5000-pound, minimum door opening 4'6" x 8'0" side-opening.

Freight Elevators: Class C1, 6000-pound, minimum door opening 8'0" x 8'0" automatic bi-parting.

Elevator Equipment: Non-proprietary Components: Accommodate non-proprietary components, including controllers, in the design.

Elevator Cabs

Specify cab finishes that will last 20 years for cab floors and walls. Provide LED lighting that provides a minimum 40 foot-candles level evenly in the elevator cab.

Elevator Signage

In addition to Code required signage, see [Signage/Interior Signage/Operation and Maintenance](#)

Elevator Equipment and Machine Rooms

Please see [Architecture/Space Specific Criteria/Elevator Machine Rooms](#)

Chapter 10: Fire Protection & Life Safety

See [Building Life Safety Program](#) for intent, and Room Specific criteria within the Architecture Chapter.

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Fire Protection and Life Safety - General

If not in conflict with the governing codes and regulations, incorporate the following modifications and clarifications into the design and specifications:

1. As a minimum, each floor of a building shall be a separate automatic sprinkler zone coordinated with the fire alarm system.
2. Coordinate automatic sprinkler zones with the smoke control systems. Do not include parts of one automatic sprinkler zone in more than one smoke control zone.
3. When sprinklers are specified, provide a combined automatic sprinkler and standpipe system.
 - a. On the Evanston campus pressure for hose stream requirements in "low rise" buildings is provided by the responding fire department. Fire pumps are to be provided where insufficient pressure is available for automatic sprinkler demands and "high rise" buildings. For buildings equipped with fire pumps, design the pump to provide both hose stream and automatic sprinkler demands.
4. The automatic sprinkler design criterion applies to wet pipe systems. Increase the area of application in accordance with NFPA Standard 13 for dry systems.
5. Follow NFPA Standard 13 for Occupancy classification definitions. Do not use the Room Design Method in NFPA Standard 13 to reduce the area of application for each classification below. However, the use of the Special Design Methods is permitted and should be used where applicable.
6. On the Chicago campus, consult the Chicago Building Code for deviations from NFPA standards.

Review the following occupancies with the NU Facilities Project Manager and the University's Office of Environmental Health and Safety to determine the sprinkler system design basis for the following areas and vaults:

1. Multiple purpose areas that may be used for exhibits.
2. Storage areas over 12 feet high.
3. Storage for tires, rolled paper, Group A plastics, or unusual materials of any height.
4. Vaults for liquids, gases, or wastes.

Automatic Fire Sprinkler Systems

Arrange Siamese connections in Chicago and 5" Stortz connections in Evanston to supply both the automatic sprinkler and standpipe systems.

Design Fire pumps to include a valved bypass city loop and a valved connection to an outside test header. Design valve arrangements so that the fire pumps can be isolated during testing with the water

supply loop remaining in service. On the fire pump and jockey pump, provide the Hands-Off Auto status to the fire alarm control panel.

Dry pipe systems are to be used in the following locations:

1. Areas exposed to outdoor temperatures, i.e., pedestrian bridges between buildings, loading docks, etc.
2. Areas sensitive to water, i.e., document storage, museums/art galleries, etc.

Dry pipe valves should be provided with a dedicated tank-type air compressor. Do not connect dry pipe valves to an HVAC control air compressor. Dedicated air compressors must be connected to the emergency power system.

Route drains from automatic sprinkler system equipment (dry pipe valves, flow test valves, RPZ backflow preventers) to a floor drain capable of handling the expected maximum discharge for at least two minutes. Provide the ability to drain each floor independently of another floor.

Quick response automatic sprinklers are required in offices, classrooms, hallways, assembly areas, atriums, sleeping rooms, dining rooms, and most laboratory areas. Use ordinary response heads in storage areas, mechanical rooms, janitor closets, and areas where special coated sprinkler heads are required. Provide Temperature ratings that are the maximum expected ceiling temperature.

Install a water flow alarm in each automatic sprinkler zone at the main water supply entrance, and at the supply connection to each vertical combined automatic sprinkler and standpipe riser.

Provide valve supervisory switches for each point where the water supply to the system or parts of the system can be shutoff. Valves grouped at a common location can be combined into the same zone to a maximum of five. Do not conceal control valves. External tamper switches or external wired tamper switches are required. Butterfly sectional and floor control valves are preferred.

Architect/Engineer of record will be required to meet with the Authority Having Jurisdiction (AHJ) for either Chicago or Evanston Campus.

Provide Siamese connections in Chicago and 5" Stortz connections in Evanston that are of the flush type with a polished chrome plated finish. Indicate dual service with lettering.

1. On the Evanston campus, provide a weatherproof visual fire alarm signal device above the Siamese connection along with a weatherproof box for a future audible device.

Show all sprinkler heads on the Reflected Ceiling Plan(s) if ceiling mounted or on room elevations if wall mounted. Designs should not assume "minimum coverage" to allow for sprinkler heads in an aesthetically pleasing pattern. Sprinkler heads located in ceiling tiles should be centered in the tile unless the head can otherwise be aesthetically located.

Smoke Control Systems

System Descriptions:

1. General: Hardwire all smoke control safety devices into the fan safety circuit, with auxiliary relay contacts used for notification to BAS platform. Do not use Building Automation System (BAS) software control logic for fire alarm shutdown.
2. Static Systems (Fans OFF). In the design, locate the fire alarm relay panel within 10 ft. of each Building Automation System (BAS) panel.
 - a. Typically, the Fire Alarm Contractor is expected to provide wiring from the smoke detectors to the Fire Alarm Control Panel (FACP) and from the FACP to the fire alarm relay panels. Wiring in the BAS panels and the designated fire alarm relay for BAS is typically done by the BAS Contractor. Confirm who is responsible for terminations in each panel and verify project specific requirements with NU Facilities Project Manager and indicate requirements in Construction Documents.
3. Dynamic Systems (Fans ON). In the design, locate the Fire Alarm Relay Panels within 10 feet of the BAS panels and provide FARP one for each smoke zone. In the installation, the location of the smoke zone FARPs is expected to be coordinated by the BAS and Fire Alarm Contractors. The wiring from the smoke detectors to the FACP (Fire Alarm Control Panel) and from the FACP to the fire alarm relay panels is expected to be by the Fire Alarm Contractor.
4. Provide 1) the power source and controls for the smoke dampers or the combination fire/smoke dampers, and 2) 1/2 in. EMT conduit between the BAS control panels and the nearby FARP. Confirm size of conduit with electrical requirements. The BAS Contractor is expected to provide the Wiring between the BAS panels and fire alarm relay panels.

Chapter 11: Plumbing

Clearly show all valves, clean outs, and access points on the drawings. Ensure that these service points are accessible for maintenance. Review all plumbing access points at the DD, and 50% CD owner reviews.

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Domestic Water Distribution System

Design Considerations:

1. For renovation projects, provide a shut-off valve immediately outside the project limits. If a valve already exists, the contractor and an NU operations team member are to confirm that the valve operates correctly. The valve whether new or existing should be LOTO with locks from both the Contractor and Northwestern.
2. Route potable water pipe so that the circuit terminates at high use areas, such as washrooms. The purpose is to avoid stagnation leading to a high bacteria count.
3. Low water consumption associated with programmatic and seasonal use of the building or space must be taken into consideration and accommodations for flushing provided.
4. Route piping orthogonally (no diagonal shortcuts).
5. Use copper lines in the following locations: Domestic cold water, domestic hot water supply and recirculation, laboratory cold water, laboratory hot water and recirculation, and fill/makeup water lines.
6. Provide local shutoff valves within five feet of a faucet/fixture, such as emergency showers, eye wash, dishwashers, and autoclaves. Valves must be accessible. Locate shut-off valves for Multi-person Toilet Rooms in an adjacent Janitor's Closet.
7. Do not route piping with a fluid over electrical busway housings. For electrical busway housings provide a minimum 24 inches on top, both sides and the bottom.
8. An excellent table giving the chemical resistance of four commonly used thermoplastic piping materials can be found in the Technical Manual published by the Charlotte Pipe and Foundry Company, Industrial Division (800-438-6091).
9. In lab buildings, consider a redundant distribution system such as a pair of risers cross connected at the floors.
10. Locate main piping runs above corridors when possible and provide isolation valves to shut down each floor or section of floor.

Plumbing Specialties

Gate Valves are not permitted.

Plumbing Fixtures

When possible sinks, urinals and closets should match existing fixtures for renovation projects. See the NU MasterSpec for acceptable new plumbing fixtures. See also Room Specific criteria within the Architecture Chapter.

Provide each Drinking Fountain location with one bottle filler.

Chapter 12: Mechanical Systems

General: The Heating, Ventilation, and Air Conditioning (HVAC) systems within Northwestern’s facilities need to be designed and maintained to provide occupant comfort and to meet the goals of safety, reliability, serviceability, and efficient operation as described below:

1. Safety for building occupants during equipment operation and for maintenance personnel equipment service.
2. Reliability of the systems regarding the quality of components and materials and in the required equipment redundancy.
3. Well-maintained HVAC systems result in lower operating costs and extended service life. Therefore, the serviceability of the systems should promote easy access to equipment and valves.
4. Systems efficiency should consider all operating costs, including energy and maintenance.

Redundancy: The design must identify and address points of failure for systems serving critical spaces, which are to be identified with the owner. Redundancy and/or back-up systems should be identified. (For example, for an area with critical temperature stability requirements, a secondary source of cooling may be required as back-up to the central plant systems). Review each project with the NU Project Manager and Operations to determine necessary system redundancy to support the programmatic Basis of Design requirements.

Sustainability: HVAC system design should employ sustainable design concepts to meet the goals of NU and the community it serves. Building wide systems should not be required to run just to satisfy one computer room or and other miscellaneous usage room.

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Performance

Design systems to function per the criteria in the [Basis of Design](#) document, and to be durable and low maintenance, with particular focus to be placed on the operability and maintainability of the installed systems.

A Life Cycle Cost Analysis is typically required for major mechanical systems. Review specific requirements with the NU Facilities Project Manager prior to the start of the design phase of the project. See also [Life Cycle Costing](#).

Size HVAC Systems with all window shades in a completely open position.

Temperature

Unless otherwise directed, design the room comfort for rooms which are occupied most of the time, to provide space temperature of 72 degrees F year-round, with seasonal set points of 68 degrees F and 74 degrees F. Common space setpoints may be 76/78 in the summer.

Humidity

Typically, spaces are not humidified. Humidification systems are only provided when a specific need requires it, such as labs, museums, and archives. Confirm the specific requirements with the NU Facilities PM.

Where operable windows exist or are provided, also provide a sensor for the window position: if the window is left open, the HVAC system should shut down to prevent mold.

Energy Performance

See [Sustainability](#)

Benchmark each building benchmarked via ENERGY STAR's Portfolio Manager

Test and Balance

The systems that are most likely to be tested, adjusted, and balanced to provide design conditions as indicated by the contract documents, include but are not limited to:

1. Balancing Air Systems - Constant air volume and variable-air-volume systems.
2. Balancing Hydronic Piping Systems - Constant and variable-flow hydronic systems, and primary-secondary systems.
3. Measuring the electrical performance of HVAC equipment.
4. Verification that automatic control devices are functioning properly.
5. Measurement of sound levels as related to rotating mechanical equipment.
6. Vibration testing and analysis of all rotating equipment greater than or equal to 10 hp.
7. Measurement of duct leakage.

Commissioning

See also [Commissioning](#)

The Commissioning Team will be made up of representatives from the Owner, Design Team, General Contractor (GC), manufacturers, and construction trades. The trades represented on the Commissioning Team will include, but not be limited to sheet metal, piping and fitting, controls, test and balance, and electrical. The lead person for each trade who will actually perform or supervise the work is to be designated as the representative to the Commissioning Team. Responsibility for various steps of the Commissioning Process will be divided among the members of the Commissioning Team.

For projects which impact an existing system, even in a small way, the entire existing system must be recommissioned.

HVAC Systems

Primary Heating Equipment

Fired boilers are used in the Central Utility Plant (CUP) on the Evanston campus. The primary heating equipment is for convertors from steam to heating hot water.

EV CUP

Process Cooling: Process chilled water (CHW) through plate and frame heat exchanger to CUP CHW. Do not use CUP CHW directly for process cooling. Design the heat exchanger for a maximum CUP CHW supply temperature of 52 degrees F. Process cooling loads are to be presented to the NU Facilities Project Manager and Operations for review during the design phases of the project. Where process cooling loads are identified in the design, provide hard pipe connections to the loop. Braided tubing, barbed fittings, etc. are not permitted.

Hydronic and Steam Distribution: All buildings east of Sheridan Road have access to the campus central hot water or steam distribution system. Buildings west of Sheridan Road may have access to this system or may have in-building systems. Utilize the campus central hydronic or steam system when available. If a central system steam is not nearby. A life cycle cost analysis will need to be completed comparing extending campus steam or hot water into the building versus other types of heating systems. Provide hot water heating systems with standby pumps and heat exchangers sized for 100% of the load.

Chicago

The Chicago campus does not have a central chilled water system: there are several Chilled Water plants. Coordinate services with the NU Facilities PM.

HVAC Components

Roof Top Equipment

Roof top equipment exposed to the elements is discouraged. If no other option is available, discuss the necessity to roof mount equipment with the NU Facilities PM and Operations.

Enclose Roof mounted AHU's so FMO personnel are not in the elements when repairing or maintaining the AHU. Provide 110v power and frost proof spigot nearby to maintain roof mounted AHU's.

See also [Roof - General](#)

Outdoor Air Intake Locations

On buildings more than 40 feet tall, intakes must be located a minimum of 40 feet above grade. On buildings less than 40 feet, the intakes must be located as high as practical on the roof or on a wall. Provide the following minimum separation distances between ventilation air intakes and other building features:

- | | |
|---|---------|
| 1. Garage entry, loading dock | 25 feet |
| 2. Driveway, street, or public way | 10 feet |
| 3. Cooling tower or evaporative condenser | 25 feet |
| 4. Exhaust fans and plumbing vents | 15 feet |
| 5. Kitchen exhaust air | 25 feet |

Outdoor air intakes must be ducted directly to the AHU cabinet; the equipment room must not be used as an outdoor air intake plenum.

Air Handling Units

See NU Master Specification.

Locate unit relative to other equipment and systems in the room for ease of maintenance. Allow sufficient clearance for filter and coil replacement, etc.

Hydronic Piping

See NU Master Specification.

Design Considerations:

1. Provide diaphragm type Expansion tanks; specify the pre-charge pressure to suit the system.
2. Install Air separators in each heating system distribution loop at the point of lowest air solubility and vented to atmosphere.
3. Hot and Chilled Water Piping:
 - a. Provide each new closed hydronic system with full bore strainers and a particulate side-stream filter rated at 100 microns, unless specified otherwise.
 - i. Griswald pot feeder with safety bar required on all closed loop systems.
 - b. Do not route piping with a fluid over electrical busway housings. For electrical busway housings provide a minimum 24 inches on both sides and the bottom.
4. Tracer Wire is required on all non-electric site utilities with above ground locating terminals clearly marked.

Incorporate the following items into the NU Master Specification as appropriate for the project.

Pipe Support Guides:

1. Space and support piping at a maximum of 10-foot intervals in conduit by insulating support-guides and to permit pipe to expand and contract freely without stress or wear on pipe or insulation as well as provide for drainage and free air circulation.

Expansion Loops, Moment Guided, Ells and Tees:

1. Prefabricated ells, loops, and tees to be provided where shown on drawings and to consist of pipe, insulation, and conduit conforming to the same pipe and welding specifications as specified for straight runs. Provide tees, anchors, elbows, and other fittings that are factory connected and prefabricated to straight sections whenever shipping requirements permit.
2. Expansion loops to be of proper design in accordance with stress limits indicated by ASME Code for pressure piping, District Heating Section. Install loop piping in conduit suitably oversized to handle the calculated pipe expansion without damaging the insulation.
3. The piping system is designed with both expansion loops and expansion joints. Design the piping system to accommodate this requirement by including moment guides as required for the piping system to function properly in conjunction with expansion joints.
4. Cold springing or pre-stressing piping as a means for control of expansion in any portion of the steam system is not allowed.

Anchors:

1. Prefabricated plate anchors to be provided where shown and to consist of a steel plate welded to pipe and conduit. Provide 1/2" thick steel plate for 1" to 22" conduit and 3/4" thick for conduit over 22" for anchors with expansion loops.

2. Concrete block to be cast over plate and conduit and to be large enough for firm anchorage into undisturbed trench sidewalls and/or bottom. Concrete block to be at least 36" in length and extend minimum of 12" beyond entire anchor plate. The piping vendor shall provide detailed instructions to Contractor for oversized anchors due to expansion joints. The Contractor shall provide oversized anchors as detailed by the piping vendor.

Field Joints:

1. Provide field joints that conform to the pipe manufacturer's specifications.
2. Provide field joints that consist of field installed mineral wool insulation banded with stainless steel bands on the carrier pipe, field applied 10-gauge connector sleeve on the inner conduit, field applied foam insulation, polyethylene heat shrink wrap and split HDPE jacket at a minimum. Provide field joint materials and methods provided by and approved by the piping manufacturer.

Filters

Design Considerations:

1. General:
 - a. It is preferred that air handling units have the following filter sections, where efficiency is the ASHRAE atmospheric dust-spot efficiency determined by ASHRAE Standard 52.2.
 - i. Prefilter: 25-30% efficiency minimum MERV 7
 - ii. Final: 80-90% efficiency minimum MERV 13
 - b. Heat recovery coils must have prefilters.
2. Prefilters: Provide prefilters that are extended surface pleated panel 4 inches in depth. Efficiency shall be 25-30% minimum, MERV 7 where efficiency is the atmospheric dust spot efficiency determined by ASHRAE Standard 52.2-2007.
3. Final Filters: Provide final filters that are extended surface, non-supportive pocket type. Efficiency shall be 80-90% minimum, MERV 13 where efficiency is the atmospheric dust spot efficiency determined by ASHRAE Standard 52.2-2007.
4. Provide filters with a UL Class I or Class II Listing
5. Filters on 100% OA units for before and after the preheat coil depending on winter and summer (Snow loading)
6. Use Slide out filter racks when total CFM is 5000 CFM or under. Use Lift out filter frames for units above 5000 CFM.
7. For slide out filter racks, provide each housing with a door on both sides to facilitate changing filters. Provide doors with perimeter gaskets to minimize air leakage, that are hinged, and have cam-lock or lever handle latches to secure the door.
8. For lift out filter frames, provide frames with a minimum 16-gauge galvanized construction and provisions for assembly in a bank. Provide frames that are suitable for the filters scheduled and incorporate gaskets and spring clips to prevent air bypass.
9. Provide three (3) sets of pre-filters: one (1) set for use during construction, one (1) set for building turnover to owner, and one (1) spare set. Provide two (2) sets of after and final filters: one (1) set for building turnover to owner and one (1) spare set.
10. Provide Bag-In / Bag-Out filter housings with isolation dampers/valves on each side.
11. Provide filter pressure drop gauges across each bank of filters.

Air Distribution

Ductwork and diffuser velocities must achieve the sound criteria developed for each project. Review project specific requirements with the NU Facilities Project Manager.

Return air is to be ducted. Ceiling plenum returns are not permitted.

Provide 316 stainless steel (not 304 stainless steel) laboratory fume hood exhaust ductwork between the fume hood and the main exhaust duct. Evaluation of other ductwork material options is expected based on use and dilution of system. Pitch the fume hood exhaust ductwork down toward the fume hood.

Duct systems must be designed, not just sized by use of the Trane Ductulator or the friction chart. Procedures to follow are the 2013 ASHRAE Handbook of Fundamentals, Chapter 21 (Duct Design), page 21.21 (HVAC Duct Design Procedures).

Fan powered terminals are not generally permitted. Fan powered terminal for final diffuser filtering applications may be considered with NU Facilities Project Manager and Operations approval.

Provide VAV terminals that have a reheat coil with access panels upstream and downstream.

Show all balancing dampers on the drawings.

Chapter 13: Electrical Systems

Space Specific Criteria

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Performance

General

The Electrical systems within Northwestern's facilities need to be designed and maintained to meet the goals of safe, reliable, and efficient operation. Electrical safety is paramount in any facility and that begins with a design that is safe to operate and maintain. Electrical equipment should be specified and located with emphasis placed on reduced maintenance exposure, manageable short circuit, and ground fault current, and arc-flash safety. Reliability in the electrical system is also critical to meeting the goals of the University to provide world class technical and health research capabilities. Electrical systems that are reliable also require less maintenance, have lower operating costs, and produce less waste. The design must identify and address points of failure for systems serving critical spaces, which are to be identified with the owner. Redundancy and/or back-up systems should be identified. Electrical system design should address sustainable design concepts, energy use reduction, and occupant comfort to meet the goals of NU and the community it serves.

Refer to the NU Master Specification for content that will affect information shown on the drawings. Spare capacity requirements are listed in the NU Master Specification. See also Room Specific criteria within the Architecture Chapter.

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

Review the following basic information with the NU Facilities Project Manager in the Schematic Design Phase of the project:

1. General Requirements:
 - a. Standards Applied: NEC, NESC, ANSI C2, NFPA 70E, and NETA.
 - b. System Voltages.
 - c. Variations in Supply Voltage.
 - d. System Power Factors.
 - e. Supply Capacity.
 - f. Short Circuit Ratings.
 - g. Electrical Protection and Control.
 - h. System Grounding.
 - i. Electrical Supply Facility for Safeguards.
2. Normal Equipment Requirements:
 - a. Switchgear/Switchboards/Panelboards.
 - b. Transformers.
 - c. Motor Control Center (MCC).

- d. Electrical Motors.
- 3. Cables and Wire Requirements:
 - a. Ampacity will be in accordance with NEC.
 - b. Consider special requirements such as voltage drop, fault current, and environment.
 - c. Flame retardant cables.
 - d. MV cables.
 - e. Grounding.
 - f. Raceways and Equipment.
 - g. Duct Banks, Manholes, and Hand Holes.
- 4. Lighting Requirements:
 - a. Classroom and Laboratory Lighting.
 - b. Office and Meeting Room Lighting.
 - c. Common Space / Corridor / Toilet Room Lighting.
 - d. Parking Lot Lighting.
 - e. Street Lighting.
 - f. Sidewalk Lighting.
 - g. Exterior Lighting at entrances, stairs, ramps, signage, and landscaping areas.
 - h. Bicycle Rack Lighting.
 - i. Emergency Lighting.
 - 1) Provide emergency lighting as required by the applicable codes. In addition, provide a minimum of one emergency light fixture in each public restroom, including single occupant rooms.
 - j. Lighting Controls.
- 5. Power Requirements:
 - a. Convenience Outlets.
 - b. Metering Equipment.
 - c. Grounding.
 - d. Substations.
- 6. Motor Requirements:
 - a. Review the following recommendations:
 - 2) 1/3 HP to less than 1/2 HP = 120v
 - 3) 1/2 HP to 249 HP = 480v if available, otherwise 120v
 - 4) 250 HP and larger = 4160v
- 7. Emergency Requirements:
 - a. Generators.
 - b. Battery Systems (invertors) / Self-diagnostic Battery Lighting.
 - c. Life Safety Emergency Systems.
 - d. Essential Systems.
 - e. Critical Operations Power (COP) Systems.
 - f. Uninterruptable Power Supplies (UPS) (Flywheel).
 - g. Fire Pumps.
 - h. Fire Alarms.
- 8. Grounding and Lightning Protection System Requirements:
 - a. Testing Requirements.

Commissioning

See [Commissioning](#)

Electrical System

Power Calculations

Engineering calculations are required for each project during both the design and construction phases. Their goal is to provide a safe, reliable design that can be easily revised or added to in the future with complete knowledge of the existing system's capacities and limitations. Engineering calculations and studies that are required for every system design for both new facilities and renovations/additions include the following:

1. Short Circuit
2. Protective Device Coordination Study / Time-Current Coordination
3. Arc-Flash
4. Voltage Drop
5. Kilo Ampere Interrupting Capacity
6. Load Studies

General: Power calculations are to be performed using SKM Power Tools software.

There are numerous Northwestern buildings with electrical feeders and risers exceeding 80% capacity. Existing loads must be confirmed prior to adding any additional load. New lighting or power panels installed on existing risers must be approved by Northwestern Supervising Electrician.

Design Phase: For renovation projects, the design team is required to visually investigate the existing conditions to gather the necessary information for power calculations. When required, power studies will be provided by NU. The design team needs to identify this need and request the power studies. For new and renovation projects, the design team is required to provide calculations based upon the design. For renovation projects, the study is to include coordination with all existing equipment and devices.

Preliminary short circuit calculations are to be provided for review during the design phase.

Include a preliminary over-current protection device coordination study using SKM Power Tools and following ANSI standards for over-current device settings, transformer, and cable damage curves in the engineering documents for all new electrical power systems.

A preliminary arc-flash study of all new electrical power systems will be conducted by the Electrical Engineer of Record in accordance with NFPA 70E requirements. For renovation projects, the study is to include the source equipment where the new work is added.

The Electrical Engineer of Record provides a preliminary study to confirm KAIC sizes.

The results of the preliminary studies will be provided to the installing electrician.

Construction Phase: The Electrical Contractor is required to provide power studies at the end of construction utilizing the "as-installed" equipment and system components. The Electrical Contractor is responsible for coordinating the final equipment selections to provide a complete system. The Electrical Contractor is responsible for utilizing the installed feeder length and routing in the final calculations.

The Electrical Contractor is required to provide a finalized Short Circuit Study and Protective Device Coordination Study for all new overcurrent protective devices and existing devices where connections are made as part of the project. Device trip settings will be adjusted by the installing electrician and verified before the system is energized. A "For Record" submittal is required which shows all scales, includes the one-line diagrams, and copies of all labels.

An arc-flash study is a required "For Record" submittal to NU and the Electric Engineer before the completion of the project. The Electrical Contractor is required to perform the study under all possible operating conditions (normal power, emergency power, tie breaker open and closed, etc.). The study must indicate the worst-case incident energy levels at each component.

The Electrical Contractor is responsible for producing and applying NFPA 70E and OSHA compliant labels that contain the appropriate information obtained from the final studies. All new switchgear, switchboards, panel boards, motor control centers, starters, VFDs and disconnect switches for each project are to be included in the study and properly labeled. Existing equipment where connections are made as part of the project will also be included in the study and properly labeled.

Electrical Spaces, Vaults, Rooms and Closets

Design Rooms to allow growth within the electrical system and safe maintenance of components within the room. Space allowed for growth will depend on the facility type and type of equipment in the room. Discuss space for future panels and transformers with NU during the design. At a minimum, provide 30% of clear wall space in all electrical rooms for future panels and equipment. Provide separate rooms for separate electrical systems served by different trades. These may include, but not be limited to: Electric, Data, Security (video and key systems), and Fire Alarm.

Additional Considerations are:

1. Electrical rooms should be stacked from floor to floor and located with attention given to the noise, heat, and magnetic interference caused by the room.
2. Review minimum size requirements for electrical and telecommunication rooms and closets prior to starting design of the project.
3. The room air is to be exhausted to keep the space below 104F in conditioned buildings.
4. Electrical rooms are to be free of foreign systems such as ductwork, piping and other equipment that do not serve the room.
5. Components are to be clearly labeled to allow identification from the room entrance.
6. Electrical spaces are painted. See NU Design Guidelines for Interior Finishes in the Appendix.
7. Switchgear and Switch board location considerations are:
 - a. Do not locate in areas of elevated temperatures or high humidity.
 - b. A separate room near the transformer vault is recommended.
 - c. Mechanical ducts, water pipes, drainpipes, etc. will not be permitted in electrical room.
 - d. Switchgear is to be self-supporting and placed on a housekeeping pad.
8. Maintain rooms which contain Uninterruptable Power Supplies between 68°F and 77°F. Provide room temperature and hydrogen gas alarms tied to building management system.
9. When emergency power is available, provide at least 25% of the lighting from emergency power and one labeled emergency power receptacle.
10. In rooms with electrical distribution equipment, a battery light is required, in addition to other lighting.

Utility Service Entrance

Service entrance types vary depending on campus location, building size and type of use.

1. Transformer Vaults:
 - a. Underground or indoor transformer vaults are preferred over above ground, outdoor vaults or pad-mounted transformers for aesthetics, reliability, and maintenance. Underground vaults are to be adjacent to the building they serve.
 - b. Utility (ComEd)-owned transformer vaults are to be built to ComEd standards for size and construction. Transformer vaults are required to be ventilated to ComEd standards based on the transformer and equipment ratings within the vault.
 - c. University-owned transformer vaults are to be located to allow maintenance and removal of failed transformers or other vault equipment. Indoor vaults are to be constructed with a three-hour fire rating.
 - d. Natural ventilation of the vault is preferred over forced ventilation. A minimum of two square inches of open space per transformer rated kVA is required for natural ventilation. Two CFM of forced ventilation per transformer rated kVA is required for forced ventilation. Forced ventilated vaults require high temperature and fan failure alarms connected to the Building Automation System (BAS).
 - e. Vault equipment must be clearly marked, so that each component and raceway can be identified from the entrance to the vault.
 - f. Vaults are to be lighted with low maintenance, all-weather lighting fixtures connected to the building essential power system and switched at the entrance. Adequate lighting is to be provided to allow identification of all component and raceway markings from the entrance to the vault.
 - g. Vault man doors are to open in the direction of egress with panic hardware.
 - h. Vault equipment doors are to be sized to allow the largest single piece of equipment to be removed for replacement.
 - i. A 6-inch concrete dike is to be cast onto the floor to prevent leaking transformer oil from escaping vault. An integral transformer leak basin can be used in lieu of a dike. The basin is to be sized large enough to contain the liquid contents of the transformer.
 - j. A sump pit with cover is to be placed in one corner of vaults located below or at grade.
 - k. Where allowed by the AHJ, water fire suppression is not to be used in transformer vaults.
 - l. For transformer vaults and/or main distribution rooms located below grade, provide high water alarms connected to the Building Automation System (BAS).
2. Transformers:
 - a. Oil-filled transformers are preferred to air-insulated type. Insulating oil is to be Factory Mutual listed as "less flammable" or "non-flammable."
 - b. If air-insulated transformers are used for service entrance applications, only VPE silicone encapsulated or cast-coil type units are to be specified. VPI polyester resin impregnated type units are not allowed.
 - c. Air-insulated transformers are to have forced air cooling with a core temperature indicating display.
 - d. Transformer MV terminations are to be loop-feed type.
3. Duct Banks:
 - a. Service Entrance (MV and LV) duct banks are to be concrete encased. Duct banks are to terminate in a service entrance switchboard or switchgear within 5' of entering the building

or are to remain in concrete and painted red until terminated in a service entrance rated disconnect.

- b. Install trace wire with acceptable connection points on top of all underground outdoor duct banks and raceways.
4. Service Disconnect:
- a. MV service disconnecting means will be in metal enclosed, fused switchgear.
 - b. LV service disconnecting means rated over 1200 amperes will be in either a service entrance rated switchboard or switchgear. Laboratory and research facility services will utilize switchgear equipment with power style circuit breakers.
 - c. Service disconnects will be in dedicated service rooms. No foreign systems are allowed in service rooms. Service rooms are to be constructed with a three-hour fire-rated enclosure with doors that open in the direction of egress with panic hardware.
 - d. All components in a service room are to be clearly labeled to allow identification from the entrance to the room.

Distribution Equipment

Electrical distribution equipment is to be designed and specified for a minimum life span of 25 years. Equipment is to be selected to allow for growth of the facility within reason and meeting the goals of the University. See specific equipment sections for space requirements. The distribution system design should allow for safe maintenance of components. Short circuit and ground fault levels are to be minimized to allow safe maintenance and operation of systems. Special attention is to be given to allow for inspection of equipment bus and junction points without the use of arc-flash PPE wherever possible. This can include IR viewing windows, remote IR inspection and detection equipment, and maintenance settings on circuit breakers. Utilize equipment that has a lower maintenance alternative. Maintenance of intensive components such as bus duct, battery systems, fan-cooled equipment, etc. are to be avoided. Energy conserving and Energy Star listed equipment should be used as the design basis for all facilities. Material manufacturer's and types are to match current Northwestern warehouse stock where applicable. Provide all equipment with a Positive Lock Out attachment point (PLO).

Circuit separation

The following items are to be isolated to circuits that include only like items, i.e., outlets only on a circuit with other outlets, lighting only on a circuit with other lighting, etc.:

1. Outlets
2. Lighting
3. Mechanical equipment
4. Laboratory equipment
5. AV equipment

Check with the NU Facilities PM to identify other items.

Medium and Low Voltage Conductors

Base Conductor ampacities on 90 degree C ratings in all cases and adhere to the following:

1. Cable more than 2400 volts must be shielded and copper.
2. Cable for primary and/or secondary distribution for voltage applications more than 2400 volts shall adhere to the following criteria.

- a. Provide Cable that is suitable for use in wet and dry locations in underground encased duct systems.
 - b. Provide Cable that is rated for 105 degree centigrade for normal operation, 130 degree centigrade for emergency overload and 250 degree centigrade for short circuit conditions. Use of 90-degree centigrade rated cable is to be approved by the Supervising Electrician.
 - c. Provide Cable with 133% insulation.
 - d. Provide Power cable that has a performance record of 15 years minimum of operating experience in utility and industrial cable application. This includes shielded cable.
3. Wire and cable for secondary power and light distribution shall be new 600 volt insulated copper conductor.
 4. Aluminum conductors are not acceptable.
 5. Provide wire and cable in dry locations that is THHN (copper) or THWN (in areas of high moisture); in damp locations, such as crawl spaces or below grade, shall be XHHW, THWN or XLP-USE type (copper).
 6. Voltage drop calculations shall assume nominal system voltage at building service entrance. Minimum voltage with full connected load energized shall be as follows:
 - a. 98% of voltage at panel boards.
 - b. 95% at equipment connections.
 7. Branch circuits supplying receptacles and other equipment generating harmonics shall each be run with individual neutral (minimum #10 AWG). Where the load on a specific feeder is at least 25% of such equipment the neutral on that feeder will be sized at 173% of the over-current protective device.
 8. Provide a minimum #12 AWG conductor for power and lighting loads. Minimum size for control wiring is #14 AWG. All power and control conductors are to be stranded copper.
 9. Install wiring in conduit with no exceptions.
 10. Signal and communication wiring can be installed in a cable tray system for non-plenum areas, when allowed by code.
 11. Twist-on connectors are allowed for #10 AWG and smaller conductors. Only mechanical compression type connectors shall be used on conductors larger than #10 AWG.
 12. Conductor splices are not allowed unless the circuit run exceeds 500 feet. Splices are to be made with mechanical compression connectors only. Insulation of the splice is to be the same as the conductor being spliced. Splices are to be in dry locations only and inside pull or junction boxes with "SPLICE" identified on the cover.
 13. Bus duct is not permitted.

Raceways and Boxes

Provide dedicated raceway systems for the following:

1. Essential circuits.
2. Stand-by feeders and circuits.
3. Fire alarm systems.
4. Security and Intrusion detection systems.
5. Access control systems.
6. Telecommunication wiring.
7. Public address system.
8. Audio/visual systems.
9. Environmental control systems.

10. Spare conduit in underground trenches.
11. Class I circuits; remote control and signaling circuits, less than 600V.
12. Class II circuits; remote control and signaling circuits fed from a Class II limited power supply, 150V and less.
13. Where legally required.

Transformers

1. Install appropriate K factor transformers in laboratories and area of multiple computer use to offset effects of harmonics.
2. Mount transformers on housekeeping pads with vibration isolation. Ceiling mounted transformers should be an exception and require NU approval.

Switchgear & Switchboards

1. Bussing of switchgear and switchboards should be of sufficient capacity to accommodate the next size larger transformer bank. Main breaker should be similarly sized. Buss bracing shall be for the expected fault current for the next size transformer, a minimum of 65,000 amperes for 30 cycles on any switchgear/switchboard. Overcurrent devices are to have an interrupt rating the same as the switchgear fault current rating. Provide blank spaces equal to not less than 25% of the switchgear/switchboard spaces in each frame size at completion of the project.
2. Provide housings with full welded construction, including welded frames and IR windows.

Panel Boards

1. Surface mount panel boards in electric closets. Floor mount panel boards with a bus rating of 1200A or above. See NU Master Specification for mounting criteria.
2. Provide housings with full welded construction, including welded frames and IR windows.
3. For panel boards recessed in walls provide a minimum of four 3/4-inch spare conduits stubbed into a junction box in the ceiling space for future load requirements.
4. Provide 100 ampere panel boards with space for a maximum of 30 circuits; 125 ampere panel boards with space for a maximum of 36 circuits; 225 ampere panel boards with space for a maximum of 42 circuits.
5. Include in each panel one spare 20 ampere, 1 pole circuit breaker a minimum of 25% of the total number of circuit breakers in panel.
6. Review the appropriateness of matching the Panel boards in existing facilities to equipment already being used with NU.

Motor Control Centers

Motor Control Centers are generally undesirable. When project requirements suggest their use, review this with NU.

Provide Motor starters and overload protective devices for all motors ½ HP or larger. Receptacles may be used for disconnects only on motors less than 1/2 HP and only as allowed by the Chicago Electrical Code and the N.E.C. and is recommended for all hot water circulating pumps.

Except for motors less than 1/2 HP, provide 480V, 3 phase motors.

Group Starters into motor control centers. Individual starters except in isolated cases are to be avoided. Provide each starter with a hand/off/automatic selector switch pilot light (run), two normally open and two normally closed auxiliary contacts.

Control power for starter must originate from MCC cubicle to maintain voltage continuity with disconnection of power to starter or MCC.

Size Heater overloads at no more than 130% of running load of motor.

Locate Lockable, heavy duty safety non-fused disconnect switches near motor and not within sight of MCC.

For each Motor Control Center provide:

1. A positive lockout in the "OFF" position for pushbuttons for starters.
2. A reduced voltage or solid-state starting and power factor correction for Motors over 30 HP.
3. A Minimum NEMA size for starters of number 1.
4. Copper bussing for Motor control centers.
5. Fuses for overcurrent protection.
6. A minimum 500va control power transformer in each starter cubicle. Size larger transformers as needed with 100% spare capacity.
7. "Open / Close" and "Run / Stop" light in MCC.
8. Fully welded construction, welded frames, and infrared windows
9. Arc-flash labels on all motor control devices including VFDs.

Motor starters are to have phase loss/under voltage detection relays and shall open contactor upon a loss of any one or two phases or voltage that is 30% below rated system voltage with a 5 second adjustable delay.

For renovation projects, new VFDs are to match existing VFDs. For all other equipment, verify the existing equipment and confirm whether to match it, or not, with the FM Electric Shop.

Wiring Devices

Receptacles: Use only standard NEMA "Specification Grade" for receptacles, except:

1. Where subject to physical abuse - use nylon type devices and metal plates. Use in all dorms and housing facilities. Use stainless steel cover plates in laboratory spaces.
2. Where subject to tampering, specify tamper-resistant devices.
3. Where subject to water spray, high humidity, acid fumes, etc., specify corrosion resistant devices with in-use weatherproof cover plates.
4. Use dual GFCI/AFCI breakers in R1 living areas. Use local dual GFCI/AFCI devices in R2 areas.

Provide cleaning outlets in corridors and stairs at least every 40'. Provide receptacles in corridors so that no point along the corridor is greater than 40 feet from a receptacle. Place corridor receptacles on an independent circuit from other rooms or equipment. Maximum of six receptacles per circuit. Provide light switches and convenience receptacles that are rated for 20 amperes.

See the NU Master Specification for the color coding of receptacles. When not dictated by code or the NU Master Specification, consult with the NU Facilities PM to match device color with facility finish requirements.

Switches and Disconnects

Provide Switches for disconnects and switching. Do not use Circuit breakers for switching.

Rate Switches at 20 amperes, minimum, at 120/277 volts.

Rate Disconnect switches as “heavy duty”.

Provide fuses where the available fault current is higher than 10kA and Switches and disconnects are used.

Use auxiliary contacts to open starter or e-stop VFD prior to the knife blades opening the circuit when the handle is placed into the off position on Motor disconnects located downstream from starters or VFDs.

Apply Arc-flash labels on each disconnect enclosure.

Emergency & Standby Power

The need for emergency power must be evaluated. Consult with the Facilities PM.

When an emergency generator is not provided, discuss the options with the NU Facilities PM and Operations, including potential tap box installation.

Conventional fixtures with battery backup drivers or ballasts are not allowed.

When provided, for new buildings, diesel fueled generators are preferred. On the Chicago Campus Natural gas emergency generators should be considered where diesel fueled emergency generators are less desirable.

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

1. Life safety;
2. Essential loads including pumps and exhaust fans; and
3. Research loads.

Stand-by (diesel or gas) generator power and automatic transfer switch interlocked with dual service systems are preferred to provide power for designated critical and emergency loads. Life safety, critical, and standby loads are to be fed from different transfer switches. Monitor automatic transfer switches with both a Fire Alarm and SCADA connection. Comply with codes and regulations and include the following Essential – ES and Emergency - EM loads: Review what is on each service with the NU Facilities PM and Electric Shop during the design phases.

1. Exit signs.
2. Selected corridor and stairwell lights.
3. Emergency lighting in mechanical, switchboard and electric room.
4. A 120-volt receptacle on essential power (red in color) in each mechanical and switchboard room
5. Lights in main electric room.
6. Selected sump and ejector pumps.
7. One passenger elevator per bank.

8. Critical laboratory experiments which cannot withstand a minimum 2-hour power loss.
9. Fire pumps.
10. Fire alarm and door security systems.
11. Critical HVAC controls.
12. Critical smoke control systems.
13. Telecom systems.

Generator requirements

1. Where generators are installed, locate them so that generator exhaust fumes are prevented from re-entering the building. Connect to carbon monoxide monitoring stations.
2. Set-mounted diesel fuel tanks are to be listed UL2085.
3. Diesel generator fuel supplies are to be designed to allow for 24 hours of operation at full load before refueling. All generators are to be designed to operate at their listed standby rating for a period of 168 continuous hours.
4. Enclosures and silencers for outdoor generators are to be critical grade, sound attenuating type.
5. Locate the Generator annunciator panel next to building fire alarm control panel. Integrate the annunciator communications into the University's SCADA system for campus monitoring.
6. Transfer switches are to be open transition or delayed transition type for EM only.
7. Transfer switches are to be closed transition for Essential – ESS.
8. Transfer switches are to be electrically operated and mechanically held.
9. Transfer switches are not to use circuit breakers as switching devices.
10. Transfer switches are to be connected to the SCADA system for monitoring.
11. Include an outdoor load bank test connection point.

Lab Power / Clean Power

See the Laboratory Design Guidelines in Appendix

Lighting

Lighting methods and requirements vary depending on the facility type. An emphasis on energy conservation and controllability are to be included in each design. The latest lighting methods and technologies are to be researched and their applications explained during the design review process.

Design with the following in consideration:

1. Efficiency based on ASHRAE 90.1 guidelines – strive to improve efficiency relative to the guidelines while maintaining lighting quality.
2. Illuminating Engineering Society of North America guidelines based on the latest IESNA Lighting Handbook
3. The goals of energy reduction, energy code compliance, and LEED certification are a priority to the University and efficient lighting designs and controls are a key part in meeting those goals.
4. The University maintains a stock of lamp types, and new lighting designs should utilize stocked lamps whenever possible. When designs include lamps that are not NU-stocked items, advise Facilities of this condition early in the process. Avoid specialty lamps.
5. Provide accurate color rendition where security cameras are focused.
6. Unless there are specific design criteria to do otherwise, provide CRI 90 minimum light sources.

Lighting Calculations

Lighting power density calculations for each area to show compliance with the energy code are to be shown on the lighting plan drawings.

Submit lighting photometric drawings for exterior paths and entrances, laboratories, office areas, classrooms, auditoriums, entrance lobbies and other high-profile spaces as required by the University during the design review process.

Site Lighting

See [Site Lighting](#) in Chapter 3: Civil.

Interior Lighting

Design Interior lighting systems with energy conservation in mind as well as color scheme of walls, ceilings, and floors to achieve the following light levels while complying with the energy code and LEED requirements. Levels are measured in foot-candles on a working service 30" above finished floor. The following are generally recommended light levels. Coordinate specific requirements with current energy codes, other applicable codes, the NU Facilities Project Manager, and the authority having jurisdiction.

SPACE TYPE	LEVEL (fc)
Auditoriums, lecture halls:	30
Bedrooms	15
Classrooms:	50
Corridors:	15
Dining Halls:	20
Laboratories (General and Task)	75
Libraries (Reading Areas):	50
Library (Stacks):	30
Locker rooms:	20
Lounges:	20
Mechanical rooms:	20
Music rooms:	50
Storage Areas:	15
Toilets:	15
Workshops:	75

Place corridor lights on circuits to allow a small number of lights to be left on for night service, with the remainder controlled by a central system with local override or occupancy/vacancy sensor.

Unfinished areas to have a minimum of 2-foot candles, and on a local switch or existing building control system with occupancy or vacancy sensor.

Panels and associated feeders for shell spaces will be sized to provide adequate power for maximum future lighting requirements.

Illumination of Means of Egress

Emergency lighting for means of egress must be provided in accordance with the requirements in NFPA 101. Emergency lighting outside the building must also provide illumination to a public way.

Emergency Lighting

Design Emergency Lighting systems with consideration of whether or not an Emergency Generator serves the building: not all campus buildings have Emergency Generators.

Install emergency lighting systems in generator rooms, electric rooms, mechanical rooms, over fire alarm panels and wherever required for reasons of personal safety and in compliance with the code. Unit battery fixtures are to be provided in these spaces in addition to emergency fixtures supported by a generator.

Locate Exit and directional lighting on the emergency system. See the NU Master Specification for Exit Sign requirements for both the Chicago and Evanston campuses.

If the Area of Rescue Assistance (ARA) sign is electrically illuminated, provide illuminated blue letters. Otherwise, emergency lighting can fulfill the need for sign illumination.

Locate emergency distribution panels in mechanical and switchboard rooms, accessible only to qualified personnel.

Minimum of 20 foot-candles of lighting is to be provided in mechanical and switchboard rooms. Provide override relay and switch if the mechanical room has more than 10 fixtures on the emergency circuit.

Emergency lights are not to be locally switched except in equipment rooms, tunnels, and vaults. Emergency lights controlled by the Quantum lighting control system can be switched by that system.

In buildings where generators and/or life safety equipment exists, connect the new design and construction to the existing systems.

Design emergency unit battery lights so that they can be tested as a system per floor.

Artwork

Occasionally, NU receives a gift of art from an alumni or donor. When these are displayed within a building project, provide accent lighting for it. Consider, the size, shape, texture, and location of the piece, as well as the reflection, glare, and UV impact of the light on it.

Light Fixtures and Ballasts

Fixtures should be easy to maintain, i.e., tool-less access, with replacement lenses available from open stock.

Where strip lighting is used, it is recommended that rows be arranged parallel with any exposed ceiling beams.

Provide flush and recessed fixtures installed in furred ceilings with junction boxes located at least 1 foot from fixture.

Small dimension “egg crate” lenses are not permitted.

Lighting Controls

Lighting controls are highly desired for energy savings and maintenance monitoring.

The size and the budget of a project will determine the extent to which lighting control systems are implemented. For projects in an existing building with a lighting control system, the existing lighting control platform should be continued. Where financially feasible, Lutron Quantum Lighting controls are desired. References herein will be to Lutron Quantum, but other lighting control systems may be specified.

The extent of the lighting control system will be determined by the NU Facilities PM as informed by the code minimum requirements, scope, and budget of the project. Four levels of the lighting control system have been identified:

1. Level 0: Code minimum. No Lutron Quantum preparation. Example: Residential Properties
2. Level 1: Code minimum. Switches and Occupancy/Vacancy Sensors
3. Level 2: Level 1, plus control ready light fixtures and conduit. Control wiring is not required but preferred for future projects.
4. Level 3: Lighting Control system with local control and the capacity to be expanded to include network capability.
5. Level 4: Full Lighting Control system, including local control and network capability. Example: Major Renovation and New Construction

In addition, the following items need to be considered. For smaller projects room lighting control sensors are acceptable. Time clocks or Lutron Quantum lighting control panels are to be used in open areas or classrooms where after-hours sweep is required by the energy conservation code or LEED. Depending upon the level of lighting controls installed, local area override is to be provided for after-hours operation.

Occupancy/Vacancy sensors are to be used in areas required by codes and ordinances, including but not limited to the Illinois Energy Conservation Code or the Chicago Energy Conservation Code for facilities located in Chicago. Unless required by code or ordinance, areas exempt from occupancy sensor use are:

1. Electrical Rooms.
2. Mechanical Rooms.
3. Elevator Equipment Rooms.
4. Areas where moving or electrified equipment would make a lighting disruption hazardous.
5. Areas where open pits or fall hazards exist.
6. Identified research labs with chemicals.
7. Other areas identified by the owner as being hazardous when dark.

In addition to occupied rooms, include lighting controls for spaces frequently used by students, staff, faculty, and the public. These spaces include, but may not be limited to corridors, and toilet rooms.

Ideally, the lighting control system is integrated with the Fire Alarm, so that Emergency Lights could be turned off when not needed. Emergency lights would be turned on upon Fire Alarm activation or when an occupancy/vacancy sensor was triggered.

Lighting controls may be integrated with motorized window shades, projection screens, etc. Control systems must be by the same manufacturer for integrated control.

Ceiling mount occupancy/vacancy sensors. Wall mounted sensors are not allowed. Show occupancy/vacancy sensors on the Architectural Reflected Ceiling Plans and Electrical Lighting Plans.

Control standalone exterior light poles through the GE light grid. Control Building mounted exterior lighting through the building lighting system or the GE light grid as determined by the team.

Fire Alarm

General

Fire alarm systems shall comply with all applicable codes and standards and local amendments as a minimum. The design guideline requirements are in addition to those noted in the applicable codes and standards. Where a conflict arises between the design guidelines, specifications, appendices and applicable codes and standards, the most stringent requirement shall take precedence.

Existing Fire Alarm System Classification and Building Designations

A spreadsheet is maintained by NU which contains information about existing fire alarm systems in NU buildings located in Evanston. This document is located in Appendix 28 3113 *Existing Fire Alarm System Classification and Building Designations*. The information in the spreadsheet is intended to be used as a starting point for the designer to understand the existing system and any upgrades desired by NU.

NU has established the desired type of fire alarm system based on the building use, occupancy, and occupant load. The criteria for each classification type can be found in the “Building Designation Type” tab of the spreadsheet. Where building use/occupancy or occupant load is modified as part of the designer’s scope, the designer shall reassess the type of system desired by NU in accordance with the NU “Building Designation Type” classifications.

Emergency Communication Systems

Emergency Communication Systems, including mass notification systems, shall be provided for new fire alarm system designs where specified by the *Northwestern University Building Designations* document, or as required by code, whichever is more restrictive. For new buildings, the designer must request the building risk assessment from the NU project manager. The risk assessment will be performed internally by NU to determine if mass notification is required. The NU project manager must coordinate with NUPD, Environmental Health and Safety, and the Electric Shop for risk assessment

In Evanston, where a building is provided with an In-Building Fire Emergency Voice/Alarm Communications System or a Mass Notification System, that system shall be provided with a connection to the NUPD TrueSite system to allow NUPD control of the system’s voice capability.

Supervisory Control and Data Acquisition (SCADA) System

In Evanston, and where indicated in the Appendix 28 3113 *Existing Fire Alarm System Classification and Building Designations*, fire alarm systems shall be remotely monitored by the TrueSite system located in the NUPD building and the Electrical Shop. The provision of TrueSite monitoring is a requirement for NU's existing agreement with Evanston Fire Department to extend system test frequencies.

Graphic Annunciators

In Evanston, TrueSite graphic annunciators shall be installed in any building where a fire command center is required. A standard fire alarm system annunciator (main or remote) shall be provided where a graphic annunciator is not provided.

In Evanston, a remote client (monitor) can be added to any building to display TrueSite graphics upon request. The NU project manager will make this determination based on communication with the building manager. The NU project manager must confirm that the building occupants will be responsible for creating the display content, and annual content upload subscription.

Fire Alarm Equipment Spaces

Locate fire alarm control panels in a secure location having a minimum 1-hour fire resistance rated enclosure for any building. A 2-hour fire resistance rated enclosure is required for major facilities having fire command centers, in-building fire emergency voice/alarm communications systems or mass notification systems. Provide rooms with clean conditioned air in a temperature range of 50 to 80 degrees F and without wide fluctuations in humidity. Provide floor space and wall space within the room to install and maintain all systems and equipment located within. Provide at least three feet of clear space in front of all cabinets.

Locate the fire command center on the ground floor and near the building entrance designated for first response. If a building has multiple main entrances, coordinate the location of the Fire Command Center and possible remote-control panels with the NU Facilities PM and AHJ.

Control unit displays, visible indicators, and controls shall be mounted such that the distance to the highest switch lamp, or textual display does not exceed 6 ft above the finished floor, and the lowest switch, lamp, or textual display shall not be less than 15 in. above the finished floor. Annunciators shall be installed such that the distance to the top of the cabinet does not exceed 5.5 feet. This is to assure that messages can be read, and controls can be readily accessed.

Connect safety-related equipment, lighting, and duplex receptacles within the room to the building's emergency power system, if one exists.

Initiating Devices

Detection: Mount new fire alarm detection devices on the ceiling whenever possible. Include these locations on the Architectural Reflected Ceiling Plan for coordination. When initiating devices are mounted on walls, show these in the elevations. Specific fire alarm replacement projects where there are existing wall mount detection devices, will have locations reviewed before relocating.

In non-residential buildings equipped with an automatic sprinkler system with complete coverage in accordance with NFPA 13, selective detection coverage, as defined by NFPA 72, shall be provided.

Automatic detection of smoke or heat shall be provided in accordance with NFPA 72, National Fire Alarm and Signaling Code in all spaces as required by the applicable codes and standards and in the areas noted below:

Smoke detectors

- Within 5 feet of fire alarm control unit
- Corridors
- Storage rooms
- Electrical closets
- Main electrical rooms
- I.T. rooms/closets
- AV closets
- Top of stairs
- Trash collection
- Recycling room
- Battery Rooms

Heat detectors

- Janitor closets
- Mechanical rooms
- Any room or office with a cooking appliance (e.g., microwave, coffee maker) (rate of rise)
- Attics
- Conditioned generator rooms

CO/Methane Coverage

- Locate at source in buildings without sleeping areas
- Locate within 15 feet of sleeping room door in buildings with sleeping areas

In all residential buildings, museums, historic buildings, and in buildings that are not equipped with an automatic sprinkler system with complete coverage in accordance with NFPA 13, selective detection coverage, as defined by NFPA 72, shall be provided. Automatic detection of smoke or heat in accordance with NFPA 72, National Fire Alarm and Signaling Code shall be provided in all spaces as required by the applicable codes and standards ***and in all occupiable areas***, which include, but shall not be limited to:

Smoke detectors

- All locations required for non-residential, sprinkler protected buildings, as indicated above
- Offices
- Sleeping rooms
- Conference Rooms
- Auditoriums

- Cafeterias
- Event spaces
- Practice Rooms
- Libraries

Heat detectors

- Janitor closets (combination fixed temperature/rate-of-rise)
- All locations required for non-residential, sprinkler protected buildings, as indicated above

CO/Methane Coverage

- All locations required for non-residential, sprinkler protected buildings, as indicated above

In residential buildings, smoke detectors with sounder bases shall be provided where permitted by the applicable codes and standards. Corridor smoke detection is required and shall be connected to the building fire alarm system. Photoelectric smoke detectors are the preferred type of smoke detector for corridor unless prohibited by the ambient conditions.

Detection is not required in non-occupiable spaces such as shafts, small closets, and spaces above ceiling, unless required by other applicable codes and standards.

Detection in Elevator Spaces: In Chicago, sprinklers are not permitted in elevator machine rooms or elevator hoistways. Therefore, heat detection is not required in elevator machines rooms or elevator hoistways.

Smoke detection shall not be provided at the top of elevator hoistways unless it is required meet NFPA or ICC requirements or provided to initiate smoke venting.

The City of Evanston amends the IFC Section 907.4.4 (amendments dated November 31, 2021) to require smoke detection at the top of elevator hoistways, unless otherwise directed by the Fire Official. The designer must discuss the omission of smoke detection at the top of elevator hoistways noted in this section with the Fire Official and Elevator Inspector, on a project by project basis.

Detection in elevator pits and hoistways shall be provided in the minimum locations required by code only. Where a fire alarm device is installed in an elevator hoistway, these devices must be serviceable from outside of the elevator hoistway through an access hatch.

Manual pull stations: Manual pull stations shall be provided in all buildings within 5 feet of the exits on each floor and within 5 feet of each exterior door. Manual pull stations shall be of the double action type.

Manual pull stations shall be provided at the exit access door from any room or suite of rooms classified as a Group H occupancy.

In museums and historic buildings, manual pull stations may be omitted where permitted by code or approved by the AHJ, if it is deemed desirable for building aesthetics.

Notification Appliances

Mount fire alarm notification devices on the ceiling whenever possible. Include these locations on the Architectural Reflected Ceiling Plan for coordination. When devices are mounted on walls, show these in the elevations. Where existing wall mounted notification devices are available during a fire alarm replacement project, the locations of wall mounted devices must be reviewed by NU before relocating to the ceiling. Unless noted otherwise, fire alarm notification devices shall be provided as follows:

1. Fire Alarm System without Emergency Communication System: Red device with White “Fire”, except
2. Fire Alarm with Emergency Communication System: White device with Red “Alert”

In residential occupancies, ADA devices shall be provided upon request.

Visual notification devices shall be provided in any office where audible notification is required in accordance with the State of Illinois’s ADA requirements.

Audible and visual notification appliances must be provided in any occupiable room that is provided with sound attenuating insulation, unless reviewed and approved by NU.

In multi-stall Toilet Rooms, follow the more stringent of the code or the following:

Gendered	Visual Device in the Main Room	Audio is assumed to come from the corridor
Non Gendered	Audio/Visual Device in the Main Room	

Individual stalls, in either Toilet Room type, unless required by code, do not require a notification appliance.

In animal research spaces (CCM), audible notification should be eliminated, and visual notification should be provided throughout. This arrangement must be approved by the AHJ on a project by project basis.

Emergency Control Functions and Interfaces

Elevator Phase I Emergency Recall Operation Initiation and Power Shutdown: The designer must coordinate with the NU Facilities Project Manager for verification of the following, prior to the design of any fire alarm system which may require interface with elevators:

- Elevator age
- Elevator recall/ shunt trip capabilities
- Existing level of sprinkler protection in elevator hoistways, machine spaces, and control spaces

The designer must provide on-site verification of information provided by the NU Facilities Project Manager. NU Facilities Project Managers should provide the Design Assist documents to designers at the beginning of any fire alarm system design.

Smoke detectors installed for elevator recall and control shall also activate the building and/or zone alarm signals.

Where elevator equipment was installed before 1971 and does not have recall and/or shunt trip capability, the fire alarm system shall have the capability to accommodate modules for recall and power shutdown in the event of a future elevator upgrade, but control modules for recall shall not be installed.

Where an existing elevator constructed after 1971 is not capable of recall or power shutdown, smoke detectors and control modules for recall and power shutdown shall be provided for interface with future elevator upgrades.

Where new sprinkler protection is added to any elevator hoistway, machine room, or control space, smoke detectors and control modules for recall and power shutdown shall be provided.

Door and Shutter Release: Door and shutter hold open release shall be zoned by smoke control zones and/or by floor. Stairway door hold open release shall take place throughout the entire building upon fire alarm signal.

Electrically Locked Doors: Stairway door unlocking shall take place throughout the entire building upon fire alarm signal. Where an existing building is partially renovated, existing doors within the area of work which are modified as part of the work must be configured to unlock.

Gas Detection: In laboratories, all new installations of gas leak or oxygen depletion alarm systems shall not initiate the building fire alarm until a gas alarm signal arrives at the Central Station (NUPD Dispatch). NUPD Dispatch prescreens fire alarms and gas leak alarms, and routes alarm activations to 911 responders as needed.

Building Crossover Devices

When buildings are connected by either tunnel, bridge or corridor the following shall apply:

1. An addressable relay module shall be provided at all connected building fire alarm panels.
2. Automatic closing doors shall release upon activation of the fire alarm system in both buildings.
3. A red strobe shall be provided at each entrance with signage stating, "DO NOT ENTER WHEN FLASHING."

Circuits and Pathways

Pathways for signaling line circuits and notification appliance circuits shall be designated as Class B unless an alternate classification is required by applicable codes or standards. Pathway survivability shall be Level 0 or Level 1, unless a higher level of survivability is required by the applicable codes and standards, or determined by risk assessment for mass notification systems. All fire alarm cables shall be installed in electrical metallic tubing (EMT). Minimum 3/4" conduit.

Color Coding: For new fire alarm systems, color code wiring as to function. Color codes shall be continuous from the fire alarm control panel to and through the last device. Initiating loops on addressable systems are an exception to the following requirements:

Cable/wire usage, type, and gauge	Positive	Negative
SLC Loop – 18/2 minimum – red FPLR/FPLP	Red	Black
Speaker Circuit – 16/2 minimum – Red FPLR/FPLP Multiple speaker circuits shall have tracer color	Red	Black
Strobe circuit – 12AWG THHN – Stranded Multiple strobe circuits shall have tracer color	Red	Black
Pair 2	Yellow	Blue
Pair 3	Orange	Brown
Pair 4	Pink	Purple
24-volt dc Power - 12 AWG THHN - Stranded	Red	Black
COLORS NOT ACCEPTED FOR INITIATING DEVICES, NOTIFICATION DEVICES, AND AUX POWER	Green white Slate	

Always use the lighter color to indicate the positive wire. Identify earth ground wires by a green wire with a yellow stripe. These grounds are to be supplied and wire per manufacturer's specifications. (Applies to both tables)

For fire alarm renovations, if existing 3/4" conduits are accessible and within the project scope area, existing junction boxes shall be provided with red cover plates and conduits shall be marked using red paint or tape. Conduits are considered accessible if they can be removed or exposed without damaging the building structure or finish, do not require the removal of ceiling tiles which are not already removed as part of the project, and are not permanently closed in by the structure or finish of the building. Inaccessible, existing 1/2" conduit requested to be reused, must be reviewed, and approved by the Electric Shop.

Communications

Communications Services

Please see [Service Management Portal](#) for an overview of Communications Services at Northwestern.

Please see [Chapter 5: Space Specific Criteria](#) for more detailed information when it applies to specialized spaces.

Fire Command Center:

1. Evanston Campus: Provide an Evanston area phone in each fire command center.
2. Chicago Campus: Specific requirements are to be reviewed with the NU Project Manager during the design phases of the project.

Locate Telecommunications Rooms for efficient wiring. Rooms should be stacked but can occur on every other floor, i.e., two floors may be served by one Telecommunications Room.

Telecommunications outlet faceplates and jacks must follow the N IT Label Standards found in the Appendix.

Computers and telephones are provided and installed by Northwestern. All other components of the system are provided and installed by the Contractor.

Distributed Antenna System

On both campuses, Northwestern Information Technology has a Preferred Vendor who designs and installs all Distributed Antenna Systems (DAS). This system serves both our cell phone service providers, our Facilities Operations radio communications, and the City of Evanston's Emergency Response radio system. The design team is expected to work with this vendor and integrate this system into the construction documents. This includes, but is not limited to, providing sufficient areas for equipment, raceways, electrical supply, coordination of the location of the devices in Reflected Ceiling Plans, or conduit/cable tray space and roof installation details. The DAS vendor will provide a design for the system during the Construction Documents phase – after sufficient information is known about the spatial configurations and construction assemblies that the radio wave strength can be determined.

The construction team is expected to work cooperatively with the DAS installer to ensure that the system is fully integrated into the final finish building.

Building Surveillance & Emergency Communications

Both the Evanston Campus and the Chicago Campus have security systems in place that include site-located Blue Lights and interior emergency call stations and closed-circuit video surveillance cameras.

For Blue Light information see [Emergency Phones and Cameras](#). Locate interior emergency call stations per code and as coordinated with the NUPD through the Facilities PM. All emergency call stations are to have two-way communication.

Locate closed circuit video surveillance cameras so that they cover the following areas:

1. Entries and Exits serving the building. Locate the camera inside the building. This includes public entrances and exit only doorways.
2. Main floor elevator lobbies
3. Elevator Cab Interiors
4. Cash transaction locations
5. Entries and exits serving changing rooms, such as lockers or dressing rooms.

Light fixture color rendition must be accurate where cameras are focused.

Personal distress buttons may be required for a specific location. Check with the Facilities PM.

Show all emergency communications devices on the Architectural Reflected Ceiling Plans and/or elevations for coordination with other ceiling or wall mounted items, and proof of coverage area.

Locations will be reviewed with the Northwestern University Police, and their recommendations will be given great consideration.

Depending upon the project, blue lights, call stations, and cameras may be:

1. Provided and installed by Northwestern,
2. Provided by Northwestern and installed by the Contractor, or
3. Provided and installed by the Contractor.

In all cases, the NUPD has specific cameras which will need to be incorporated into the design. Obtain the system components and procurement requirements from the NU Facilities PM.

All systems in Evanston and Chicago tie back to the Northwestern University Police Department at 1201 Davis Street, Evanston, IL.

Access Control

Northwestern has standardized on a Millenium Door Access Control System. New installations or changes to existing systems will become part of the campus-wide system. Because of proprietary technology, NU provides all card and biometric readers. All other components of the system are provided by the contractor.

Working with the NU Facilities PM and the NU Lock Shop during the Schematic Design Phase, a determination must be made on the system installation to determine local or remote installation of the Door Controller Devices and ensure that the proper location and size of closet is included for the equipment. Some buildings on campus have a Millenium Access Control Plan: engage the Lock Shop to determine which buildings have been included in this process.

Access must be provided to all components for maintenance, i.e., access panels must be provided in hard surface ceilings if the door controller is in the ceiling cavity above the door. Therefore, review the wiring protocol with the NU Facilities PM and Lock shop during initial access and security design development.

Academic Buildings require separate wiring systems for the following functions:

1. Base Building
2. Elevators, when controlled by Millenium.

Backup all Millenium equipment with batteries and/or UPS systems. When feasible, include Millenium on the building generator, in lieu of batteries and/or UPS. Confirm conditions and receive approval from the NU Electric Shop and NU Lock Shop during design.

Door Access Control is installed in the following locations:

1. All exterior entrances at grade with an entry from the exterior. Exit only doors without exterior hardware do not require access control.
2. Electrical, Fire Alarm, Mechanical, Data, and Security Spaces that are greater than 63 square feet.
3. Rooms or Closets that have Access Control Panels within them, regardless of size.
4. Rooms or Closets that have AV equipment in them. Through the Facilities PM, confirm the need for access control with the Occupants if the AV room is used by students.
5. Secure spaces that are defined by the Occupant user group. During Design Development, discuss these doors with the NU Facilities PM and the occupants.

Wherever access control is installed, a physical key lock must also be installed. Wherever biometric access control is installed, card access must also be installed.

See the Appendix for sample rough-in diagrams.

Appendix

The following items are included in the Appendix. Please note that the Appendix documents have been developed over time and by different groups within NU. Consequently, the document and page formats vary, and there may be content which is not fully coordinated. Consult the NU Facilities PM if questions arise.

1. 01 0000 Fall Protection
2. 01 0000 Life Safety Systems Checklist
3. 01 0000 Variance Request Form
4. 01 0000 Room Numbering
5. 07 8400 Firestopping
6. 087100 Typical Door Hardware – Chicago Campus
7. 087100 Typical Door Hardware – Evanston Campus
8. 09 0000 Common Space Strategies, Standards + Guidelines
9. 09 0000 General Purpose Classroom Guidelines
10. 09 0000 NU Design Guidelines for Interior Finishes
11. 09 0000 NU Lab Design Guidelines
12. 10 1400 Donor Recognition Guidelines
13. 10 1400 Exterior Door Regulatory Sign
14. 23 0519 NU Meters & Gages
15. 25 0000 NU Direct Digital Control Standards, dated 06/18/2018
16. 25 0000 NU Direct Digital Control SI Spec, dated 2/12/2014
17. 25 0000 Sample Controls Spec
18. 26 0000 NU Standard Exterior Light Fixture – Phillips Lumec
19. 26 0000 NU Standard Metering Enclosure
20. 26 0000 NU Standard Metering Wiring Diagram
21. 27 0000 NU IT Label Standards
22. 27 3600 NU Ramtel Emergency Telephone
23. 28 1300 Access Control Rough In Diagrams
24. 28 3113 Existing FA Classification
25. 28 3113 NU FA Building Designations
26. 32 0000 Campus Planning Design Guidelines
27. 32 0000 NU Landscape Design Standards
28. 32 3300 Victor Stanley Mixed Recycling
29. 32 3900 Removable Bollard & Storage Pad