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December 2013, rev 00

01 5600 – Temporary Barricades and Enclosures

PART 1. - GENERAL

- 1.01 Barricades shall be comprised of, but not limited to, chain link, plastic snow fencing, silt fencing, natural barriers (i.e. creeks, walls, existing fence).
- 1.02 Barricades, barriers must be placed around all construction and renovation projects to prevent, as much as practical, intrusion into the work area by personnel not associated with the work being performed.
- 1.03 Doorways, fire escapes and other potential pathways for unauthorized persons to enter the site should be posted with signs appropriate to the project and indicating the hazard. **DO NOT LOCK EXIT DOORS/EMERGENCY EXITS** unless approved by the Project Manager.

A. Definitions:

1. Barricade: A barricade, or barrier, is an obstruction intended to deter the passage of persons or vehicles.
2. Signs: Signs are the warnings of hazard, temporarily affixed or placed, at locations where hazards exist.
3. Signals: Signals are moving signs, provided by workers, such as flagmen, or by devices, such as flashing lights, to warn of possible or existing hazards.

PART 2. - PRODUCTS

2.01 Temporary Fencing

- A. The type of temporary fencing used should be based upon the habitual flow of pedestrian traffic prior to the beginning of the project.
- B. Acceptable types of temporary fencing:
 1. Portable chain link fence
 - a. Used where there is a potential of high traffic volume and/or a high potential of intrusion by people not associated with the work being performed and/or where the hazard level is determined to be high.
 2. Snow fencing: Orange, plastic safety fence or similar height and quality
 3. Silt fencing: Woven fabric fencing generally used to prevent or reduce erosion. (silt fencing used at the perimeter of the project for erosion control may be adequate to fulfill the barricade requirement. Consult Project Manager).

2.02 Signs

- A. Signs indicating the extent of the hazard/hazards present in the work area may be used in conjunction with the fencing such as:



- B. Signs indicating proper direction of travel around the site may also be appropriate.

PART 3. - EXECUTION

3.01 Site Enclosure Fence:

- A. Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering the site except by the entrance gates.

- B. Extent of fence:

- 1. As required to enclose the entire project site or portion determined sufficient by the Project Manager to accommodate construction operations

3.02 Barricades, Warning Signs, and Lights:

- A. Comply with requirements of Authorities Having Jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.03 Security Enclosure and Lockup:

- A. Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at the end of each work day.

3.04 Perform periodic inspections of fencing and repair sections that have fallen or need support.

End of Division 01 5600

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

August 2013, Rev 00

01 7419 – Construction Waste Management

PART 1. GENERAL

1.01 Requirements Include:

A. Each Contractor provide:

1. Participation in Construction Waste Management plan, including separation of recyclable materials.

B. General Contractor provide:

1. Coordinate Construction Waste Management Plan.
2. Provide and pay all costs for labeled containers for receipt of recyclable materials and for disposal of recyclable material.
3. Monthly log of construction and demolition materials diverted from landfill and either reused on-site or sent to an approved recycling facility. An approved recycling facility is a facility that can legally accept construction and demolition waste for the purpose of processing the materials into an altered form for the manufacture of a new product

1.02 Regulatory Requirements

A. IEMA ten day notification for demolition provisions as necessary

B. Project sizes greater than one acre, the contractor is required to submit a “Notice of Intent for General Permit to Discharge Storm Water Associated with Construction Activities (NOI) as necessary.

C. IEPA Uncontaminated Soil Certification LPC 663

1.03 Related Work

- A. Related work may be specified in other Design and Construction Standards

1.04 Definitions

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
 - D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
 - E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
 - F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.
- 1.05 Performance Requirements
- A. LEED Requirements: Comply with LEED Credit requirements as appropriate for the following items:
 - B. LEED Credit MR 2, divert a minimum of 75% by weight of construction and demolition debris from disposal in landfills and incinerators.
 - 1. Redirect recyclable materials back to the manufacturing process.
 - 2. Redirect reusable materials to appropriate sites.
- 1.06 Submittals
- A. **Submit as project requires:**
 - 1. Waste Management Plan:
 - 2. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include separate reports for demolition and construction waste. Include the following information:
 - a). Material category
 - b). Generation point of waste.
 - c). Total quantity of waste in tons.
 - d). Quantity of waste salvaged, both estimated and actual in tons.
 - e). Quantity of waste recycled, both estimated and actual in tons.
 - f). Total quantity of waste recovered (salvaged plus recycled) in tons.
 - g). Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
 - 3. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
 - 4. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

5. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
6. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
7. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
8. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
9. Qualification Data: For Waste Management Coordinator

1.07 Quality Assurance: **as project requires**

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 1. Review and discuss waste management plan including responsibilities of Waste Management Coordinator **as project requires**.
 2. Review requirements for documenting quantities of each type of waste and its disposition.
 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
 5. Review waste management requirements for each trade.

1.08 Waste Management Plan: **as project requires**

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.

- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.
- D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
1. Total quantity of waste.
 2. Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
 3. Total cost of disposal (with no waste management).
 4. Revenue from salvaged materials.
 5. Revenue from recycled materials.
 6. Savings in hauling and tipping fees by donating materials.
 7. Savings in hauling and tipping fees that are avoided.
 8. Handling and transportation costs. Include cost of collection containers for each type of waste.
 9. Net additional cost or net savings from waste management plan.

PART 2. PRODUCTS (Not Used)

PART 3. EXECUTION

3.01 Plan Implementation: as project requires

- A. General: Implement waste management plan as approved by Architect. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Section 01 5000 - Temporary Facilities and Controls for operation, termination, and removal requirements.
- B. Waste Management Coordinator may be engaged (and is encouraged to be engaged) to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Control dust, dirt, noise, and environment as required
- E. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.02 Disposal of Waste

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials on Owner controlled property.

End of Division 01 7419

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

January 2016, Draft 00

01 7700 – Closeout Procedures

PART 1 - GENERAL

1.01 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 Summary

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures
 - 2. Final Completion procedures
 - 3. Warranties
 - 4. Closeout Documentation
 - 5. Final cleaning

1.03 Substantial Completion

- A. Submittals and Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following:
 - 1. Prepare a list of incomplete items that are to be completed and/or corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - a) Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - b) Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - c) Include the following information at the top of each page:
 - 1) Project name
 - 2) Date
 - 3) Name of Architect
 - 4) Name of Contractor

3. Advise Owner of pending insurance changeover requirements.
 4. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 5. Submit Project Record Documents, Operation and Maintenance Manuals and any other Close Out submittals specified in Divisions 01 through 33.
 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 8. Complete startup and testing of systems and equipment.
 9. Submit test/adjust/balance records.
 10. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 11. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 12. Advise Owner of changeover in heat and other utilities.
 13. Perform preventative maintenance on equipment used prior to substantial completion.
 14. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 15. Complete final cleaning requirements, including touchup painting.
 16. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Subsequent reinspections, if required, will be invoiced to the Owner who will, in turn, deduct the amount from the Contractor's outstanding balance by Change Order thereby reducing the Contract amount.
 3. Results of completed inspection will form the basis of requirements for Final Completion.
 4. Following their inspection, Architect/Engineer will prepare and process a Certificate of Substantial Completion, containing:
 - a) Date of Substantial Completion
 - b) Punch List items to be completed or corrected
 - c) The time within which Punch List items shall be completed or corrected.

- d) Date and Time Owner will take occupancy of project or designated portion thereof.
- e) Responsibilities of Owner and Contractor for Insurance.
- f) Signatures of:
 - 1) Architect/Engineer
 - 2) Contractor
 - 3) Northern Illinois University

1.04 Final Completion

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Application for Final Payment
 - a) Certificate of Application for Payment
 - b) Final Invoice-Voucher.
 - c) Separate releases of waivers of liens for all subcontractors, suppliers and others with lien rights against property, together with complete list of those parties.
 - d) Submit required Certified Payroll.
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
5. Submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Subsequent reinspections, if required for final completion, will be invoiced to the Owner who will, in turn, deduct the amount from the Contractor's outstanding balance by Change Order thereby reducing the Contract amount.

1.05 Warranties

- A. Submittal Time: Submit signed written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
 2. Table of Contents: Neatly typed in orderly sequence:
 - a) Product or work item.
 - b) Firm, with principal's name, address and telephone number.
 - c) Scope.
 - d) Date of beginning of warranty or bond (in accord with General Conditions).
 - e) Duration of warranty or bond.
 - f) Provide information for Owner's personnel: Proper procedure in case of product or equipment failure.
 - g) Contractor, responsible principal's name, address and telephone number.
 3. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation.
 4. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, NIU Project number, and name of Contractor.
 5. Warranty Electronics File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.06 Project Record Documents

- A. Contractor
 1. At the Project Site, the Contractor shall maintain one record copy of:
 - a) Contract drawings, including any separate volume(s) of details.
 - b) Project Manual/Specifications.
 - c) Interpretations and supplemental instructions.
 - d) Addenda.
 - e) Reviewed, approved shop drawings and product data.
 - f) Other modifications to contract.

- g) Field test records.
- h) All schedules.
- i) Correspondence file.
2. Store documents in field office, apart from documents used for field construction.
3. Provide files and racks for document storage.
4. File documents in format in accord with Project Manual Table of Contents.
5. Maintain documents in clean, dry, legible condition.
6. Do not use record documents for field construction purposes.
7. Make documents available at all times for inspection by Architect/Engineer.
8. Provide paper and electronic closeout documentation.

B. Document Recording

1. Label each document "PROJECT RECORD DOCUMENTS" in 2" high printed letters.
2. Keep record documents current.
3. Do not permanently conceal any work until specified information has been recorded.
4. Contract drawings: Legibly mark to record actual construction:
 - a) Depths of various elements of foundation in relation to first floor level.
 - b) Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
 - c) Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.
 - d) Field changes of dimension and detail.
 - e) Changes made by change order.
 - f) Details not on original contract drawings.
5. Project Manual/Specifications and addenda: Legibly mark up each section to record:
 - a) Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - b) Changes made by change order or field order.
 - c) Other matters not originally specified.
6. Shop drawings: Maintain as record documents; legibly annotate drawings to record changes made after review.
7. A/E will periodically review documents to confirm they are up-to-date.
8. Contractor payment may be withheld or reduced if record documents are not current.

C. Submittal

1. At completion of project, deliver the hard copy and an electronic copy of the record documents to the A/E.
2. Accompany submittal with transmittal letter, in duplicate, containing:
 - a) Date.
 - b) Project title and NIU project number.
 - c) Contractor's name and address.

- d) Title and number of each record document.
- e) Certification that each document submitted is complete and accurate.
- f) Signature of contractor, or his authorized representative.

1.07 Operating and Maintenance Manuals

- A. Compile product data and related information manual appropriate for Owner's maintenance and operation of products provided under the Contract. Operations and maintenance manual content may be specified in individual Specification Sections to be reviewed as the time of Section submittals.
- B. Prior to final submittal, submit a draft of all operations and maintenance manuals to the Architect, who will review and comment on whether content of operation and maintenance submittals are acceptable.
 - 1. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- C. Submit operations and maintenance manuals in the following format:
 - 1. Manuals
 - a) Hard Copy
 - 1) Quantity: 3 identical manuals.
 - 2. PDF electronic file. Assemble each manual into a composite electronically indexed file. Refer to 1.08 for further requirements. Otherwise, submit on digital media acceptable to the Architect.
 - 3. Form: Manufacturer's standard product data of same type and form furnished to manufacturer's maintenance personnel.
- D. Manual Content
 - 1. Binder
 - a) Provide neatly typewritten identification of the manual content, project name and contractor name on the cover and on the binder edge.
 - 2. Neatly typewritten table of contents for each volume, arranged in systematic order. Unless otherwise indicated, organize each manual into a separate section for system and subsystem. Each manual shall consist of the following materials:
 - a) Title Page
 - 1) Contractor, name of responsible principal, address and telephone number.
 - b) Table of Contents
 - 1) List of each product specified to be included, indexed to volume table of contents.
 - 2) List for each product:
 - i. Respective specification section.
 - ii. The name, address, and telephone number of subcontractor.
 - iii. Local supply source for replacement material.
 - c) Manual Contents.

- a. Follow Project Manual format.
- E. Product Data:
1. Include only sheets pertinent to specific product.
 2. Clearly identify specific product or part installed.
 3. Supplement product data with drawings to clearly illustrate relationship of component parts of equipment and systems.
- 1.08 Electronic Closeout Documentation
- A. General: Provide a complete project closeout documentation package in electronic format. This package shall include:
1. Project Record Documents.
 2. Approved Submittals.
 3. Operation and Maintenance Manuals.
 4. Warranties.
 5. Owner training DVD's.
 6. Project Contact Directory.
- B. The contractor is responsible for all costs associated with Electronic Closeout Documentation.
- C. Unless otherwise noted and/or approved by the NIU Project Manager, the Electronic Closeout Documentation shall be prepared by Digital Revolution Inc./BHFX LLC Contact TJ Hurckes at 847-899-3414 or tj.hurckes@bhfx.net.
- D. In order to facilitate the Electronic Closeout Documentation process, comply with the following procedures:
1. Contact Digital Revolution, Inc. a minimum of three months prior to the date of Substantial Completion to schedule a pre-closeout meeting. Review the following:
 - a) Format of documents: PDF electronic format for all documents.
 - b) Folder structure for storage and transfer of files.
 - c) Schedule for collection and turn-over of closeout documentation.
 - d) Record Document format procedures: Provide clean and accurate paper copies of the marked-up Record Documents (Drawings and Specifications) for scanning.
 - e) Provide contact information for the individual responsible for the collection and transfer of the electronic closeout Documentation package contents.
 - f) Review a complete listing of closeout documentation package contents with the A/E and NIU prior to submitting.
 2. Provide all Documentation to Digital Revolution, Inc. for processing no later than 30 days after the date of Substantial Completion and a copy to NIU.

3. Schedule a training conference with the Owner's Representative, Architect, and Digital Revolution, Inc. to present the completed Electronic Closeout Documentation Package.

PART 2 - PRODUCTS

2.01 Materials

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.01 Final Cleaning

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a) Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b) Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d) Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e) Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - f) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - g) Sweep concrete floors broom clean in unoccupied spaces.

- h) Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - i) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - j) Remove labels that are not permanent.
 - k) Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
 - l) Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m) Replace parts subject to unusual operating conditions.
 - n) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - o) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - p) Clean ducts, blowers, and coils in compliance if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - q) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r) Leave Project clean and ready for occupancy.
 - s) Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
 - t) Repair grass and planting beds. Using black dirt topsoil, fill and grade site areas damaged during the work to original elevations and slope.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

End of Division 01 7700

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

August 2013, Rev 00

02 4113 – Site Demolition

PART 1. General

1.01 This Standard specifies information for surface and sub-surface infrastructure systems demolition and removal.

1.02 General Considerations

A. Review Northern Illinois University Contractor Safety Handbook

http://www.niu.edu/ehs/constructionsafety/Contractor%20Safety%20Handbook_2013.pdf

B. Consider contacting JULIE prior to any subsurface disturbances

C. Consider contacting the Illinois Historic Preservation Agency if there is a potential for disruption of historic sites or materials.

1.03 Regulatory Requirements

A. Project sizes greater than one acre, the contractor is required to submit a “Notice of Intent for General Permit to Discharge Storm Water Associated with Construction Activities” (NOI)

B. Storm Water Pollution Prevention Plan

C. IEMA ten day notification for demolition provisions

D. IEPA Uncontaminated Soil Certification LPC 663 if material is to be hauled offsite.

1.04 Related Documents

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to this section.

1.05 Summary

A. Provide labor, materials and equipment as necessary to complete work as indicated on the Drawings and specified herein.

B. This section includes the removal of existing structures, fences, pavements, and other items indicated on the Drawings or specified, or both.

1.06 Project Conditions

- A. Erect barricades or barriers around the site prior to the commencement of demolition activities.
 1. Type and robustness of barricade should be based upon traffic patterns prior to onset of demolition and for potential of encroachment by non-work related personnel.
 - a). Silt fencing
 - b). Snow fencing
 - c). Portable chain link fencing
 - d). Any other appropriate means to restrict access to work site.
- B. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the Project Representative. Provide alternate routes around closed or obstructed traffic ways if required.

PART 2. PRODUCTS

Not Used

PART 3. EXECUTION

3.01 Demolition Operations

- A. At the direction of the Project Manager, certain items within the Project limits may be salvaged by the Contractor to the Owner. Salvaged materials or equipment will be indicated on the Drawings or specified. Salvaged items not indicated or noted to be reinstalled shall be delivered to designated location(s) on campus as directed by Project Manager.
 1. Items to be salvaged include, but are not limited to:
 - a). Post and chain fencing.
 - b). Catch basins and manhole frames and covers.
 - c). Bike racks.
 - d). Litter receptacles, trash receptacles and ash urns.
 - e). Light fixtures and poles.
 - f). Face brick.
 - g). Chain link fence fabric.
 - h). Paver brick.
 - i). Limestone cap.
 - j). Steel and concrete bollards.
 - k). Benches
 - l). Bus shelters
 - m). Irrigation system components, including valves, sprinklers, and vacuum breakers.

n). Any other items identified by the Owner

- B. The use of explosives is not permitted.
- C. Conduct demolition operations and the removal of debris to ensure minimum interference with adjacent roads, streets, walks, and other facilities, operations and people.
- D. Conduct operations to prevent damage by falling debris or other cause to adjacent buildings, structures, vegetation to be retained, and other facilities as well as persons.
- E. Promptly repair damages caused to adjacent facilities by demolition operations, as directed by the Project Representative. Repairs shall be made at no cost to the Owner.

3.02 Removal of Pavements

- A. Saw cut concrete curb and gutter and flatwork on nearest existing joint beyond area required to be removed as shown on the Drawings.
- B. When the existing pavement cannot be used as the concrete form (with approval of the Project Manager), saw cut asphalt pavement with a near vertical edge.
- C. Provide a minimum of 18 inches between the new gutter pan edge and the bituminous paving edge.
- D. Remove curb and gutter and asphalt to saw cut.

3.03 Clean Up

- A. Contractor shall be responsible for disposing debris from demolition and salvage operations. Disposal of debris shall be done legally off the Owner's property, except that specifically requested for salvage by the Project Representative. Burning of debris is not permitted.
- B. During demolition operations, keep dust to a minimum using appropriate methods.
- C. During demolition operations, access roads and adjacent concrete pathways shall be maintained broom clean. Roads shall be cleaned by using a pick-up type sweeper. A front-end tractor mounted sweeper is not permitted.
- D. The site shall be graded to provide surface drainage and shall be left in a clean condition.



End of section 02 4113

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification

August 2013, Rev 00

02 4119 – Selective Structure Demolition

1. General

1.01 Summary

- A. Review NIU Environmental Health & Safety (EHS), Contractor Safety Handbook,
http://www.niu.edu/ehs/constructionsafety/Contractor%20Safety%20Handbook_2013.pdf
- B. Contacting the Illinois Historic Preservation Agency if there is a potential for disruption of historic sites or materials as necessary
- C. Consider contacting JULIE prior to any subsurface disturbances as necessary
- D. This section includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolitions and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.
- E. Contractor to remove designated building equipment, fixtures, partitions and components.
- F. Refrigerant Recovery: If refrigerant recovery is needed, the technician must be certified by an EPA approved certification program.

1.02 Definitions

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and re-installed.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.03 Regulatory Requirements

- A. IEMA ten day notification for demolition provisions

B. Project sizes greater than one acre, the contractor is required to submit a “Notice of Intent for General Permit to Discharge Storm Water Associated with Construction Activities (NOI)”

C. IEPA Uncontaminated Soil Certification LPC 663

1.04 Existing Conditions

A. Conduct demolition to minimize interference with adjacent building and site areas. Maintain protected egress and access at all times.

B. Provide, erect, and maintain temporary barriers and security devices.

1.05 Project Conditions

A. Salvageable Items

1. Items to be reused: Items shown to be reused in the remodeled building shall be removed by the General Contractor and properly stored until reinstallation.
2. Items of historic value: Remove and turn over to the Owner all items listed in the salvage schedule to be of historic value. Take care to protect historic items against damage.
3. Other items that may be included in contact.
4. Items of value to Contractor: Other items of salvageable value to the contractor must be transported from the site as they are removed. Storage or sale of items salvaged by the contractor on the site will not be permitted.

B. Protect existing construction as required to prevent damage during demolition operations. Protection shall be by the General Contractor.

C. Extermination: The General Contractor shall employ a certified exterminator and maintain entire building in accordance with governing health regulations for rodent and insect control.

D. Coordination: The General Contractor shall coordinate the work of all contractors. The General Contractor shall determine the timing of demolition operations, use of existing facilities for temporary construction utilities and the location of storage for items salvaged for re-use.

E. Occupancy:

1. Portions of a building may be occupied during Selective Demolition. Appropriate precautions shall be incorporated to ensure the safety and wellbeing of personnel who may remain in or near the areas of demolition.

F. Condition of Structure: Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable.

- G. Protection: Ensure the safety of persons working around the area of demolition. Conduct operations to prevent injury to adjacent construction to remain.
 - H. Damages: Promptly repair damages caused to adjacent work by demolition operations.
- 1.06 Materials Ownership
- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
 - B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.
- 1.07 Field Conditions
- A. Owner may occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
 - B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before selective demolition, Owner will remove the following items:
 - a). Fire Extinguishers and cabinets.
 - b). AEDs and cabinets
 - c). Mounted First Aid kits and cabinets
 - C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
 - D. Hazardous Materials:
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
 - E. Storage or sale of removed items or materials on-site is not permitted.
 - F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations if required in contract.
2. Utility Services, and Mechanical/Electrical systems will be shut off and coordinated with the relevant utility company, by the Owner as necessary.

2. Products

2.01 Performance Requirements

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

2.02 Reuse of Existing Materials

- A. Remove existing materials designated for reuse and refinish for relocation in new construction where shown on the drawings.
- B. Provide storage of salvage materials for reuse or turn materials over to owner as scheduled.
- C. Recycle of materials is encouraged

3. Execution

3.01 Preparation

- A. Erect and maintain weatherproof closures for exterior openings.
- B. Erect and maintain temporary partitions to prevent spread of dust, fumes, noise, and smoke to provide for Owner occupancy.
 1. Dust Controls: Use temporary enclosures and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.
 - a). Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
 2. Clean adjacent structures and improvements of dust, dirt, and debris caused by demolition operations, as directed by Architect or governing authorities. Return adjacent areas to condition existing prior to start of work.
- C. Protect existing items which are not indicated to be altered.

1. Extent of removal is shown on the drawings. Any construction that is shown to remain that is inadvertently removed shall be replaced at the Contractor's expense.
 - D. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - E. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - F. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 1. Strengthen or add new supports when required during progress of selective demolition.
- 3.02 Utility Services and Mechanical/Electrical Systems
- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - C. Mark location of disconnected utilities. Identify and indicate capping locations on Project Record Documents.
 - D. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.
- 3.03 Selective Demolition, General

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Utilize the NIU Hot Work Permit:
http://www.niu.edu/ehs/fire/hot_works.pdf
 5. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 6. Maintain adequate ventilation when using cutting torches.
 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 10. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management"
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.04 Selective Demolition Procedures for Specific Materials

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.05 Disposal of Demolished Materials

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.06 Cleaning

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.
- 3.07 Selective Demolition Schedule
- A. Existing Construction to Be Removed: Refer to construction drawings or as specified by Owner.
 - B. Existing Items to Be Removed, Salvaged and Returned to Owner: Specified by Owner.
 - C. Existing Items to Be Removed and Reinstalled: Specified by Owner.
 - D. Existing Items to Be Removed, Salvaged and Reinstalled: Specified by Owner.
 - E. Existing Items to Remain: Refer to construction drawings. Specified by Owner.

End of Division 02 4119

This section of the NIU Design and Construction Standards establishes minimum requirements only.

It should not be used as a complete specification.

April 2012, rev. 00

02 8213 – Asbestos Abatement

1. General

1.01 Summary of Work

A. Contractor

1. The Contractor shall provide removal and proper disposal of asbestos containing materials. Activities by the Contractor shall be performed in accordance with applicable local, federal, and state regulations.
2. Before beginning any removal of asbestos-containing material, the Contractor shall contact the NIU Environmental Health & Safety Department to ensure that proper NIU protocols are followed.
3. Contractor shall employ and pay for an independent testing laboratory to perform OSHA compliance air monitoring.

1.02 Definitions

A. Reference the following documents for applicable definitions:

1. Rules for Asbestos Abatement for Public and Private Schools and Commercial and Public Buildings in Illinois, Part 855.20.
2. State of Illinois Asbestos Abatement Act.
3. State of Illinois Commercial and Public Building Asbestos Abatement Act
4. EPA Asbestos Hazardous Emergency Response Act (AHERA), 763.83.
5. EPA National Emission Standard for Hazardous Air Pollutants (NESHAP) – 40 CFR 61 Subpart M, 61.141
6. OSHA Construction Industry Standard - 29 CFR 1926.1101 (b) SEQUENCE AND SCHEDULES

1.03 Regulatory Requirements

- A. Illinois Asbestos Abatement Act, as amended through Public Act 89-143, effective July 14, 1995.
- B. Illinois Commercial and Public Buildings Asbestos Abatement Act, as enacted through Public Act 89-143, effective July 14, 1995.
- C. IDPH Rules for Asbestos Abatement for Public and Private Schools and Commercial and Public Buildings in Illinois (77 Illinois Administrative Code, ch. I: Department of Public Health (IDPH) Subchapter p (Hazardous and Poisonous Substances): Part 855, referred to here as IDPH Rules, effective March 12, 1999.

- D. AHERA (Asbestos Hazardous Emergency Response Act), 40 CFR 763.
 - E. NESHAP (National Emissions Standards for Hazardous Air Pollutants) - 40 CFR Part 61, Subpart M.
 - F. OSHA Construction Standard (Occupational Safety and Health Administration) – 29 CFR 1926.1101.
- 1.04 Testing Laboratory Services
- A. Contractor shall employ and pay for an independent testing laboratory to perform OSHA compliance air monitoring.
- 1.05 Security
- A. Contractor shall regulate the work area and implement a security program starting upon mobilization to the site. At minimum, visitors shall provide a reasonable proof of identification and shall maintain a worksite entry log. The Contractor shall protect work, stored materials, construction equipment, and the Owner’s property from theft and vandalism.
- 1.06 Parking
- A. Existing roads, drives, walks and parking facilities may be used for construction traffic. Damage resulting from construction equipment or vehicles shall be repaired to, at minimum, original condition prior to Final Acceptance of work performed by the Contractor.
- 1.07 Temporary Utilities
- A. Contractor shall coordinate with the Owner’s Representative as necessary for the connection of any temporary services needed for the work area including, but not limited to: electrical service, water and drain connections.
- 1.08 Construction and Barriers
- A. Contractor shall provide construction aids necessary to complete required project activities. Contractor shall provide and maintain barriers as necessary to prevent unauthorized access to the work areas and to protect the work, existing facilities, and utilities from construction operations.
- 1.09 Submittals
- A. Contractor shall provide the following submittals to the Engineer at least five (5) days prior to the start of an asbestos abatement project:
 - 1. Required IEPA and/or IDPH Notifications

2. List of workers and supervisor(s)
3. Construction schedule
4. Product/materials data sheets (MSDS)
5. Documentation showing manufacturer's certification that vacuums, negative air equipment, and other local exhaust ventilation conform to ANSI 29.2-79
6. Photocopy of contractor's license and insurance
7. Photocopy of supervisor's license and accreditation certifications
8. Photocopy of each asbestos worker's license and accreditation certifications
9. Documentation by physician within the past year that employees and agents entering the work area are capable of wearing required respirators
10. Documentation that employees and agents entering the work area have passed a respirator fit test within the past year
11. Certification of respiratory protection training for personnel on-site and a copy of the current respiratory protection program
12. Landfill permit and arrangement for waste disposal
13. NIOSH approvals for respiratory equipment
14. Floor layout identifying locations of ACMs to be removed
15. Type and quantity of ACMs to be removed

1.10 Record Documents

- A. Maintain, protect, and keep current one copy of contract drawings, Project Manual, addenda, approved shop drawings, and product data, or other modifications to contract, field test records, schedules, and correspondence. These documents should be clearly labeled and be available for inspection by the Engineer.

2. Products (This Section not used)

3. Execution

3.01 Field Quality Control

A. Contractor Shall:

1. Employ a full-time IDPH-licensed Asbestos Supervisor to perform the duties and responsibilities referenced in the IDPH Rules, Part 855.140 and serve as the OSHA Competent Person in accordance with 29 CFR 1926.1101. The Contractor's supervisor will be responsible for the performance of the project.
2. Maintain records of air monitoring of own personnel or a Negative Exposure Assessment (NEA) in accordance with OSHA 29 CFR 1926.1101.
3. Provide proper respiratory protection and protective clothing for contractor personnel in accordance with OSHA 29 CFR 1926.1101 and OSHA 29 CFR 1910.134.

- B. Appropriate regulatory agencies or the Owner's representative may issue emergency stop work orders to the Contractor.

3.02 Notifications

A. For friable removal greater than 160 square feet or 260 linear feet:

1. Complete the Notification of Demolition and Renovation Form and ensure notification is postmarked or hand delivered to IEPA at least ten (10) working days prior to start of construction in accordance with 40 CFR 61.145(b)(3)(iii). Submit to the following address:

**IEPA – Illinois Environmental Protection Agency
Division of Air Pollution
P.O. Box 19276
Springfield, IL 62796-9276
217-785-1743**

B. For friable removal between 3 square feet and 160 square feet or 260 linear feet:

1. Submit COMMERCIAL AND PUBLIC BUILDING ASBESTOS ABATEMENT NOTICE form to IDPH at least two (2) working days prior to start of construction in accordance with IDPH Rules, 855.220. Submit to the following address:

**IDPH Illinois Department of Public Health
Asbestos Program
525 West Jefferson
Springfield, IL 62761
217-782-3517**

C. For non-friable removal: No notice to IDPH or IEPA is required

3.03 Work Area Preparation

A. Work Area Preparation:

1. Establish regulated areas and restrict access to the site.
2. Remove movable objects from work area and relocate to a temporary location.
3. Seal all ventilation openings and fixed equipment within the work areas with one layer of 6-mil polyethylene sheeting.
4. Install critical barriers on all penetrations, windows, doors, fixtures, equipment, or remaining furnishings with one layer of 6-mil polyethylene sheeting.
5. Perform pre-cleaning of all surfaces within the work areas using wet wiping and HEPA vacuums.

6. Post caution signs in and around the work area to comply with OSHA regulation 29 CFR 1926.1101 and in compliance with all other Federal, State, and local requirements.
7. Shut down and lock out/tag out all hazardous energies inside the regulated work area.
8. Construct worker decon and waste out decon units.
9. Establish negative air pressure inside the controlled work area.

3.04 Work Practices

A. Work Practices:

1. All licensed personnel entering the regulated areas shall don appropriate personal protective clothing and equipment. Contractor shall comply with all OSHA regulations referencing respirator selection, personal protective equipment (PPE), and Hazard Communication.
2. Maintain work areas free of accumulated asbestos-containing materials. Keep waste materials wet using amended water until enclosed in sealed poly bags. Seal polyethylene bags airtight with adequate wetness inside the bag. Ensure that asbestos-containing and contaminated materials are double-bagged to yield a minimum covering of 12 mils before removal from the work area and that bags are sealed in a goose-neck style. Move the bagged material to the wash-down station, clean and properly label before removing to the on-site waste dumpster.
3. Remove all visible accumulations of asbestos-containing materials and debris by HEPA vacuums, sponging, etc. Wet clean all surfaces within the work area. The entire work area shall be totally, visibly clean and all bagged waste shall have been removed from the work area and placed in the disposal dumpster.
4. Use encapsulation techniques as necessary.
5. Visual Inspection: The Engineer or the Owner shall observe the work to document that the removal is completed per the contract documents and request additional cleaning if necessary.

3.05 Disposal

- A. Waste material must be removed from the project site as soon as practicable. This includes material that may contribute to fire load in the work area. The contractor is to remove and properly dispose of the stored material at the time directed by the Owner. Material stored at the project site that is slated for disposal must be stored in a manner acceptable to the Owner, and in accordance with all appropriate asbestos regulations.
- B. Perform work in accordance with IDPH Rules, 855.475.

- C. Disposal bags shall be properly labeled in accordance with EPA, DOT and OSHA. Label bags or containers containing asbestos debris as follows:

Northern Illinois University
(Building Name)
DeKalb, Illinois
(Date)
(Contractor Name)

- D. Whenever trucks or dumpsters are being loaded or unloaded with asbestos waste, post in accordance with the NESHAP STANDARD - DANGER, ASBESTOS DUST HAZARD, CANCER AND LUNG DISEASE HAZARD, AUTHORIZED PERSONNEL ONLY.
- E. Transport waste to an IEPA approved landfill. Complete a waste shipment record for each load of waste in accordance with the NESHAP STANDARD. Return the record, signed by waste disposal site owner/operator to the Engineer within 10 working days of completion of the project.

3.06 Final Cleaning

- A. Contractor shall remove waste, debris, rubbish, tools, construction aids, temporary equipment, machinery and surplus materials upon **successful** completion of **clearance criteria**. Building materials not to be removed or abated for this project must remain undamaged. Maintain work area until project is accepted by the Owner.
- B. Examine work area for damage incurred during abatement project. Confer with Owner's representative and repair as agreed.
- C. **Restore building system to operational status.**

End of Division 02 8213

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

August 2013, rev 00

08 7100 – Door Hardware

PART 1. - GENERAL

1.01 Summary

A. Base Bid:

1. General Contractor Provide: The furnishing and installation of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specifications.
2. Electrical Contractor Provide: The installation of all power and control devices hereinafter specified or obviously necessary to complete the building, except those items which are specifically excluded from this section of the specifications.

1.02 Description of Work

- A. “Finish Hardware” includes items known commercially as finish hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame. Extent of finish hardware required is indicated on drawings and in schedules. Types of finish hardware required may include, but is not necessarily limited to the following:

1. Continuous Hinges
2. Pivots
3. Butt Hinges
4. Lock cylinders and keys
5. Lock and latch sets
6. Bolts
7. Exit Devices
8. Push/pull units
9. Closers
10. Electronic hold-open devices
11. Automatic door openers
12. Protection plates
13. Weather stripping for exterior doors
14. Thresholds
15. Silencers

1.03 Quality Assurance

- A. Hardware has been specified herein by manufacturers' name, brand and catalog numbers for the purpose of establishing a basis for quality, finish, design and operational function.
- B. To ensure a uniform basis of acceptable materials, it is the intention that only manufacturers' items specified as "Acceptable and Approved" be furnished for use on this project.
- C. Deviation from, or modification of items will be permitted only for the special instances caused by reason of construction characteristics and for the purpose of providing proper operational function. The Contractor shall be responsible for checking any necessary deviation in order to assure that the hardware shall fit and function properly.
- D. Substitutions – Request for substitution of hardware items listed as "Acceptable and Approved" shall be made to the Architect no later than ten (10) days prior to bid opening. Approval of substitutions will only be made in writing or by addendum. Requests for substitutions shall be accompanied by samples and/or detailed information clearly showing pertinent data for the proposed manufacturers' product (s). Submittal of a request for substitution will not constitute automatic approval of substitute. The A/E and NIU reserve the right to reject substitutions.
- E. Supplier – A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than five (5) years, and who is or has in employment an Architectural Hardware Consultant (AHC) in good standing as certified by the Door and Hardware Institute or equivalent. This consultant shall have experience in the preparation of Architectural hardware specifications, estimating, detailing, ordering, and servicing of Architectural hardware and will be available at reasonable times during the course of the work for hardware consultation with the Owner, Architect and Contractor.
- F. All hardware provided and installed shall comply with all regulatory agency requirements including the Americans with Disabilities Act, Illinois Accessibility Requirements and NFPA 101 Life Safety Code.
- G. Pre-Installation Meetings: Prior to start of hardware installation, contractor shall schedule and conduct pre-installation meetings with hardware supplier, lock, exit device, and door closer manufacturers' representative(s), installer and related trades, to coordinate materials and techniques, and sequence complex hardware items and systems installation. Proper and correct installation and adjustment of hardware is to be reviewed, and criteria for punch list review will be established. Convene at least one week prior to commencement of related work. Written documentation of date and attendees/participants is to be provided to architect and owner for record.

1.04 References

A. Finish hardware in this section shall meet the following standards as established by the American National Standards Institute, Inc. (ANSI) which is sponsored by the Builders Hardware Manufacturers Association, Inc. (BHMA). Product tests are to be administered by the ETL Testing Laboratories, Inc., Underwriters Laboratories, or other official testing laboratories which have been designated by BHMA for the testing of ANSI standards. The standards latest revision will be in effect.

- | | |
|-------------------------------------|----------------------|
| 1. Materials & Finishes | |
| 2. Butts & Hinges | ANSI A156.1 Grade 1 |
| 3. Locks & Lock Trim | ANSI A156.2 Grade 1 |
| 4. Exit Devices | ANSI A156.3 Grade 1 |
| 5. Door Controls – Closers | ANSI A156.4 Grade 1 |
| 6. Auxiliary Lock & Assoc. Products | ANSI A156.5 Grade 1 |
| 7. Architectural Door Trim | ANSI A156.6 |
| 8. Template Hinge Dimensions | ANSI A156.7 |
| 9. Door Controls – Overhead Holders | ANSI A156.8 Grade 1 |
| 10. Cabinet Hardware | ANSI A156.9 |
| 11. Power Operated Pedestrian Doors | ANSI A156.10 |
| 12. Cabinet Locks | ANSI A156.11 Grade 1 |
| 13. Mortise Locks & Latches | ANSI A156.13 |
| 14. Sliding & Folding Door Hardware | |
| 15. Closer Holder Release Devices | |
| 16. Auxiliary Hardware | |

B. Listed Hardware – Hardware which is to be installed in or on fire labeled doors and frames, Class A or lesser, single or pairs, shall be tested and listed by Underwriters Laboratories and/or Warnock Hersey Laboratories Division. Exit devices which are to be used as panic hardware shall be tested and listed in Underwriters Laboratories “Accident Equipment List – Panic Hardware”. All listed hardware shall be in compliance with National Fire Protection Association Number 80 and be properly stamped or labeled for easy identification.

1.05 Submittals

A. After the award of a formal contract, six (6) completed typewritten copies of the proposed Finish Hardware Schedule shall be submitted to the Architect for approval. This schedule shall be prepared using the “Sequence and Format for the Hardware Schedule” as approved and recommended by the Door and Hardware Institute (DHI). After approval of the schedule, the Hardware Supplier shall provide two (2) copies of the approved schedule to the Architect for file and distribution purposes.

- B. When submitting schedules for approval, include three (3) sets of manufacturers' cut sheets on hardware item proposed.
 - C. Samples – As part of this contract, provide as requested by the Architect, one brand new (not used) sample of each item of finish hardware that is to be furnished for this project. These samples will be held by the Architect until completion of the project and will then be turned over to the Owner. They will serve as product samples for the building maintenance department.
 - D. ANSI – Upon request of the Architect, the hardware manufacturers will issue letters of compliance that their products meet with ANSI standards, have been tested, and are the grades required in this specification.
 - E. Templates – The Hardware Supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order to cut, reinforce, or otherwise prepare their material or product to receive the hardware item. In the event that physical hardware is required by any manufacturer, the Hardware Supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in execution of their work.
- 1.06 Delivery, Storage, and Handling
- A. All items of hardware to be delivered to the job site shall be completely packaged with all necessary screws, bolts, miscellaneous parts, instructions, and where necessary, installation templates for manufacturer's suggested installation. They are to be clearly labeled so as to conveniently identify them and their intended location in the building.
 - B. A representative of the General Contractor shall receive the hardware when delivered at the job site. A dry, locked storage space, complete with shelving, shall be set aside for the purpose of unpacking, sorting out, checking and storage.
 - C. Finish hardware shall be delivered to the General Contractor by the Hardware Supplier. Direct factory shipments to the job site are not acceptable.
 - D. The hardware shall be jointly inventoried by representatives of the General Contractor and the Hardware Supplier.
 - E. Items damaged prior to acceptance by General Contractor shall be replaced promptly with proper material, and without additional cost to the General Contractor.
 - F. All hardware shall be handled in a manner to minimize marring, scratching, or damage.

1.07 Warranty

- A. The finish hardware shall carry a limited warranty against defects in workmanship and operation for a period of one year or as listed below from date of final acceptance. No liability is to be assumed where damage or faulty operation is due from abuse, improper usage, improper installation or failure to exercise normal maintenance.
- B. The finish hardware shall be delivered in good condition, expeditiously as possible.
- C. The finish hardware shall be wrapped and covered to eliminate any deterioration caused by weather or freak occurrences.

PART 2. - PRODUCTS

2.01 General Hardware Requirements

- A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in this section and the hardware schedule at the end of this section.

2.02 Finish of Hardware

- A. Finish of hardware items shall conform to ANSI A156.18 unless other specified as follows:
 - 1. General Contractor shall field verify existing hardware finish at each building. It is the intent of this specification that hardware installed in existing buildings will match the existing hardware finish.
 - 2. Provide satin stainless steel (US 32D) on exterior and doors subject to special atmospheric conditions (pool areas, chemical laboratories, etc) locations at all new buildings. Provide satin chrome, satin aluminum finish at balance. Closers only – painted MTLPC finish.
 - 3. Provide Satin bronze (US 10) at existing buildings as determined by the owner. Closer only - painted finish to match US 10.

2.03 Keying

- A. All locks and cylinders shall be keyed to the existing SCHLAGE GMK system as required by the owner's instruction.
- B. It is required that the key systems have visual key control and that all keys and cylinders be stamped with the alphanumeric key symbol designated for each key change as recommended by the Nomenclature for Masterkey Systems established by the Door and Hardware Institute.
- C. Provide six (6) construction master keys to be supplied with the locksets to the General Contractor. The construction master key shall operate all locks and

cylinders, and shall permit access to all areas by the General Contractor, during the construction period, prior to the owner assuming control of the building.

- D. Upon completion of the building, the Owner shall remove the construction cores by means of a control key to be supplied by the finish hardware contractor and install the permanent master keyed cores.
- E. Provide a total of one (1) cut key for each core combination. For each lock or cylinder supplied, provide two (2) uncut blank keys. Provide 6 construction master keys.
- F. All operating keys, control keys, master and grand master keys shall be delivered directly to the Owner by the hardware subcontractor who shall obtain a receipt for delivery of same.

2.04 Butt Hinges

- A. Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template hinges which conform to ANSI whenever applicable.
- B. Use ball bearing hinges on doors.
- C. All butt hinges to be used on exterior doors or doors subject to special atmospheric conditions (pool areas, chemical laboratories, etc.), shall be of non-ferrous material: Brass, Bronze or Stainless Steel.
- D. Unless otherwise noted, hinges for interior doors may be steel.
- E. Hinge pins, except as otherwise indicated, shall be as follows:
 - 1. Steel hinges: Steel pins.
 - 2. Non-ferrous hinges: Stainless Steel pins.
 - 3. Exterior doors: Non-removable pins (NRP) or security stud.
 - 4. Out-swing corridor doors: Non-removable pins (NRP).
 - 5. Interior doors: Non-rising pins.
 - 6. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip is indicated.

F. Size of hinges shall be as follows:

Door Thickness to Width	Hinge Height	Hinge Width
1-3/8" to 32"	3-1/2"	3-1/2"
1-3/8" over 32"	4"	3-1/2"
1-3/4" to 36"	4-1/2"	4" or 4-1/2"
1-3/4" over 36"	5"	4-1/2" Extra Heavy Ball Bearing

1-3/4" over 42"	6"	4-1/2" Extra Heavy Ball Bearing
2-1/4" to 42"	5"	4-1/2" Extra Heavy Ball Bearing
2-1/4" over 42"	6"	4-1/2" Extra Heavy Ball Bearing

G. Numbers of hinges per door, provide quantities as follows:

1. For doors less than 5 feet high: 1 pair.
2. For doors 5 feet to 7 feet 6 inches high: 1-1/2 pair and one addition hinge for each additional 2-1/2 feet of door height or fraction thereof.
3. When projection of door trim is such as to prevent desired degree of opening, the proper hinge width shall be provided to allow the door to clear the trim.

H. Acceptable and Approved Series/Manufacturer as follows:

- | | |
|----------|--------|
| 1. Hager | BB1191 |
| 2. Ives | 5BB1 |

2.05 Continuous Hinges

- A. Hinges shall be aluminum alloy 6063-T6 with anodized finish, to match other door hardware.
- B. Hinge shall be a pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising. The door leaf and jamb leaf shall be geared together for the entire length of the hinge and joined by a channel. Hinge knuckle shall be monolithic in appearance. Continuous hinge with visible knuckle separations are not acceptable. Vertical door loads shall be carried on minimum 3/4" acetyl bearings through a full 180 degrees. Screw hole locations on door leaf and jamb leaf to be templated. All continuous hinges shall be fully templated for fasteners.
- C. Acceptable Manufacturers:

1. Ives	224HD/112HD Series
2. Roton	780-224HD/112HD Series

2.06 Mortise Lever Handle Locksets

- A. Locksets shall be mortise type with solid cast stainless steel lever handle x escutcheon trim.
- B. The lockset case shall be .093 gauge wrought steel with zinc dichromate finish.
- C. Locksets shall have armor front with adjustment for door bevel.
- D. Locksets to have full 3/4" projection stainless steel mechanical anti-friction deadlocking latchbolt and 1" projection stainless steel deadbolt.

E. Acceptable and Approved as follows:

1. Schlage – EVEREST SFIC, seven pin – Verify keyway prior to ordering.

2.09 Exit Devices

- A. All exit devices for this project shall have the chassis, end cap, and horizontal mounting rail, mounted directly to, and flush with, the door surface. No gaps or space shall be permitted between the back of the horizontal mounting rail and the door surface. If required, a continuous solid spacer bar shall be used to fill the space between the back of the device and the door surface. **Provide guarded latch bolts for all exit device types.**
- B. The touch pad shall retract the latchbolt by means of a sliding motion of the touch pad towards the lock stile, activating the level arm for easy operations and reduced friction.
- C. All exit devices shall have deadlocking latchbolts, minimum ¾” projection.
- D. Concealed vertical latch exit devices shall be cable actuated.
- E. All exit devices, regardless of function, except for fire rated or electrically operated devices, shall have cylinder dogging.
- F. Trim to match existing exit device hardware.
- G. All electrically operated exit devices shall have electric latch retraction with no dogging capabilities and shall include manufacturer's recommended power supply and mortise-type electrical power transfer:
1. Von Duprin VD QEL 99 (for door stiles \geq 4-3/4" width).
 - a. (Von Duprin VD QEL 33 for door stiles \geq 1-3/4" and $<$ 4-3/4" width).
 2. Von Duprin VD PS 900 series
 3. Von Duprin VD EPT 10
- H. Acceptable and Approved exit devices are as follows:
1. Von Duprin 99/99F Rim Series (for door stiles \geq 4-3/4" width).
 2. (Von Duprin 33 Rim Series for door stiles \geq 1-3/4" and $<$ 4-3/4" width).
- I. Removable Mullions: Where indicated, mullions shall be key removable type with wall mounted storage kit.

2.10 Electronic Access Control Lockset

- A. Hardwired Mortise Type – (Exterior Doors, Pod Dorm Entries – Verify Locations with the University)
1. Hardwired electronic locksets to comply with the following requirements:
 - a. Type: Mortise, field-reversible handing.
 - b. Backset: 2-3/4-inch (70 mm), nominal.
 - c. Latchbolt: 3-piece, beveled, stainless steel with 3/4-inch (19 mm) throw and anti-friction latch.
 - d. Chassis: Shall accommodate ANSI standard mortise lock prep for 1-3/4-inch (44 mm) doors standard, or 1-3/8-inch (35 mm) to 2-3/4-inch (70 mm) thick doors in 1/8-inch (3 mm) increments.
 - e. Applicable Standards:
 - 1). Listed, UL 294 - The Standard of Safety for Access Control System Units.
 - 2). Compliant with A156.25 and A156.13 Series 1000, Grade 1 Operational and Security.
 - 3). Lockset to meet or exceed ANSI Standard A156.25 and A156.13 Series 1000, Grade 1 strength and operational requirements.
 - 4). Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
 - 5). Compliant with ASTM E330 for door assemblies.
 - 6). Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
 - f. Lockset Functions: Provide locks with following functions, as scheduled, that are field configurable without taking the lock off the door:
 - 1). Classroom / Storeroom 70. NOTE: Not available in mortise deadbolt option.
 - 2). Apartment 60.
 - 3). Office 50. NOTE: Not available in mortise deadbolt option.
 - 4). Privacy 40.
 - g. Deadbolt Option: Provide lockset incorporating deadbolt complying with the following.
 - 1). Characteristics: Stainless steel, 1-inch (25 mm) throw, 1-5/8-inch (41 mm) high and 5/8-inch (16 mm) thick.
 - 2). Operation:
 - a) Deadbolt can be thrown from interior when door is in closed position to prevent unauthorized entry.
 - b) Deadbolt can be retracted from both interior and exterior.
 - c) Deadbolt interconnected with latch.

h. Power Supply:

- 1). Required Power Supply: 12VDC or 24VDC.
 - a) Max current draw not to exceed 250mA.

B. Hardwired Exit Device Trim – (Exterior Doors, Stairwells – Verify Locations with the University)

1. Hardwired exit device trim to comply with the following requirements:

- a. Type: Exit device trim, field-reversible handing.
- b. Exit Device Configurations: Exit device lever trim to retract latchbolt for the following exit device applications:
 - 1). Rim
 - 2). Surface vertical rod
 - 3). Mortise
 - 4). Concealed vertical rod
- c. Exit Device Compatibility: Provide exit device trim with universal mounting plate enabling operation as follows:
 - 1). All Von Duprin 98/99 Series exit device configurations.
 - 2). Von Duprin 22 Series rim and surface vertical rod configurations.
 - 3). Rim exit devices from Falcon, 25 Series.
- d. Applicable Standards:
 - 1). Listed, UL 294 - The Standard of Safety for Access Control System Units.
 - 2). Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security Requirement.
 - 3). Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
 - 4). Compliant with ASTM E330 for door assemblies.
 - 5). Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
- e. Exit Device Trim Functions: Provide exit device trim with following functions, as scheduled, that are field configurable without taking the trim off the door:
 - 1). Classroom / Storeroom.
- f. Power Supply:

1). Required Power Supply: 12VDC or 24VDC.

a) Max current draw not to exceed 250mA.

C. Wireless Mortise Type – (Interior Dorm Rooms – Verify Locations with the University)

1. Wireless electronic locksets to comply with the following requirements:

- a. Type: Mortise, field-reversible handing.
- b. Backset: 2-3/4-inch (70 mm), nominal.
- c. Latchbolt: 3-piece, beveled, stainless steel with 3/4-inch (19 mm) throw and anti-friction latch.
- d. Chassis: Shall accommodate ANSI standard mortise lock prep for 1-3/4-inch (44 mm) doors standard, or 1-3/8-inch (35 mm) to 2-3/4-inch (70 mm) thick doors in 1/8-inch (3 mm) increments.
- e. Applicable Standards:
 - 1). Listed, UL 294 - The Standard of Safety for Access Control System Units.
 - 2). Compliant with A156.25 and A156.13 Series 1000, Grade 1 Operational and Security.
 - 3). Lockset to meet or exceed ANSI Standard A156.25 and A156.13 Series 1000, Grade 1 strength and operational requirements.
 - 4). Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.
 - 5). Compliant with ASTM E330 for door assemblies.
 - 6). Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
- f. Lockset Functions: Provide locks with following functions, as scheduled, that are field configurable without taking the lock off the door:
 - 1). Classroom / Storeroom 70. NOTE: Not available in mortise deadbolt option.
 - 2). Apartment 60.
 - 3). Office 50. NOTE: Not available in mortise deadbolt option.
 - 4). Privacy 40.
- g. Deadbolt Option: Provide lockset incorporating deadbolt complying with the following.
 - 1). Characteristics: Stainless steel, 1-inch (25 mm) throw, 1-5/8-inch (41 mm) high and 5/8-inch (16 mm) thick.
 - 2). Operation:

- a) Deadbolt can be thrown from interior when door is in closed position to prevent unauthorized entry.
 - b) Deadbolt can be retracted from both interior and exterior.
 - c) Deadbolt interconnected with latch.
 - h. Power Supply:
 - 1). Lockset powered by four AA batteries with options for eight AA batteries or a 12V or 24V DC power supply.
 - 2). Lockset shall have ability to communicate battery status and battery voltage level by means of a handheld programming device at door and remotely by Partner integrated software.
 - i. Wireless Transmission:
 - 1). Modulation: 900 MHz spread spectrum, direct sequence, 10 channels.
 - 2). Encryption: AES-128 bit Key minimum.
- D. Wireless Exit Device Trim – (Verify Locations with the University)
 1. Wireless Exit Trim to comply with the following requirements:
 - a. Type: Exit device trim, field-reversible handing.
 - b. Exit Device Configurations: Exit device lever trim to retract latchbolt for the following exit device applications:
 - 1). Rim
 - 2). Surface vertical rod
 - 3). Mortise
 - 4). Concealed vertical rod
 - c. Exit Device Compatibility: Provide exit device trim with universal mounting plate enabling operation as follows:
 - 1). All Von Duprin 98/99 Series exit device configurations.
 - 2). Von Duprin 22 Series rim and surface vertical rod configurations.
 - 3). Rim exit devices from Falcon, 25 Series.
 - d. Applicable Standards:
 - 1). Listed, UL 294 - The Standard of Safety for Access Control System Units.
 - 2). Compliant with ANSI/BHMA A156.25 Grade 1 Operation and Security Requirement.
 - 3). Certified to UL10C, FCC Part15, Florida Building Code Standards TAS 201 large missile impact, TAS 202 and TAS 203.

- 4). Compliant with ASTM E330 for door assemblies.
 - 5). Compliant with ICC / ANSI A117.1, NFPA 101, NFPA 80, and Industry Canada IC.
- e. Exit Device Trim Functions: Provide exit device trim with following functions, as scheduled, that are field configurable without taking the trim off the door:
- 1). Classroom / Storeroom.
- f. Power Supply:
- 1). Lockset powered by four AA batteries with options for eight AA batteries or a 12V or 24V DC power supply.
 - 2). Lockset shall have ability to communicate battery status and battery voltage level by means of a handheld programming device at door and remotely by Partner integrated software.
- g. Wireless Transmission:
- 1). Modulation: 900 MHz spread spectrum, direct sequence, 10 channels.
 - 2). Encryption: AES-128 bit Key minimum.

E. Requirements

1. Emergency Override: Lockset shall have the ability to utilize emergency mechanical key override with the following manufacturer's key systems in the lever:
 - a. Full Size cylinders from Schlage and Sargent up to 6-pin cylinders and Falcon up to 7-pin cylinders.
 - b. Full Size Interchangeable Cores from Schlage, Sargent, Corbin Russwin, Medeco, and Yale format by Medeco in up to 6 pin cylinders
 - c. Small Format Interchangeable core up to 7 pin by Schlage, Falcon, BEST, Sargent, Corbin Russwin, Medeco, Yale, and others.
2. Levers:
 - a. Vandal Resistance: Exterior (secure side) lever designed with ability to rotate freely while door remains securely locked, preventing damage to internal lock components from vandalism by excessive force.
 - b. Levers shall operate independently of each other.
 - c. Style: Athens (07)
 - d. Tactile Warning (Knurling): Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous by the authority having jurisdiction.

3. Features:
 - a. Ability to communicate unit's communication status.
 - b. Visual tri-colored LED indicators that indicate activation, additional PIN code credential required, operational systems status, system error conditions and low power conditions.
 - c. Visual bi-colored LED indicator on interior that is capable of indicating secured/unsecured status of device to occupants on interior.
 - d. Audible feedback that can be enabled or disabled.
 - e. Tamper-Resistant Screws: Tamper torx screws on inside escutcheon for increased security.

4. Adaptability:
 - a. Open Architecture: Locksets manufactured with open architecture characteristics capable of handling new and existing access control software and credential reading technology.
 - b. Field changeable Reader Modules: Lockset to have the ability to change credential reader technologies without being removed from door.

5. Switches: Provide locksets with the following switches, standard:
 - a. Door Position Switch
 - b. Interior Cover Tamper Guard
 - c. Mechanical Key Override
 - d. Request to Exit
 - e. Request to Enter
 - f. Unlock/Lock Status (Clutch Position).

6. Credential Reader:
 - a. Credential Reader Configuration: Provide credential reader modules in the following configurations, as indicated in door hardware sets. Multi-tech contactless reader shall be NFC-Compatible and read access control data from both 125 kHz and 13.56 MHz contactless smart cards. The multi-tech contactless reader shall be optimally designed for use in access control applications that require reading both 125 kHz proximity and 13.56 MHz contactless smart cards.
 - 1). Proximity, Smartcard, Multi-Technology and keypad.
 - b. Credential reader capabilities, which can be configured at lockset with handheld programming device and remotely by Partner software to include, but may not be limited to:
 - 1). 13.56 MHz Smart card credentials:

- a) Secure section (Multi-Technology and Smartcard): Schlage, XceedID ISO-X, MIFARE, ISO-X Lite, my-d, DESFire 8-EV1.
 - b) 13.56 MHz Serial number only (Multi-Technology and Smartcard): MIFARE, DESfire, iClass, Inside Pictotag, ST Micro, TI Tagit.
 - c) 125 kHz Proximity card credentials: Schlage, XceedID, HID, GE/CASI ProxLite and AWID. NOTE: Multi-tech reader.
- 2). Dual credential reading capabilities credential card or fob and PIN.
 - 3). 12 button keypad with backlit buttons.
7. Operation:
- a. Lockset System Interface:
 - 1). Directly via RS485.
 - b. Lockset to have real-time bidirectional communication between access control system and lock.
 - c. Credential Verification Time: less than 1 second.
 - d. When Utilized with Access Control Network Software With Remote Commanding Capability: Lockset shall have ability to be remotely locked down or unlocked within 10 seconds or less without user interface at the device.
 - e. Upon Loss of Power to Lockset: Lockset shall have ability to manage access control offline in one of three methods below that can be configured in the field at lockset by handheld programming device and remotely by Partner integrated software:
 - 1). Fail locked (secured)
 - 2). Fail unlocked (unsecured)
 - 3). Fail As-Is
 - f. Upon Loss of Communication Between Lockset and Network: Lockset shall have ability to manage access control offline in one of four methods below that can be configured in the field at lockset by handheld programming device and remotely by Partner integrated software:
 - 1). Fail locked (secured)
 - 2). Fail unlocked (unsecured)
 - 3). Fail As-Is
 - 4). Fail to Degraded/cache mode utilizing cache memory with following selectable options:
 - a) Grant access up to the last 1,000 unique previously accepted User IDs.

- b) Grant access up to the last 1,000 unique previously accepted facility/site codes
 - c) Remove from cache previously stored User IDs or facility/site codes that have not been presented to lock within the last 5 days.

 - g. Lockset shall have ability to be configured at door by handheld programming device and remotely by Partner integrated software the length of time device is unlocked upon access grant.
 - h. Lockset shall have the ability to communicate identifying information such as firmware versions, hardware versions, serial numbers, and manufacturing dates by handheld programming device and remotely by Partner integrated software.
- F. Acceptable and Approved exit devices are as follows:

1. Schlage	AD-300-MS/MD
2. Schlage	AD-400-MS/MD
3. Schlage	AD-300-993
4. Schlage	AD-400-993

2.11 Door Closers

- A. All door closers for this project shall be the product of one of the manufacturer and shall have cast iron cylinders.
- B. The cast iron door closer cylinder shall be a Class 30 gray iron with a minimum 180RBH hardness.
- C. Door closers shall be full rack and pinion type construction, non-handed and adjustable spring power size 1 through 6 in accordance with ANSI A117.1 handicapped code.
- D. All closers shall have separate adjustable, non-critical key control valves, one each for the following:
 - 1. Closing Speed
 - 2. Latching Speed
 - 3. Back check and/or delayed action
- E. All closers to have metal covers with MTLPC finish.
- F. The spindle shall be heavy-duty heat-treated steel construction; piston to be one-piece forged steel.
- G. Closer fluid shall be of type that requires no seasonal adjustment from –30F to 120F.

- H. The installing contractor shall be responsible for proper installation of door closers in accordance with degree of opening indicated on hardware schedule. The installing contractor shall be responsible for adjustment of the three individual valves, for proper control as follows:
 - 1. Closing speed
 - 2. Latching speed
 - 3. Delayed action, or backcheck
 - I. All door closers shall be listed by Underwriters Laboratories for use on self-closing fire rated doors.
 - J. All door closers shall carry a minimum ten (10) year warranty.
 - K. Pressure relief valve feature is not accepted on door closers.
 - L. All door closers on exterior doors shall be located on the interior side of the building.
 - M. Acceptable and Approved devices are as follows:
 - 1. 1. LCN 4040XP EDA Series; LCN 1460T-B Series (for dorm rooms)
- 2.12 Electro-Hydraulic Automatic Operators (Verify With university)
- A. Requirements:
 - 1. Provide low energy automatic operator units with hydraulic closer complying with ANSI A156.19.
 - 2. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
 - 3. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check, and opening and closing speed adjustment valves to control door
 - 4. Provide units with on/off switch for manual operation, motor start up delay, vestibule interface delay, electric lock delay, and door hold open delay.
 - 5. Provide units with conventional door closer opening and closing forces unless power operator motor is activated. Provide door closer assembly with adjustable spring size, back-check valve, sweep valve, latch valve to control door.
 - 6. Provide drop plates, brackets, or adapters for arms as required for details.
 - 7. Provide hard-wired actuator switches for operation as specified.
 - 8. Provide weather-resistant actuators at exterior applications.

9. Provide key switches with LED's, recommended and approved by manufacturer of automatic operator as required for function described in operation description of hardware group below. Cylinders: Refer to "KEYING" article, herein.
10. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
11. Provide units with vestibule inputs that allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.
12. Provide a 1 channel wireless receiver with sequencing feature.
13. Provide handheld 1/2/3/4 channel wireless transmitters as required. (Verify with University)
14. Provide 4-1/2" round wall mounted hardwired actuators. Provide jamb mounted actuators where wall mounting is not feasible.
15. Bollard posts will not be accepted without prior owner approval.

B. Acceptable and Approved devices are as follows:

1. LCN 4600 Series

C. Acceptable and Approved actuators are as follows:

1. LCN 8310-856
2. LCN 8310-818
3. LCN 8310-861/2/3/4

2.13 Electro-Mechanical Automatic Operators (Verify with University)

A. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19.
 - a. Opening: Powered by DC motor working through reduction gears.
 - b. Closing: Spring force.
 - c. Manual, hydraulic, or chain drive closers: Not permitted.
 - d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
 - e. Cover: Aluminum

2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, or adapters for arms as required to suit details.
4. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by Architect. Locate actuators, key switches, and other controls as directed by Architect.
7. Provide units with inputs for smoke evacuation doors, where specified, which allow doors to power open upon fire alarm activation and hold open indefinitely or until fire alarm is reset, presence detector input, which prevents closed door from opening or door that is fully opened from closing, hold open toggle input, which allows remote activation for indefinite hold open and close second time input is activated, vestibule inputs, which allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.
8. Provide a 1 channel wireless receiver with sequencing feature.
9. Provide handheld 1/2/3/4 channel wireless transmitters as required. (Verify with University)
10. Provide 4-1/2" round wall mounted hardwired actuators. Provide jamb mounted actuators where wall mounting is not feasible.
11. Bollard posts will not be accepted without prior owner approval.

B. Acceptable and Approved devices are as follows:

1. LCN 8310-856
2. LCN 8310-818
3. LCN 8310-861/2/3/4

2.14 Doors Stops

- A. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements.
- B. Wall type bumpers with a concealed type flange shall be used wherever possible and shall be one of the following:

1. H.B. Ives WS406
2. Rockwood 407

C. Where wall type bumpers cannot be used, such as on unreinforced partitions or in situations where door comes in contact with material such as glass, or any other obstruction, provide dome type floor stops of the proper height.

1. H.B. Ives FB13, FB17
2. Rockwood 467

D. Where wall type bumpers cannot be used and floor stop presents a tripping hazard, such as doors that swings more than 140 degrees before striking a wall or in situations where door comes in contact with material such as glass, or any other obstruction, provide heavy duty surface mounted overhead stops of the proper size.

1. Glynn-Johnson 90 Series
2. Glynn-Johnson 100 Series (Aluminum Entrances)

2.15 Push/Pulls

A. Pull Handles:

1. Pull units shall consist of offset 1" diameter round stainless steel bar, 10" center-to-center, with 2" minimum projection and 1-1/2" clearance.
2. Acceptable and Approved as follows:
 - a. Ives 8103
 - b. Rockwood 111

3. Push plates to be provided for push side of door.

B. Push Bars: Provide a push bar at full glass doors. Push bar to be 1" diameter, 2-1/2" projection.

1. Acceptable and Approved as follows:
 - a. Ives 9100
 - b. Rockwood 47

2.16 Kick and Mop Plates

A. Kickplates shall be .050 gauge solid stainless steel

1. 10" by 2" less than door width for singles.
2. 10" by 1" less than door width for pairs.

- B. Kickplates shall be applied on the push side of all doors where noted.
- C. Mop plates shall be .050 gauge solid stainless steel, 10” by 1” less than door width.
- D. Mop plates shall be applied on the pull side of all doors where noted.
- E. All kick and mop plates to be beveled three sides.
- F. Acceptable and Approved as follows:
 - 1. Ives 8400 B3E
 - 2. Rockwood .050 B3E

2.17 Flush Bolts

- A. Constant latching extension flush bolts shall have forged bronze faceplate with extruded brass lever and with wrought brass guide and strike. Rods for flush bolts shall be 12” steel or brass for doors up to 7’6” in height. Where doors are over 7’6” in height the flush bolt rod length shall be increased in increments of 6” for each 6” of additional door height. Plate size shall be 6-3/4” x 1” to meet ANSI A115 and SDI specifications. Bolt projection shall be 5/8”.
- B. Floor strikes for flush bolts shall be dustproof type cast or extruded bronze with cast bronze floor plate minimum 3-1/2” x 1-5/8” with masonry anchors for concrete floor provided a dustproof strike for sill application, for all bottom flush bolts for pairs of doors.
- C. Acceptable and Approved as follows:
 - 1. Ives FB51P x DP2
 - 2. Trimco 3820 x 3910

2.18 Surface Bolts

- A. Where surface bolts are specified, it is required that both top and bottom bolts be supplied. For doors up to 7’6” the top bolt shall be 8”. Where doors are over 7’6” in height the surface bolt length shall be increased in increments of 6” for each 6” of additional door height.
- B. Acceptable and Approved as follows:
 - 1. Ives 453
 - 2. Trimco 3922

2.19 Electric Strikes

- A. Electric strikes shall be monitor type for use with mortise locks on single doors or pairs.
 - B. Strikes shall fit standard A115.3 frame cut-out with modification.
 - C. One piece faceplate and body to be of drop-forged brass.
 - D. Provide appropriate transformer and rectifier with each electric strike.
 - E. Acceptable and Approved as follows:
 - 1. VonDuprin 6000-DS Series
 - 2. Folger Adams 310/700-LCMLBM Series
- 2.20 Weatherstripping
- A. To be provided at all exterior doors.
 - 1. Jamb and head seal. Replaceable bumper in surface mounted extruded aluminum housing. Gray Solid silicone, hollow bulb or loop.
 - 2. Bottom sweep seal. Replaceable sweep in surface mounted extruded aluminum housing. Gray Solid silicone.
 - 3. Finish to match other door hardware.
 - B. Acceptable and Approved as follows:
 - 1. National Guard Products 200S Series; 137S Series
 - 2. Pemko Manufacturing 315 Series; 297S Series
 - 3. Reese Enterprises 322 Series; 403 Series
- 2.21 Thresholds
- A. To be provided at all exterior doors.
 - 1. Aluminum storefront to be 5" wide x ½" high saddle
 - 2. Hollow metal public doors to be 5" wide x ¼" high bumper type.
 - 3. Mechanical spaces to be 5" wide x ½" high bumper type.
 - B. Ribbed aluminum, minimum of 5" wide. Finish to match other door hardware. Width shall cover joints between interior floor surface and exterior walking surface where applicable.
 - C. Provide sealant for setting of thresholds.
 - D. Acceptable and Approved as follows:
 - 1. National Guard Products 425 Series, 896S Series, 804S Series

- | | |
|------------------------|--|
| 2. Pemko Manufacturing | 1715 Series, 2005AT Series, 177AT Series |
| 3. Reese Enterprises | S205A Series, S483AS Series, S487AU Series |

E. Select styles and modify types indicated above, to suit actual conditions, changes in elevation, and to fit door hardware and frames.

PART 3 – EXECUTION

3.01 Hardware

- A. Mount hardware units at heights indicated in “Recommended Locations for Builders Hardware” for (Standard Steel Doors and Frames), (Custom Steel Doors and Frames), (Wood Doors and Frames) by the Door and Hardware Institute (DHI), except if otherwise specifically indicated or to comply with requirements of governing regulations, requirements for the handicapped, or if otherwise directed by the Architect.
- B. Degree of opening for doors with overhead holders, closers, etc., shall be included in the hardware schedule for the Architect’s approval.
- C. All hardware shall be installed or supervised by tradesmen skilled in the application of commercial grade hardware.
- D. Install each hardware item in compliance with the instructions and recommendations. Securely fasten all parts to be attached. Fit faces of mortised parts snug and flush. Make sure all operating parts move freely and smoothly without binding, sticking or excessive clearance. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, the hardware shall be removed and stored prior to the painting or finishing. Items shall then be reinstalled only when the finishes have been completed on the surface to which the hardware is to be applied.
- E. Do not modify openings in existing fire-rated/label doors in field.
- F. At exterior doors and elsewhere as indicated, set thresholds in a bed of sealant as specified in Section 07900 to completely fill concealed voids and exclude moisture from every source. Do not plug drain holes or block weeps. Remove excess sealant.
- G. After installation, representative templates, instruction sheets and installation details shall be placed in a file folder to be turned over to the Owner when the building is accepted. Included shall be at least five (5) each of any special adjusting and/or installation tools furnished with the hardware by the manufacturer.
- H. Post-Installation Walk Through: Prior to substantial completion, contractor shall schedule post-installation walk through with hardware supplier, lock, exit device, and door closer manufacturers’ representative(s), to inspect installation of door hardware

to insure that all hardware is functioning correctly. Provide complete list of findings and recommendations to Architect.

3.02 Adjusting and Cleaning

- A. Adjust and check each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
- B. Occupancy adjustment: Whenever hardware is installed more than one month prior to building acceptance or occupancy of a space or area, the installer shall return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items. Hardware shall be cleaned as necessary to restore correct operation, function, and finish. Door control devices shall be adjusted to compensate for the final operation of heating and ventilating equipment.
- C. Final Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.03 Protection

- A. Whenever hardware is located in areas where it may be subject to damage during construction by handling, cleaning, etc., (i.e. painting, cleaning of bricks) it shall be protected and/or removed from its location until the hazardous condition is terminated.

3.04 The following are suggested hardware groups that may be used at the university. It is the specifier's responsibility to review them for completeness and make final edits as required for the project.

Hardware Group No. 01 - Exterior Door – Access Control & Auto Operator

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Cont. Hinge	112HD EPT	628	IVE
2	EA	Power Transfer	EPT10	689	VON
1	EA	Keyed Removable Mullion	KR4954-MT54	SP28	VON
1	EA	Elec Panic Hardware	RX-LC-CD-99-EO	626	VON
1	EA	Elec Panic Hardware	RX-LC-QEL+-SD-99-NL-OP-LESS TRIM-110	626	VON
3	EA	Sfic Mortise Cyl.	80-102	626	SCH
1	EA	Sfic Rim Housing	80-129	626	SCH
4	EA	Sfic Const Core	80-035	GRN	SCH
4	EA	Sfic Everest 29 Core	80-036	626	SCH
2	EA	90 Deg Offset Pull	8190 10"	630	IVE
1	EA	Oh Stop	100S	630	GLY
1	EA	Closer	4040XP Arm as required	MTLPC	LCN
1	EA	Surf. Auto Operator	9542	689	LCN

1	EA	Weather Ring	8310-800	689	LCN
2	EA	Actuator, Wall Mount	8310-856	630	LCN
2	EA	Door Sweep	200SA	CL	NGP
1	EA	Threshold	425	AL	NGP
1	EA	Multitech Reader	MTK15	BLK	SCE
2	EA	Door Contact	679-05HM	BLK	SCE
1	EA	Power Supply	PS902 2RS	LGR	VON

Card Reader connections by campus security contractor.

The card reader releases the RHR leaf exit device and turns on the exterior actuator.

The inside actuator is active at all times.

Seals by Door Manufacturer.

Hardware Group No. 02 - Exterior Door

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Cont. Hinge	112HD EPT	628	IVE
2	EA	Power Transfer	EPT10	689	VON
1	EA	Keyed Removable Mullion	KR4954-MT54	SP28	VON
2	EA	Elec Panic Hardware	RX-LC-CD-99-EO	626	VON
3	EA	Sfic Mortise Cyl.	80-102	626	SCH
3	EA	Sfic Const Core	80-035	GRN	SCH
3	EA	Sfic Everest 29 Core	80-036	626	SCH
2	EA	90 Deg Offset Pull	8190 10" O	630	IVE
2	EA	Oh Stop	100S	630	GLY
2	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
2	EA	Door Sweep	200SA	CL	NGP
1	EA	Threshold	425	AL	NGP
2	EA	Door Contact	679-05HM	BLK	SCE

Seals by Door Manufacturer.

Hardware Group No. 03 - Vestibule Door – Auto Operator

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Cont. Hinge	112HD	628	IVE
2	EA	Push/Pull Bar	9190-10"-STD	630	IVE
1	EA	Oh Stop	100S	630	GLY
1	EA	Closer	4040XP Arm as required	MTLPC	LCN
1	EA	Surf. Auto Operator	9542	689	LCN
2	EA	Actuator, Wall Mount	8310-856	630	LCN

Seals by Door Manufacturer

Hardware Group No. 04 - Vestibule Door

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Cont. Hinge	112HD	628	IVE
2	EA	Push/Pull Bar	9190-10"-STD	630	IVE
2	EA	Oh Stop	100S	630	GLY
2	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN

Hardware Group No. 05 – Exterior Door – Access Control – Single

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	224HD EPT	628	IVE
1	EA	Power Transfer	EPT10	689	VON

1	EA	Elec Classroom Lock	AD-300-MS-70-MTK-ATH-BD	626	SCE
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	4040XP Arm as required	628	IVE
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	EA	Wall Stop	WS407CCV	630	IVE
1	SE T	Seals	137SA	AL	NGP
1	EA	Door Sweep	200SA	CL	NGP
1	EA	Threshold	425	AL	NGP

Hardware Group No. 06 – Exterior Pair – Mechanical Space

Qty		Description	Catalog Number	Finish	Mfr
6	EA	Hinge	5BB1 4.5 X 4.5 NRP	630	IVE
1	SET	Const Latching Bolt	FB51P	630	IVE
1	EA	Dust Proof Strike	DP2	626	IVE
1	EA	Storeroom Lock	L9080BD 07N	626	SCH
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Oh Stop & Holder	90 SERIES AS REQUIRED	630	GLY
1	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
2	EA	Kick Plate	8400 10" X 1" LDW	630	IVE
1	SET	Seals	137SA	AL	NGP
2	EA	Door Sweep	200SA	CL	NGP
1	EA	Threshold	425	AL	NGP
2	EA	Door Contact	679-05HM	BLK	SCE

Hardware Group No. 07 – Exterior Single – Mechanical Space

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	Storeroom Lock	L9080BD 07N	626	SCH
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	SET	Seals	137SA	AL	NGP
1	EA	Door Sweep	200SA	CL	NGP
1	EA	Threshold	425	AL	NGP
1	EA	Door Contact	679-05HM	BLK	SCE

Hardware Group No. 08 – Interior Pair – Access Control

Qty		Description	Catalog Number	Finish	Mfr
6	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
2	EA	Power Transfer	EPT10	689	VON
1	EA	Keyed Removable Mullion	KR4954-MT54	SP28	VON
1	EA	Elec Classroom Lock	AD-300-993R-70-MTK-ATH-BD	626	SCE
2	EA	Panic Hardware	RX-LC-CD-99-EO	626	VON
3	EA	Sfic Mortise Cyl.	80-102	626	SCH
4	EA	Sfic Const Core	80-035	GRN	SCH
4	EA	Sfic Everest 29 Core	80-036	626	SCH

2	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
2	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
2	SET	Seals	5050CL	CLR	NGP

Hardware Group No. 09 – Single Interior – Access Control

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Power Transfer	EPT10	689	VON
1	EA	Elec Classroom Lock	AD-300-993R-70-MTK-ATH-BD	626	SCE
1	EA	Fire Exit Hardware	RX-LC-99-EO-F	626	VON
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	SET	Seals	5050CL	CLR	NGP

Card Reader connections by campus security contractor.

Hardware Group No. 10 – Interior Pair – Storage

Qty		Description	Catalog Number	Finish	Mfr
6	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	SET	Const Latching Bolt	FB51P	630	IVE
1	EA	Dust Proof Strike	DP2	626	IVE
1	EA	Storeroom Lock	L9080BD 07N	626	SCH
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Coordinator	COR X FL	628	IVE
2	EA	Mounting Bracket	MB	689	IVE
2	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
2	EA	Kick Plate	8400 10" X 1" LDW	630	IVE
2	EA	Wall Stop	WS407CCV	630	IVE
1	SET	Seals	5050CL	CLR	NGP

Hardware Group No. 11 – Interior Single – Storage

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Storeroom Lock	L9080BD 07N	626	SCH
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	4040XP Arm as required	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	EA	Wall Stop	WS407CCV	630	IVE
1	SET	Seals	5050CL	CLR	NGP

Hardware Group No. 12 – Multi-Use Washroom

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5	652	IVE
1	EA	Classroom Dead Lock	L463BD	626	SCH
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Push Plate	8200 4" X 16"	630	IVE
1	EA	Pull Plate	8303 10" 4" X 16"	630	IVE

1	EA	Closer	4040XP Arm as required	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	EA	Wall Stop	WS407CCV	630	IVE

Hardware Group No. 13 – Interior Single – Classroom

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Classroom Security Lock	L9071BD 07N	626	SCH
2	EA	Sfic Const Core	80-035	GRN	SCH
2	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	4040XP Arm as required – if fire rated	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	EA	Wall Stop	WS407CCV	630	IVE
1	SET	Seals	5050CL – If fire rated	CLR	NGP

Hardware Group No. 14 – Interior Single – Office

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Office Lock	L9050BD 07N	626	SCH
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	4040XP Arm as required – if fire rated	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	EA	Wall Stop	WS407CCV	630	IVE
1	SET	Seals	5050CL – If fire rated	CLR	NGP

Hardware Group No. 15 – Interior Single – Dorm – Wireless

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Elec Classroom Lock	AD-400-MS-70-MTK-ATH-BD	626	SCE
1	EA	Sfic Const Core	80-035	GRN	SCH
1	EA	Sfic Everest 29 Core	80-036	626	SCH
1	EA	Surface Closer	1460T	MTLPC	LCN
1	EA	Kick Plate	8400 10" X 2" LDW	630	IVE
1	EA	Wall Stop	WS407CCV	630	IVE
1	SET	Seals	5050CL – If fire rated	CLR	NGP
1	EA	Viewer	U698	626	IVE

End of Division 08 7100

This section of the NIU Design Requirements establishes minimum requirements only.

It should not be used as a complete specification.



February 2012, Rev. 00

08 7400 – Access Control

PART 1. GENERAL

1.01 Summary

A. This Standard covers:

1. Lock cylinder and keys
2. AD Series Integrated locks
3. Proximity Readers with Controllers and Cards
4. Knox Box

B. NIU issues:

1. All programming issues with proximity systems shall be brought to the attention of the Owner's Key Control Manager for resolution.
2. Upon completion of the proximity system installation, the system shall be programmed to the Owner's server.
3. The Owner reserves the right to perform inspections at any time during the project.

1.02 Submittals

A. ANSI – Upon request of the Architect, the hardware manufacturers will issue letters of compliance that their products meet with ANSI standards, have been tested, and are the grades required.

B. Supplier – A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than five (5) years, and who is or has in employment an Architectural Hardware Consultant (AHC) in good standing as certified by the Door and Hardware Institute or equivalent. This consultant shall have experience in the preparation of Architectural hardware specifications, estimating, detailing, ordering, and servicing of Architectural hardware and will be available at reasonable times during the course of the work for hardware consultation with the Owner, Architect and Contractor.

C. Templates – The Hardware Supplier shall provide necessary templates and/or physical hardware to all trades requiring them in order to cut, reinforce, or otherwise prepare their material or product to receive the hardware item. In the event that physical hardware is required by any manufacturer, the Hardware Supplier shall ship to them such hardware via prepaid freight in sufficient time to prevent any delay in execution of their work.

- D. All hardware provided and installed shall comply with all regulatory agency requirements including the Americans with Disabilities Act, Illinois Accessibility Requirements and NFPA 101 Life Safety Code.
- 1.03 References
- A. Access Control hardware in this section shall meet the following standards as established by the American National Standards Institute, Inc. (ANSI) which is sponsored by the Builders Hardware Manufacturers Association, Inc. (BHMA). Product tests are to be administered by the ETL Testing Laboratories, Inc., Underwriters Laboratories, or other official testing laboratories, which have been designated by BHMA for the testing of ANSI standards. The standards latest revision will be in effect.
1. Locks & Lock Trim ANSI A156.2 Grade 1
- 1.04 Warranty
- A. The finish hardware shall carry a limited warranty against defects in workmanship and operation for a period of one year or as listed below from date of final acceptance. No liability is to be assumed where damage or faulty operation is due from abuse, improper usage, improper installation or failure to exercise normal maintenance.
- B. The finish hardware shall be delivered in good condition, expeditiously as possible.
- C. The finish hardware shall be wrapped and covered to eliminate any deterioration caused by weather or freak occurrences.
- PART 2. PRODUCTS
- 2.01 Manufacturers:
- A. NIU uses Schlage products and systems exclusively
- 2.02 Knox Box
- A. The Owner shall provide an emergency key lock box (Knox Box) where directed by local Fire Department (and/or NIU Fire and Safety Officer). Knox Boxes shall be ordered through the DeKalb Fire Department and be Model 4400. NIU Key Control will provide the keys requested by the DeKalb Fire Department.
- 2.03 Keying
- A. All locks and cylinders shall be keyed to the existing SCHLAGE GMK system as required by the owner's instruction.

- B. It is required that the key systems have visual key control and that all keys and cylinders be stamped with the alphanumeric key symbol designated for each key change as recommended by the Owner’s Key Control Manager.
- C. Provide six (6) construction master keys to be supplied with the locksets to the General Contractor. The construction master key shall operate all locks and cylinders, and shall permit access to all areas by the General Contractor, during the construction period, prior to the owner assuming control of the building.
- D. Upon completion of the building, the Owner shall remove the construction cores by means of a control key to be supplied by the finish hardware contractor and install the permanent master keyed cores.
- E. Provide to the Owner the requested number of cut keys and blanks for each core combination.
- F. Deliver all keys to:
 - Key Control
 - c/o Ms. Char Marx
 - Northern Illinois University
 - Physical Plant Building
 - 100 West Stadium Drive
 - DeKalb, IL 60115

2.04 AD Series Integrated Locks

A. General

1. BHMA/ANSI 156.25 Grade 1 Security and Operational
2. Cylindrical / Mortise Key-In-Lever on all chassis
3. Built in Door Position Switch
4. Built in Request to Exit Switch
5. Adaptability: Without removing lock from door
6. Credential Reader
7. Offline to Online Network
8. 4AA to 8AA Battery Module
9. Lock Function (70, 50, 40, 60)

B. Codes and Certifications:

1. UL 294, Attack Class 1
2. UL 10 C
3. UL 2043 Plenum (For PIM / PIB)
4. BHMA/ANSI 156.25 Grade 1 Operation and Security
 - a). A156.2

- b). A156.3
- c). A156.12
- d). A156.13

- 5. NFPA 101 – Ch 7
- 6. NFPA 80 – Ch 6 & 7
- 7. IBC – Ch 10
- 8. ADA – Ch 4.13
- 9. FCC Part 14

C. Power Failure Mode:

- 1. FSE/FSA driven by electronic motor in place of solenoid
- 2. Hardwired utilizes capacitor if 12/24VDC power is lost
- 3. Field configurable

D. Communication Failure Mode:

- 1. FSE/FSA driven by electric motor
- 2. Cache Mode manages access without Host
- 3. Field Configurable

E. 900 MHz Wireless Communication:

- 1. Wake-up ON Radio (WOR)
 - a). Centralized lock/unlock to wireless devices in <10 sec
 - b). Maintain up to 2 yr battery life

F. Interior Push Button on Network Locks:

- 1. Input to Host Hardware
- 2. Ability to simulate Office, Privacy, & Apartment Function

G. Expanded Offline Capacity:

- 1. Stand-A-Lone programmed at the lock: (specified number users and audits)
- 2. Stand-A-Lone computer manage: (specified Audits)

H. Audible Indicator:

- 1. Configurable On/Off

I. Acceptable and Approved as follows:

- 1. Schlage AD300-MS series as scheduled

2.05 Proximity Readers with Controllers and Cards

- A. Reader Controller: Schlage “SRCNX-R” model with 24 reader interfaces as required.
- B. Reader Interface: Schlage “SRINX” model which is compatible with various read head technologies.
- C. I/O Expansion Board: Schlage SIONX-8 Model with 8 relays. Provide one SIONX-8 Board with each SRCNX-R controller.
- D. Upon request by the Owner, provide one handheld device (HHD) for the project. The HHD unit is the link between the access control software and the electronic offline locks. The HHD unit is used to initialize and configure the network devices.
- E. Proximity Readers: Schlage SXF1050 mini-mullion readers.
- F. All wiring to be supplied and pulled by the system integrator. All connections to the existing Schlage SMS software system, programming and training shall be done by the Owner.
- G. Upon completion of the project, the Owner shall provide cards to all personnel authorized to utilize the system.

2.06 Cylinders

- A. All cylinders shall be Schlage, seven pin small format interchangeable core type, keyed to the existing master key system.
- B. All cylinders are to be provided with two key blanks and stamped “Do Not Duplicate” on the reverse.
- C. Deliver all keys to:
 - Key Control
 - c/o Ms. Char Marx
 - Northern Illinois University
 - Physical Plant Building
 - 100 West Stadium Drive
 - DeKalb, IL 60115
- D. Acceptable and Approved as follows:
 - 1. Schlage – Everest SFIC, seven pin.

PART 3. EXECUTION

3.01 Installation

- A. All hardware shall be installed or supervised by tradesmen skilled in the application of commercial grade hardware.
 - B. Install each hardware item in compliance with the instructions and recommendations.
- 3.02 Adjusting and cleaning
- A. Adjust and check each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
 - B. Final adjustment: Whenever hardware is installed more than one month prior to building acceptance of occupancy of a space or area, the installer shall return to the work during the week prior to acceptance or occupancy and make a final check and adjustment of all hardware items. Hardware shall be cleaned as necessary to restore correct operation, function, and finish.
 - C. Upon completion of the project, the Owner shall remove the construction cores by means of a control key to be supplied by the hardware contractor and install the permanent master keyed cores.

End of Division 08 7400

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

December 2013, Rev. 01

09 9100 - Painting

PART 1. GENERAL

1.01 Requirements:

- A. Any changes from this standard shall be submitted to and be approved by the Project Manager.
- B. All design, remodeling and construction shall meet all appropriate Federal, State and Local codes.

1.02 Submittals

- A. Submittals for all paints and coatings and associated colors shall be based upon the Benjamin Moore color system.
- B. Submittals for all paints and coatings and associated colors shall be provided to the Owner for approval prior to application. Substitutions of approved materials, colors or manufacturers shall be approved by the Owner.
- C. Beginning of application constitutes acceptance of these standards and conditions.
- D. Surface preparation and field painting of exposed interior items and surfaces.
- E. All Volatile Organic Compound (VOC) products shall conform to the Federal guidelines for VOC paints.

1.03 References

- A. American Society for Testing and Materials (ATSM) D 16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- B. PDCA (Painting and Decorating Contractors of America): P5 – Benchmark Sample Procedures for Paint and Other Decorative Coating Systems.
- C. Steel Structures Painting Council (SSPC) SP6 – Commercial Blast Cleaning Procedures.
- D. Steel Structures Painting Council (SSPC) SP10 – Near White Blast Cleaning Procedure.

1.04 Quality Assurance

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for the

Project with a record of successful in-service performance. A list of successful projects and contact list may be requested.

- B. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
 - C. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.
 - D. Apply water based paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 90 deg F.
 - E. Apply solvent-thinned paints only when temperature of surfaces to be painted and ambient air temperatures are between 45 and 95 deg F.
 - F. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.
 - G. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
 - H. The Contractor will be required to replace all unsatisfactory work caused by improper or defective surfaces as directed, at no additional cost to the Owner.
 - I. Inspections Agency: The Owner reserves the right to employ an independent testing agency to verify acceptability of substances and test coating quality, dry mil thickness, and conformance to application requirements.
- 1.05 Delivery, Storage, and Handling

- A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.
- C. Take necessary precautions to ensure that work areas, storage areas, and mixing areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.06 Extra Stock

- A. The installing Contractor shall supply to the Owner extra paint products used for future touch-up purposes. All paint materials and colors shall be clearly identified.

PART 2. PRODUCTS

2.01 Paints and coatings

- A. All paints and coatings shall be *architectural grade* as opposed to *contractor grade*.
- B. All paints and coatings shall conform to applicable code for flame/fuel/smoke ratings requirements.
- C. All paints and coatings shall be stored and applied in environmental conditions required by manufacturer’s instructions.
- D. All paints and coatings shall be applied in accordance with manufacturer’s instructions.
- E. All new work shall be a three-coat system. Different shades of color shall be used for each coat. The number of coats for existing work shall be as required to equal new work.
 - 1. Primer – one coat
 - 2. Finish – two coats
- F. The preferred materials and finishes for interior walls are those which are durable, easily maintained and resistant to normal occupancy damage. The use of vinyl wall covering and wood paneling will be considered for specific areas.
- G. **Interior wall paints shall be eggshell finish.** No flat finishes shall be permitted. Professional note: Where the wall substrate is drywall, continuing runs of wall of more than 25 feet shall be avoided, especially in corridors.
 - 1. The preferred colors for offices, hallways, and common areas are:

Color Description	Benjamin Moore Number
NIU White (NIU off-white mix)	1457
Navajo White	947
Hawthorne Yellow	HC-4
Manchester Tan	HC-81
Wythe Blue	HC-143
Revere Pewter	HC-172

- 2. Use NIU White for maintenance situations.

- H. Piping in mechanical and boiler rooms and above finished ceilings does not have to be painted, except for external corrosion-control piping. All other exposed piping shall be painted a color appropriate to the space.

2.02 Manufacturers

- A. Unless otherwise approved in advance in writing by the Project Architect or as otherwise specified, all painting materials shall be the products of one or more of the following manufacturers:

- | | |
|---------------|--|
| 1. B. Moore | Benjamin Moore & Co., Montvale, NJ |
| 2. Hydrozo | Hydrozo Coatings Co., Lincoln, NE |
| 3. ICI | ICI Paints, Cleveland, OH |
| 4. MAB | M.A. Bruder & Sons, Inc., Philadelphia, PA |
| 5. P&L | Pratt & Lambert, Inc., Chicago, IL |
| 6. Pittsburgh | PPG Architectural Finishes, Inc., Pittsburgh, PA |
| 7. SW | Sherwin-Williams Company, Cleveland, OH |

- B. Requests for substitutions will be considered in accordance with the provisions of Division 1 of Specification document.

2.03 Paint Materials – General

A. Material compatibility

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

- B. VOC content: Products shall comply with VOC limits of authorities having jurisdiction and , for interior paints and coatings applied at Project site, will be calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- C. Colors: refer to Finish Schedule and Paint Legend provided by Project Architect.

PART 3. EXECUTION

3.01 Examination

- A. Examine substrates, areas, and conditions, with applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work. Test surfaces as required.

1. Do not begin to apply paint until unsatisfactory conditions have be corrected and surfaces receiving paint are thoroughly dry.

2. No priming or painting of wood will be permitted on or in buildings where concrete, masonry, plaster, or other “wet” operations are in process of installation, application, or drying.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Masonry (Clay and CMU): 12 percent.
 3. Wood: 15 percent.
 4. Plaster: 12 percent.
 5. Gypsum Board: 12 percent.
- C. Inspect and verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
1. Beginning coating application constitutes Contractor’s acceptance of substrates and conditions.

3.02 Preparation

- A. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, electrical panel box doors and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing, replacing, and/or repainting, as acceptable to the NIU project representative. Provide “Wet Paint” signs to protect newly painted finishes. At completion of construction activities of other trades, touch up and restore all damaged or defaced painted surfaces.
- C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall onto wet, newly painted surfaces.

2. Provide barrier coats over incompatible primers or remove and re-prime. Notify NIU project representative in writing of problems anticipated with use of specified finish coat material with substrates primed by others.

3.03 Application

- A. Apply paints according to manufacturer's written instructions. Use applicators and techniques best suited for paint and substrate indicated. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- B. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required in order to produce an even, smooth surface in accordance with the manufacturer's directions. Sand lightly between each succeeding enamel or varnish coat.
- C. Apply first coat to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- D. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
- E. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
- F. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- G. All materials will be applied under adequate lighting, evenly spread and flowed on smoothly. Cut in sharp lines and color breaks.
 1. Pigmented (opaque) finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and overage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable.
 2. Transparent (clear) finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats.

3.04 Cleaning and protection

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.
- E. Provide “Wet Paint” signs as required to newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after competing painting operations.
- F. At completion of construction activities or other trades, touch up and restore damaged or defaced painted surfaces.

End of Division 09 9100

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

December 2012, Rev. 00

10 1000 – Miscellaneous Specialties

PART 1. GENERAL

1.01 Section Includes

- A. Automated external defibrillator and cabinet
- B. First Aid cabinet
- C. Waste and Recycling receptacles
- D. Ground sign
- E. Dimensional letter signage

1.02 Coordination

- A. Where applicable, furnish templates for placement of electrical or data service embedded in permanent construction by other installers.

1.03 Action Submittals

- A. Product Data: Submit for each type of product
- B. Shop Drawings: For all work of this section, showing necessary plans, elevations, colors, and finishes. **Do not fabricate or install any work before submittals are approved.**
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show mounting heights, locations of supplementary support to be provided by others, and accessories.
 - 3. Show locations of electrical or data service connections, where applicable.
 - 4. Include diagrams for power, signal, and control wiring.
- C. Samples for Verification: Where applicable, submit manufacturer's full range of colors for selection by Architect.

1.04 Closeout Submittals

- A. Maintenance Data: To include in maintenance manuals.

1.05 Quality Assurance

- A. Installer Qualifications: Use only personnel who are completely familiar with the manufacturer's recommended methods of installation and have completed work similar in material, design, and extent to that indicated in this section and whose work has resulted in construction with a record of successful in-service performance.

1.06 Warranty

A. Special Warranty for dimensional letter signage: Manufacturer agrees to repair or replace components of signs that fail in materials of workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

- a). Deterioration of finishes beyond normal weathering.
- b). Separation or delamination of sheet materials and components.

2. Warranty Period: Five years from date of Substantial Completion of project.

1.07 Field Conditions

A. Where applicable, verify location of electrical or data service embedded in permanent construction by other installers, by field measurements before fabrication, and indicate measurements on Shop Drawings.

PART 2. PRODUCTS

2.01 Automated External Defibrillator (AED) and Cabinet

A. Products:

1. Provide: Cardiac Science Corporation; Powerheart AED G3 Plus Semi-Automatic Defibrillator
 - a) AED Features: Semi-automatic defibrillator with voice prompts, text screen, Battery status indicator, pacemaker pulse detection and pediatric capability, pads, lithium battery, automatic self-tests, and event documentation. Include AED Starter kit and Ready kit.
 - b) AED Warranty: 7-year.
2. Provide: HeartStation RescueCase AED Wall Cabinet #RC5000R or #RC5000W. No substitutions allowed.
 - a) Cabinet Features: Alarm that is triggered when the door is opened. Include 12 volt Lithium Battery Pack.
 - b) Cabinet Construction: With see-through acrylic window.
 - c) Cabinet Mounting: Fully recessed RC5000R (for new construction).
 - d) Cabinet Mounting: Wall mounted RC5000W (for existing buildings).
 - e) Cabinet Color: White
 - f) Key Code Request: Use HeartStation RescueCase AED Cabinet key #2007.

2.02 First Aid Cabinets

- A. Subject to compliance with requirements and/or specific project contracts.
- 2.03 Waste and Recycling Receptacles – Within Resident Hall dining facilities and Resident Hall common or public areas:
- A. Products:
 - 1. Rubbermaid Silhouette DCR24TSESDL, Recycle Square Container, Blue.
Figure 1, example
 - 2. Rubbermaid Silhouette DCR24SPECBK, Landfill Square Container, Black
Figure 1, example
- 2.04 Waste and Recycling Receptacles – Within Resident Hall residential and office areas:
- A. Products inside residential clusters:
 - 1. Rubbermaid Untouchable FG26898BLA single stream trash can top, black
Figure 2, example
 - 2. Rubbermaid Untouchable FG356988 single stream trash container, black
Figure 3, example
 - 3. Rubbermaid Untouchable 1788374 single stream recycle top, blue
Figure 4, example
 - 4. Rubbermaid Untouchable FG356973BLU single stream recycle container, blue
Figure 5, example
 - B. Products in residential hallways:
 - 1. Rubbermaid Atrium Classic Container FG905800BLA, Funnel Top Imprinted, black
Figure 6, example
 - 2. Rubbermaid Glutton 1792339 two stream recycling container, blue
Figure 7, example
- 2.05 Ground Signs
- A. Subject to NIU Signage Standards
- 2.06 Dimensional Letter Signage
- A. Subject to NIU Signage Standards
- PART 3. EXECUTION
- 3.01 Examination
- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting work under this section.

- B. Where applicable verify that electrical or data service is correctly sized and located to accommodate components.
 - C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.02 Installation
- A. General: Install components using mounting methods indicated and according to manufacturer's written instructions.
- 3.03 Installation of signs
- A. Install interior signs according to manufacturer's specifications and/or NIU Signage Standards
- 3.04 Adjusting and Cleaning
- A. Remove and replace damaged or deformed products that do not comply with specified requirements. Replace damaged or deteriorated components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
 - B. Remove temporary protective coverings and strippable films where applicable.
 - C. On completion of installation, clean exposed surfaces of components according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish.



Figure 1, example



Figure 2, example



Figure 3 and 5, example



Figure 4, example



Figure 6, example



Figure 7, example

End of Division 10 1000

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.



March 2014, rev 00

10 1100 – Visual Display Surfaces

- The preferred manufacturer of white marker boards used at the University is Claridge.
www.claridgeproducts.com/

June 20 2013, Rev 00

10 2800 – Toilet, Bath, and Laundry Accessories

PART 1. GENERAL

1.01 This Section includes:

A. Toilet room accessories:

1. Grab bars
2. Metal framed mirrors
3. Sanitary vending unit
4. Sanitary disposal units
5. Toilet tissue dispenser
6. Paper towel dispenser
7. Electric hand dryer
8. Towel bars
9. Folding shower seat
10. Shower curtain rods
11. Shower curtain hooks
12. Shower curtains
13. Liquid soap dispenser

1.02 Submittals

A. It is preferred that all submittals to be submitted electronically in PDF format.

B. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify products using designations indicated.

D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

E. Warranty: Sample of special warranty.

1.03 Quality Assurance

- A. **Insert and Anchorages:** Furnish inserts and anchoring devices which will be surface mounted or recessed in metal stud wall with ceramic tile for the installation of toilet accessories. See Section 04 2000 for installation of masonry inserts and anchoring devices. Coordinate delivery with other work to avoid delay.
- B. **Products:**
 - 1. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas, whenever possible.
 - 2. Stamped names or labels on exposed faces of units will not be permitted.
 - 3. Provide locks where indicated, with the same keying for each type of accessory units, in the project, wherever possible. Furnish two keys for each lock.
 - 4. Comply with all features of model numbers specified.
- C. **Regulatory Requirements:** Products and finished installations to be used by handicapped persons must comply with requirements of Americans with Disabilities Act effective July 26, 1991 and Illinois Accessibility Code effective April 24, 1997.

PART 2. PRODUCTS

2.01 Materials

- A. **Stainless Steel:** AISI, Type 302/304, with satin finish, unless otherwise indicated in the specifications.
 - 1. Sheet: ASTM A167, Type 304.
 - 2. Tubing: ASTM A269.
- B. **Sheet Steel:** Cold rolled, commercial quality, ASTM A366. Surface preparation and metal pre-treatment as required for applied finish.
- C. **Galvanized Steel Sheet:** ASTM A527, G60.
- D. **Chromium Plating:** Nickel and chromium electro-deposited on metal, ASTM B456, Type SC2.
- E. **Galvanized Steel Mounting Devices:** ASTM A386, hot-dip galvanized after fabrication.
- F. **Exposed Security Fasteners:**
 - 1. Provide spanner head tamperproof security fasteners for anchoring work in exposed security areas.
 - 2. Finish shall match that specified of the item anchored.
 - 3. Provide tools for fastening devices.

2.02 Grab Bars

A. Stainless steel grab bars: Provide stainless steel grab bars as follows:

1. Mounting: Concealed mounting plate with escutcheon and vandal-proof set screws. Provide appropriate anchorage devices for wall materials as required.
2. Non-Slip Gripping Surfaces: Peened, knurled or striated; manufacturer's standard.
3. Size: 1-1/2" o.d., with wall thickness not less than 0.049" (18 ga.).
4. Configuration: As shown in drawings.

B. Acceptable Product/Manufacturer:

1. 12", 18", 24", 36", 42" (Where XX indicates specific length)
 - a). 3800xXX/ASI
 - b). B-6806xXX/Bohrick
 - c). 8122-001XX/Bradley

2.03 Mirrors

A. General:

1. Mirror Glass: 1/4" thick float or plate glass, conforming to FS DD-M-411b, with silvering, copper coating, and protective organic coating complying with FS DD-M-411. Provide 15 years minimum guarantee against silver spoilage.
2. Backing:
 - a). Resilient, non-absorbent filler material, with not less than 20 gauge galvanized steel backing plates, one-piece construction, full height and width of mirror frame. Corrugated cardboard or other moisture-absorbent filler material is not acceptable.
 - b). Construct metal backing plate with hanger slots for concealed "tamper-proof" mounting. Provide manufacturer's standard hanger to engage with backing for concealed installation.
3. Frame: Stainless steel with polished No. 5 finish, 20 gauge minimum, with square corners welded and ground smooth.
4. Integral Shelf: 4" deep, 18 gage satin finish, stainless steel shelf welded to frame. Shelf has flanged front and sides with welded and polished corners. Locations of integral shelf as indicated on drawings
5. Location and size as indicated on Drawings.
6. Mounting Height: 40" AFF maximum to bottom edge of reflecting surface, unless noted otherwise on Drawings.

B. Acceptable Product/Manufacturer:

1. 24" x 36"
 - a). 0600/ASI
 - b). B-290/Bohrick
 - c). 780/Bradley
2. 24" x 36" with steel shelf
 - a). 0605/ASI
 - b). B-292/Bohrick
 - c). 7805/Bradley
3. 24" x 36" tilted
 - a). 0537/ASI
 - b). B-293/Bohrick
 - c). 7405/Bradley

2.04 Sanitary Vending Units.

A. General:

1. Welded construction with stainless steel satin finish, 18 gauge doors, Type 304 stainless steel with full length piano hinges secured with tumbler locks. Single coin operation. Unit shall combine two dispensing mechanisms; one for sanitary napkins, the other for tampons. Units shall have no brand name advertising for products dispensed.
2. Location: Locate in Women's Toilet rooms as indicated on Drawings.
3. Mounting Height: Locate controls at 44" AFF maximum, unless noted otherwise on Drawings.
4. Installation: Semi-Recessed

B. Acceptable Product/Manufacturer:

1. 0464/ASI
2. B-352 25/Bohrick
3. 401/Bradley

2.05 Sanitary Disposal Units

A. General:

1. Welded construction with 22 gauge, Type 304 satin stainless steel finish. Flange is one piece seamless construction. Disposal door shall be secured to cabinet with full-length piano hinge.
2. Location: Locate in Women's Toilet rooms as indicated on Drawings.

3. Mounting Height: 28” AFF to top for Surface Mounted and Recessed models, 34” AFF to top for Partition Mounted (Shared) models, unless noted otherwise on Drawings.

B. Acceptable Product/Manufacturer:

1. Surface Mounted:

- a). 0852/ASI
- b). B-270/Bohrick
- c). 4781-15/Bradley

2.06 Toilet Tissue Dispensers

A. General:

1. Location: Provide at each water closet.
2. Mounting Height: 28” AFF to top, 30" from back wall, unless indicated otherwise on Drawings.

B. Acceptable Product/Manufacturer:

1. GP Jumbo Jr. Two Roll Bathroom Tissue Dispenser:
 - a). Georgia Pacific, GP #59209

2.07 Paper Towel Dispenser

A. General:

1. Location: As indicated on Drawings.
2. Mounting Height: 40” unless otherwise noted in Drawings

B. Acceptable Product/Manufacturer:

1. Paper Towel Dispenser
 - a). Renown #REN 05157

2.08 Electric Hand Dryer

A. General:

1. Die-cast aluminum casing with anti-microbial scuff resistant lacquer coating on exterior surfaces
2. Color finish: Metallic silver, gloss lacquer
3. Anti-microbially integrated external plastics and seals

4. Pressed anti-rust steel backplate
5. Tamper-proof T30 type exterior screws
6. Water ingress protection to IPX5
7. Electrical supply: 110-120 V AC, single phase 60 Hz, Rated power: 1400 W, 12.0A
8. Coordinate installation and electrical requirements with electrical contractor.
9. Location: Provide one electric hand dryer for each toilet room as shown on the Drawings.
10. Mounting Height: 34.25” AFF to top of machine, unless noted otherwise on Drawings

B. Acceptable Product/Manufacturer:

1. Dyson/Airblade
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation

C. Operation

1. Operation: Electronic-sensor activated with timed power cut-off switch.
 - a). Operating time: 30 to 40 seconds

2.09 Towel Bar

A. General:

1. Surface mounted towel bar shall be fabricated from Type 304, heavy gauge, No. 5 bright polished finish stainless steel; with nominal 2" x 2" escutcheons to conceal mounting fasteners.
2. Units shall be 3/4" square towel bar, 24" long, or as otherwise indicated on the drawings. Locate towel bars as indicated on Drawings.
3. Mounting Height: 48” AFF maximum to top of bar, unless noted otherwise on Drawings

B. Acceptable Product/Manufacturer: (Numbers listed are for polished finish)

1. 7360/ASI
2. B-673/Bobrick
3. 9055/Bradley

2.10 Folding Shower Seat

A. General:

1. L-shaped, right-hand and left-hand seat, of 5/16” thick (min) solid phenolic or blowmolded polyethylene, or Type 304 stainless steel. See Drawings for handing.
2. Frame and mounting brackets to be of Type 304 stainless steel, with self-locking mechanism, and suitable for wall mounting.
3. Location: As indicated on Drawings.
4. Mounting Height: 18” AFF to top of seat.

B. Acceptable Product/Manufacturer:

1. 8206-R and 8206-L / ASI
2. B-517 and B-518 / Bobrick
3. 9561 and 956 / Bradley

2.11 Shower Curtain Rod

A. General:

1. Type 304 stainless steel, satin finish, 20 gage, 1" diameter rod, with concealed mounting. Length as indicated on drawings.
2. Location: Provide at each shower location as indicated on Drawings.
3. Mounting Height: 80" above finished floor, unless indicated otherwise on Drawings.

B. Acceptable Product/Manufacturer

1. 1224 / ASI
2. 2. B-207 / Bobrick
3. 3. 9538 / Bradley

2.12 Shower Curtain Hooks

A. General:

1. Shower curtain hooks, chrome finish snap hook for 1” diameter rod.
2. Quantity: Provide 1 for every 6” of shower curtain rod length, plus 1 additional hook per rod.
3. Product/manufacturer:
 - a). 1200-SHU / ASI
 - b). 204-1 / Bobrick
 - c). 9536 / Bradley

2.13 Shower Curtain

A. General:

1. Vinyl shower curtain, flame resistant, anti-bacterial, with grommets for hooks.
2. Location: Provide one at each shower rod.
3. Product/manufacturer:
 - a). 1200-V / ASI
 - b). 204-2 / Bobrick
 - c). 9533 / Bradley

2.14 Liquid Soap Dispenser

A. General:

1. Location: As indicated on Drawings.
2. Mounting Height: 46" AFF maximum to control mechanism, unless noted otherwise on Drawings

B. Acceptable Product/Manufacturer:

1. Spartan 9765 Lite'N Foamy Soap Dispenser, White

PART 3. EXECUTION

3.01 Inspection

- A Examine the areas and conditions under which toilet room accessories are to be installed. Notify the Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until satisfactory conditions have been corrected.

3.02 Inspection:

- A Use concealed fastenings wherever possible.

B Contractor shall:

1. Furnish anchors, bolts and other necessary anchorages.
2. Furnish concealed mounting devices and fasteners fabricated of the same materials as the accessories, or of galvanized steel, as recommended by manufacturer.
3. Furnish exposed mounting devices and fasteners finished to match the accessories.
4. Furnish theft-resistant fasteners for all accessory mountings.
5. Install all toilet accessories as directed or as shown on the drawings in accord with manufacturer's instructions.
6. Install plumb and level, securely and rigidly anchored to substrate.

End of Div 10 2800



This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

January 2012, Rev 00

10 4400 – Fire Protection Specialties

PART 1. GENERAL

1.01 NIU Issues

- A. To the greatest extent possible, a cabinet shall be installed in an accessible corridor for every fire extinguisher required. Travel distance to a cabinet/extinguisher shall not exceed 75 feet, except that it shall not exceed 50 feet in areas that house flammable liquids.
- B. Fire extinguishers are maintained by NIU department of Environmental Health and Safety. Cabinets will be sized to accommodate the following unless otherwise specified:
 - 1. One 2½ gallon water pressure extinguisher.
- C. Fire extinguisher cabinets will be recessed unless existing conditions make semi-recessed or surface mounting necessary. Cabinets will be non-rated unless being installed in a fire rated wall.
- D. Specialty fire protection equipment, which includes but is not limited to, fire blankets and associated cabinets, will be addressed by the Project Manager and/or Project Architect.

1.02 Quality Assurance

- A. Furnish all fire extinguishers and brackets by one manufacturer. Furnish all specified fire extinguisher cabinets by one manufacturer as approved by Owner.
- B. Regulatory Requirements:
 - 1. National Fire Protection Association (NFPA) 10, most current version.
 - 2. Illinois Administrative Code 41, Chapter 1, Part 100 Fire Prevention and Safety

1.03 Summary

- A. This Section includes the following:
 - 1. Fire-protection cabinets for the following:
 - a). Portable fire extinguishers
 - 2. Signage for fire-protection cabinets.

3. Standard fire extinguishers utilized at NIU.

1.04 Submittals

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection cabinets.
 - 1. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Certification that fire extinguishers comply with classifications and requirements.

PART 2. PRODUCTS

2.01 Fire Protection Cabinet

- A. Manufacturers:
 - 1. Larsen's Manufacturing Company, or equal approved by Owner.
- B. Cabinet Material: Aluminum or Stainless-steel sheet.
- C. Door Style:
 - 1. In academic buildings: wired glass panel in frame.
 - 2. In residence halls: solid metal door.
- D. Door Hardware:
 - 1. Friction or magnetic catch and a pull handle.
 - 2. Provide continuous hinge, of same material and finish as trim permitting door to open 180 degrees.
- E. Accessories:
 - 1. Identification: Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER" in raised 2" lettering, applied to cabinet door.

2.02 Fire Protection Cabinet Fabrication

- A. Fire-Protection Cabinets: Provide manufacturer's standard box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

2.03 Fire Extinguishers

- A. Provide new extinguishers for each location shown on drawings, labeled and approved by acceptable testing agency.

1. Fire extinguishers shall be Ansul Sentry, Model AA05-1, 3A40BC, 5 lb. unless otherwise specified.

2.04 Fire Extinguisher Wall Signage

- A. Provide and install High Visibility, 3-dimensional, triangle-projection mounted sign above each fire extinguisher cabinet.

1. Material: Acrylic.
2. Size: 6 inches high, 9 inches wide, 4 inches deep with 2 mounting holes.
3. Signage wording: “FIRE Extinguisher” with down arrow, or as required by Authority Having Jurisdiction.
4. Color: Red background with white signage.
5. Installation: Surface mounted.

PART 3. EXECUTION

3.01 Examination

- A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Installation

- A. General: Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.

End of Section 10 4400

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.



March 2012, Draft 00

12 9300 – Site Furnishings

PART 1. GENERAL

1.01 This section includes:

- A. Div 12 9313 Bicycle Racks and Loops
- B. Div 12 9323 Waste Receptacles, Recycle Receptacles and Ash Urns
- C. Div 12 9333 Manufactured Planters (to be added)
- D. Div 12 9343 Site Seating
- E. Div 12 9343 Site Tables
- F. Site Bollards
- G. Post and Chain
- H. Div 10 7343 Bus Shelters

1.02 Installation locations for products under this standard shall be approved by A&E Services

PART 2. PRODUCTS

2.01 Bicycle Racks and Loops

A. Single unit Loops

- 1. Manufacturer: Wabash Valley Manufacturing, Inc. www.wabashvalley.com
 - a). Model BL100N, 36”, **Black (Figure 5)**
 - b). In ground

B. Multiple unit racks

- 1. Manufacturer: Cora Bike Rack, Inc. www.cora.com
 - a). Cora Expo ‘W’ Series Bicycle Rack (**Figure 6**)
 - b). Length to be determined by A&E Services
 - c). Surface mount

2.02 Waste and Recycle Receptacles

A. Manufacturer: Victor Stanley, Inc. www.victorstanley.com

B. Supplier: Howard L. White & Associates, Buffalo Grove, IL
<http://www.howardlwhite.com/>

- 1. Waste Receptacles: (**Figure 2**)

- a). Model S-42, Ironsites, Bethesda Series
 - b). 36 Gallon (136 Liter) PVC liner
 - c). Powder coated, **Black**
 - d). S-2 Dome top, powder coated, **Black**
2. Recycle Receptacles: **(Figure 1)**
- a). Model S-42, Ironsites, Bethesda Series
 - b). 36 Gallon (136 Liter) PVC liner
 - c). Powder coated, **Blue**
 - d). S-2 Dome top, powder coated, **Blue**
 - e). Recycle decal produced and applied by NIU Media Services
3. Ash Urns **(Figure 3, 4)**
- a). Model S-20, Ironsites, Bethesda Series
 - b). 6 Gallon
 - c). Powder coated, **Black**
 - d). Standard stainless-steel ashtray
- 2.03 Manufactured Planters **(to be added)**
- 2.04 Site Seating
- A. Manufacturer: Landscapeforms, Inc. www.landscapeforms.com
1. Benches, (backed) **(Figure 3)**
 - a). Scarborough
 - b). Backed, horizontal strap seat style
 - c). 28"x 34"x 72"
 - d). 28"x 34"x 24"
 - e). Surface mount
 - f). Powder coat, **Black**
 2. Benches, (backless)
 - a). Scarborough
 - b). Backless, horizontal strap seat style
 - c). 28"x 34"x 72"
 - d). Surface mount
 - e). Powder coat, **Black**
- B. Other style selections, color or bench length must be submitted in writing, to A&E Services.
- 2.05 Site Tables
- A. Manufacturer: Landscapeforms, Inc. www.landscapeforms.com
1. Carousel **(Figure 7)**



- a). Table top: Steelhead Perforated
- b). Seat: Perforated (seat pattern must match table top pattern)
- c). Number of seats per table unit to be selected by Campus Planning Coordinator.
- d). Surface mount

B. Other style selections, color or bench length must be submitted in writing, to A&E Services.

2.06 Site Bollards

A. Manufacturers:

1. Reliance Foundry Co. Ltd. www.reliance-foundry.com/

- a). Cast Iron model R-7589, **Black (Figure 8)**

B. Other style selections, sizes or colors must be submitted in writing, to A&E Services

2.07 Post and Chain

A. Post and Chain shall be manufactured using:

1. 2 inch diameter SS40 gauge galvanized pipe with Black vinyl coating
2. Black vinyl coated Acorn cap
3. Single brace band and end posts
4. Double brace bands on line posts

B. Acorn cap and galvanized pipe suppliers:

1. Merchant Metals - <http://www.merchantsmetals.com/>
2. Master Halco, Inc.- <http://www.masterhalco.com/>
3. Stephens Pipe and Steel - <http://www.spsfence.com/>

2.08 Bus Shelters

A. Bus Shelters as manufactured by:

1. Brasco International - <http://brasco.com/>
 - a). Model: Slimline Series
 - 1). 8' X 6', **(Figure 9)**
 - 2). 12' X 6' **(Figure 10)**
 - 3). Example dimensional drawing **(Figure 11)**
 - b). Dark bronze anodized aluminum structure
 - c). 1/4" Clear tempered glass

- d). White dome roof with fascia/gutter system
- e). Full length aluminum wall mounted bench and backrest
- B. Other style selections, sizes or colors must be submitted in writing, to A&E Services

PART 3. EXECUTION

3.01 Installation

- A. Benches, Tables, Trash and Recycle Receptacles and Ash Urns:
 - 1. Installed on concrete slab (available sidewalk or area determined by A&E Services), using corrosion resistant cinch anchors.
- B. Bicycle Loops installed per Manufacturer’s recommendations.
- C. Bicycle Racks installed per Manufacturer’s recommendations.
- D. Bollards installed per Manufacturer’s recommendations.
- E. Post and chain installed as directed by A&E Services
- F. Bus shelters installed per Manufacturer’s recommendations.

Photographs and Drawings:



Figure 1 – Victor Stanley Model S-42 Recycle Receptacle Without dome



Figure 2 – Victor Stanley Model S-42 Waste Receptacle With dome



Figure 3 –
Landscapeforms
Scarborough Model



Figure 4 – Victor
Stanley Model S-20
Ash Urn



Figure 5 – Wabash
Valley, Model BL100N



Figure 6 – Cora Bike
Rack, Cora Expo 'W'
Series



Figure 7 –
Landscapeforms,
Carousel Model



Figure 8 – Reliance Foundry Co., Model R-7589



Figure 9 –
Brasco Slimline, 8 X 6



Figure 10 –
Brasco Slimline, 12 X 6

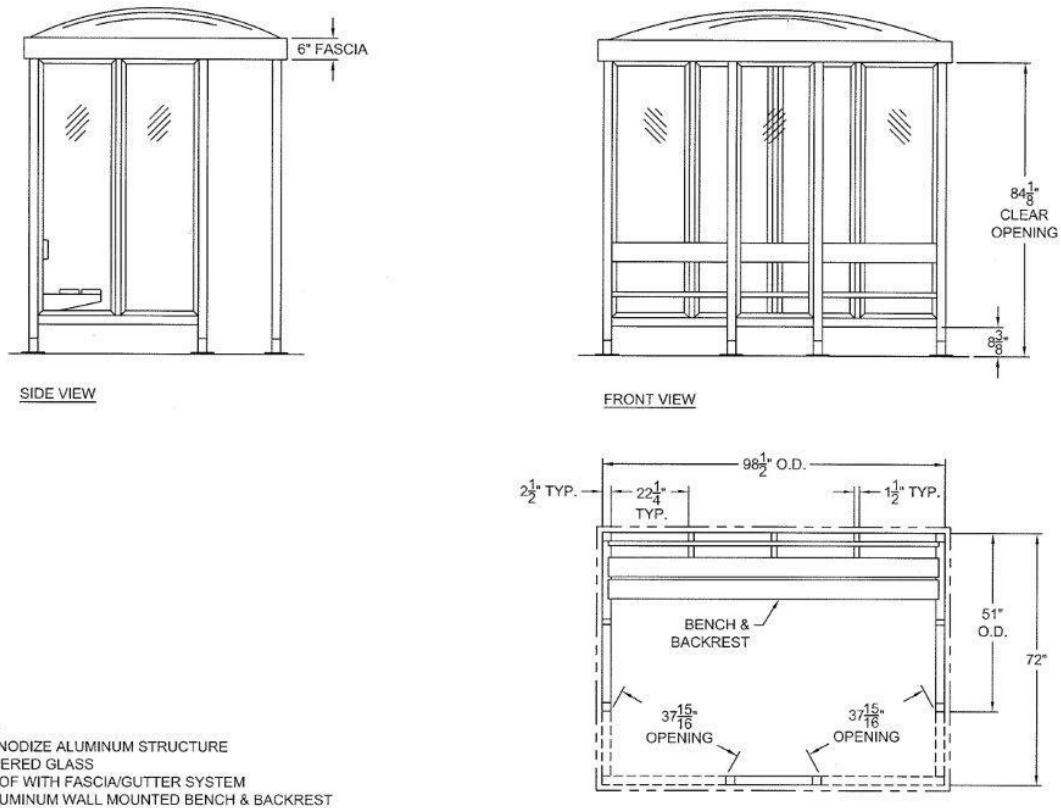


Figure 11 Example Dimensional Drawing

End of Division 12 9300

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

February 2012, Rev. 00

14 2000 – Elevators

PART 1. GENERAL

- 1.01 The Elevator Standards apply to a variety of conditions and types of elevators. The program statement for the project will outline preliminary requirements for vertical transportation systems. The A/E is fully responsible for code compliance for the design and specification of the elevator, machine room and shaft as part of the Contract Documents for the project. The University Architect will review all variances and applications for installation or alterations for elevators.
- 1.02 NIU DeKalb campus Physical Plant personnel maintain all of the elevators on campus. The regional campuses do not have in-house maintenance personnel and therefore rely upon vendors to maintain the equipment. For this reason, it is important that only NIU approved and non-proprietary elevator control equipment be installed and that all required tools, passwords, equipment and training necessary to service the elevator be provided by the Elevator Contractor.
- 1.03 Key and lock products for elevator controls and functions shall be Best Access, Division of Stanley Security Solutions products. The Fire Services Key and Key Switch shall be the national standard, FEOK1.

PART 2. PRODUCTS

- 2.01 Traction Elevators
 - A. Traction elevators shall be Hollister - Whitney Elevator Company equipment.
 - B. Controllers: Use MCE (Motion Control Engineering) type programmable microprocessor controls. The Owner has the right of final review of the type of controller used.
 - C. Car Speed: Minimum 200 feet per minute. The NIU Elevator Consultant may require a higher speed for high-rise or group systems.
 - D. Rise: Any elevator utilizing more than 4 openings in line or having abnormally tall floor heights (more than 12 feet) will be reviewed for speed requirements.
 - E. Load weigh: Furnish load weighing in all Residence Programs and Services (RPS) applications.
- 2.02 Hydraulic Elevators
 - A. Controllers: Specify Motion Control Engineering (MCE) type PHC programmable microprocessor controls for single or two car applications. Use

MCE's HMC system for group (3 or more car) operation applications. Use MCE's mechanical or solid-state starter system. Manufacturer's starter systems are prohibited. Battery Lowering Device for emergency use in the event of a main power supply failure is not required.

- B. Car Speed: Typical car speed is 125-150 feet per minute.
- C. Rise: Where the building rise is more than forty feet, or the elevator requires staggered openings on either end of the car, check with NIU Elevator Consultant for possible change in equipment or different application.
- D. Power Units: Provide non-submersible units with direct drive or belt drive. The hydraulic pump must be located outside of the hydraulic tank in an accessible area for servicing.
- E. Control Valve: Use only **Maxton Manufacturing** control valves properly sized for speed and capacity specified.
- F. Hydraulic Tank: Provide internal tank heater for elevators in parking garages, unheated buildings, or where exposed to freezing temperatures.

2.03 Well Holes, Casings and Cylinders (Hydraulic Elevators).

- A. Use steel cased holes for hydraulic applications sized properly for each set of circumstances. Place hydraulic cylinders in the pre-drilled casing and use a laser device to align the cylinder in the presence of the NIU Elevator Consultant.
- B. Enclose hydraulic cylinders in PVC to prevent corrosion and electrolysis. Cap the bottom of the PVC liner extend it upward to a point higher than the pit floor.
- C. Back fill the cylinder with dry sand from the bottom of the cylinder to the pit floor to prevent the bottom of the casing from moving. Provide a minimum of four (4) inches of concrete at the top of the cylinder to finish the pit floor.
- D. Fasten top of cylinder so as to prevent unit from moving during operation. The elevator shall operate without the piston rubbing, bumping or otherwise contacting the inside wall of the cylinder during operation.

2.04 Pushbutton Fixtures (All elevators)

- A. Provide vandal resistant pushbutton fixtures with tamper proof screws as manufactured by Monitor Controls, Inc.
- B. Locate digital car position indicators on each floor in the elevator lobby over the door opening, adjacent to the hoistway door entrance, or contained within the hall pushbutton fixture. Use vandal resistant car direction indicators located on the

elevator car to indicate direction of travel and visual arrows for car direction. Provide arrival gongs at each elevator lobby.

- C. Provide the Fire Service key switch at the main fire recall lobby pushbutton. Provide a lighted jewel to indicate Fire Service Operation. Engrave, etch, or emboss fire service instructions on the fixture cover in accordance with ASME A17.1a, Fig. 2.27.7.2. Provide switch by Adams Equipment, key number WD 01.
- D. Provide etched, embossed or engraved Fire Service Signage located on each hall pushbutton cover. Surface applied signage is prohibited.

2.05 Power Door, Hall Door and Operator Equipment

- A. Use only doors manufactured by Tyler Elevator Product, Inc.
- B. Use only door operator equipment that includes drive operator, hangers, locks, closures, etc. as manufactured by GAL manufacturing Corp. Use low speed operators for three stop elevators and high speed at all other locations.
- C. Guide Rails: Guide rails for elevator car shall be machined steel, minimum 16 lb. per foot, t-type style, fabricated and installed in accordance with ANSI A.17.1. Existing guide rails shall be examined for defects, anchorage, and alignment; rework or replace as necessary.
- D. Car frame and Platform: Welded steel units. Use platforms that reflect industry standard size for cars, depending on elevator type, use, and speed. Refer to National Elevator Industry, Inc. (NEII) “Building Transportation Standards and Guidelines”, most current addition.
- E. Guides: Guides shall be roller type on car, with six inch minimum diameter car rollers. Provide rollers for speeds in excess of 50 fpm. The manufacturer shall be Hollister-Whitney Elevator Corporation.
- F. Freight Elevators with Bi-parting doors:
 - 1. Freight or service elevators shall comply with these standards except as modified or superseded by applicable codes or this section.
 - 2. Vertical car doors and hoistway doors shall be hollow metal only. Each door shall include a wired safety glass light of at least 144 square inches, with the car door light and hoistway door light in alignment.
 - 3. Power operated doors shall have high quality operators by the Peelle Company.
 - 4. Provide an electronic edge by the Peelle Company, designed for bi-parting doors.
 - 5. Provide and install a notice as follows: “Freight Elevator is for Use by Authorized Operators Only.” Use 2-inch Helvetica letters, white on red

background, engraved plastic, adhesive-mounted next to each hoistway entrance at 60 inches above the floor.

6. Safety edges and safe-way devices shall be Adams Gatekeeper 2000 infrared curtain units with auxiliary photo-edges. The infrared sensor system shall be full height on the leading door edge and opposite jamb, to for a complete curtain effect.

2.06 Wiring and Lighting

A. Elevator Equipment Room: Provide properly sized main line disconnect for each elevator mounted on the wall adjacent to machine room door.

1. Provide a lockable circuit breaker for each 110/120VAC car light system in a separate panel board located in the machine room and near the main line disconnect. This panel board may be used for other loads related to the elevator and elevator machine room.
2. Use only rigid conduit in the elevator machine room for main power equipment. EMT may be used for low-voltage control wiring.
3. Provide adequate machine room fluorescent lighting, especially at controller and around equipment. Locate lighting to avoid conflict with installation of equipment such as motors and cables.

B. Provide emergency backup battery lighting systems for cab interior fluorescent lighting as manufactured by the BODINE Company, Model B30.

C. Provide a hoistway lighting system for every elevator as follows:

1. Provide a light at the top of the hoistway and additional lights located approximately 24” above the car top when the elevator is level with a floor.
2. Locate lights in corner of back wall where clearance allows.
3. If there is more than one elevator in the shaft, provide two strings of hoistway lights, one on either side of the center elevator near the divider beams.
4. Provide 4-way light switches at the elevator pit, at the top of the hoistway, and in the elevator equipment room.
5. Locate Pit light switch next to pit ladder and located 42” above lobby floor level.
6. Provide 13W fluorescent lamps with integral ballasts and porcelain fixture with cover.

D. Provide a GFI duplex receptacle in each elevator pit and in the elevator equipment room.

2.07 Elevator Equipment Room

A. Design: Integrate the elevator penthouses into the overall building architectural design to create a unified and compatible appearance from the exterior. Provide

approved stairs for access to elevator equipment rooms. Ship's ladders and alternating tread stairs are prohibited. Equipment unrelated to the elevator is prohibited in the elevator equipment room.

- B. Fire Protection: Elevator equipment room must meet NFPA 13, most current addition.
- C. Climate Control: Maintain temperature between 50 to 90 degrees F. See International Building Code (IBC) Chapter 30 for additional requirements if emergency power is required or provided to elevators and for machine room venting.
- D. Data/Communications: Furnish two (2) telephone lines in each elevator equipment room and one (1) data line located in a standard IU data/telephone jack. One line is to be used for the emergency call system to the control center and one line is to be used for RMS (remote monitoring system).
- E. Sound Control: If elevator equipment room is adjacent to an occupied space, provide drop seal and sound gaskets on door with sound batt insulation in walls. The A/E is responsible for determining if additional sound absorbing materials are needed inside of the elevator equipment room to meet program requirements.

2.08 Pit and Hoistway

- A. Pit Access: Provide a metal ladder from each pit floor starting 12" above the pit floor and extending to 48" above the lowest landing floor level.
 - 1. Locate the ladder at strike jamb side of hoistway when single panel or two speed doors are used.
 - 2. Where center opening doors are used, locate the ladder on the nearest side wall.
- B. Sump Pit: Provide a sump pit with approved cover below normal pit grade for all elevators on all campuses.
 - 1. Furnish the sump pump with integral oil sensor so that pump will not operate if hydraulic fluid is contaminating the water. Products are available from SEEWATER, Inc.
 - 2. Provide a high-water alarm and connect it to the building's Energy Management System.
 - 3. Pipe the sump pump discharge into an open gap drain connected to nearest sanitary sewer.
- C. Fire Protection: Hoistways may be exempt from the requirements for automatic fire protection sprinkler heads in fully sprinklered buildings. Verify requirements of with IBC Section 903.3.1.1.1 (Illinois Amendments).

- D. Provide a 7 inch clearance between the cleat and pit wall. This may require a larger hoistway or an offset in the wall at the pit level. Refer to ASME A17.1: Rule 2.2.4.2 for additional information.
 - E. Maintain hoistway temperature between 50 to 90 degrees F.
 - F. Items unrelated to the elevator are prohibited in the hoistway or pit.
- 2.09 Cars
- A. Interiors: Provide car interior designs and finish selections to NIU Project Architect for review.
 - 1. Install hooks and provide moving pads for each elevator.
 - 2. Install an ADA compliant handrail at the rear of the car and bump rails on the sidewalls of the car as necessary.
 - 3. Provide approved hard surface, water resistant flooring like vinyl or radial rubber flooring in the car. Carpet is prohibited inside of elevator cars.
 - B. Indicators: Locate the car digital position indicator over the transom or within the car operating panel. Place the Car Direction Indicators in the car door frame where they will be visible from the vicinity of the hall pushbutton. Every car direction indicator must be visible from the immediate vicinity of the hall pushbutton.
 - C. Provide each car operating panel with a lockable fixture cover door, key removable in the closed and locked position only.
 - 1. **Provide lock by Best.** Locate cabinet near upper end of the car operating panel.
 - 2. Inside of the door, provide a cabinet with switches for lights, service or inspection, and Fire Service.
 - 3. Provide a two-speed fan switch.
 - 4. If special security features are required, locate these functions within the cabinet.
 - 5. Engrave, etch, or emboss fire service instructions inside the fixture cover in accordance with ASME A17.1a, Fig. 2.27.7.2.
 - D. Provide each car operating panel with the following:
 - 1. Provide special language etched, engraved, or embossed pertaining to the posting of the Elevator Permit and the Capacity of the elevator.
 - 2. Provide each car operating panel with an emergency stop key switch. Position a Best cylinder with the key removable in either position and with one set of normally closed contacts near the bottom of the pushbuttons. Mark the switch with etched, engraved, or embossed “ON” and “OFF”.

3. Best lock key switches are used to lock out particular floor and/or functions. Wire controls so as not to interfere with Fire Service operation. Provide push buttons for each floor even if a key switch is required.
4. Install a two-way communication device in the telephone cabinet near the bottom of the car operating panel as manufactured by Talk-A-Phone, Model ETP-100MBV consisting of a single pushbutton, automatic dialer with appropriate indicator lights, pre-recorded message, and all other essential features necessary to comply with ADA. Where two or more elevators are in the same hoistway, provide a consolidator that allows two emergency communication devices to be operated on one telephone line. NIU personnel will program this device for communication and for automatic line testing.

2.10 Hoistway Entrances

- A. Provide nickel silver or chrome plated cast iron sill plate at entrance threshold. Grout sills in place with using a non-shrink, non-metallic grout.
- B. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines. Use ¼” clearances around frame and doors as standard. Fill or slush hoistway door frames.
- C. Provide dust covers at hoistway entrances that conceal the hoistway door tracks and interlocks. Provide covers no less than the width of the door opening plus 12”. Mount covers securely to the header by use of metal screws with key-hole openings. The cover shall be capable of being removed without need of removing screws entirely.
- D. Provide sight guards permanently fastened to the hoistway door and of the same color or finish as the hoistway door. There shall be no holes in the guards other than those used to fasten the guard to the door.
- E. Provided a means of emergency access for each hoistway door.
- F. Provide stainless steel hoistway doors and entrances with number four (grain line) finish. Powder coated or painted finishes may be substituted with the approval of the Project Manager and Project Architect.
- G. Provide an approved automatic fire detection system (smoke detector) that will respond to visible or invisible particles of combustion connected to building fire alarm system at elevator lobbies. See IBC Section 3004 for hoistway venting requirements.

PART 3. EXECUTION

3.01 Warranty, Quality Control

- A. Prior to placing the elevator into service, NIU Elevator Consultant will schedule a final inspection of the equipment. The final inspection will include representatives of the Elevator Contractor, the A/E, the General Contractor, and the NIU Elevator Maintenance Staff.
 - B. A State of Illinois operating permit for the elevator must be issued before the elevator can be used by the General Contractor, Sub-Contractors, or Owner.
 - C. The warranty period, which includes all labor and materials, is 12 months after substantial completion. The substantial completion date is the date that the State of Illinois operating permit is issued.
 - D. All Emergency service requests will be initiated by the NIU Public Safety and Heating Plant.
 - E. The Elevator Contractor is requested to respond to emergency service requests within 24 hours.
- 3.02 Inspection During Warranty Period

- A. The Elevator Contractor shall schedule and pay for all State of Illinois elevator inspections, including callback inspections for the first 12 months.
- B. The Elevator Contractor shall provide monthly service inspections during the warranty period and perform monthly testing of the Fire Service, alarm bell, and emergency communication device. Provide a copy of the service inspection form to the NIU Elevator Consultant.
- C. At the 10-month anniversary date, the NIU Elevator Consultant shall contact the Elevator Contractor to arrange an inspection of the elevator equipment. The NIU Elevator Consultant and the NIU Elevator Maintenance Staff shall verify all major component parts are operating as designed.
- D. Any deficiencies found shall be corrected prior to the warranty expiration, or the warranty will be extended until such deficiencies are corrected and the elevator re-inspected.

End of Division 14 2000

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

June 2013, Draft 00

21 1116 – Facility Fire Hydrants

PART 1. - GENERAL

1.01 Scope of Work

- A. The Contractor shall furnish all labor, tools, material and equipment necessary to furnish and install new fire hydrants at the locations shown on the project plans or ordered and specified.
- B. The Contractor is responsible for all excavation, furnishing and installing the new fire hydrant complete with proper jointing, blocking, backfilling, and all other incidental work necessary to complete this item of work.

1.02 References

A. City of DeKalb Water Main Standard

- 1. All Facility Fire Hydrant systems installed on Northern Illinois University property shall meet City of DeKalb Water Main Standard

PART 2. - PRODUCTS

2.01 Preferred Manufacturers

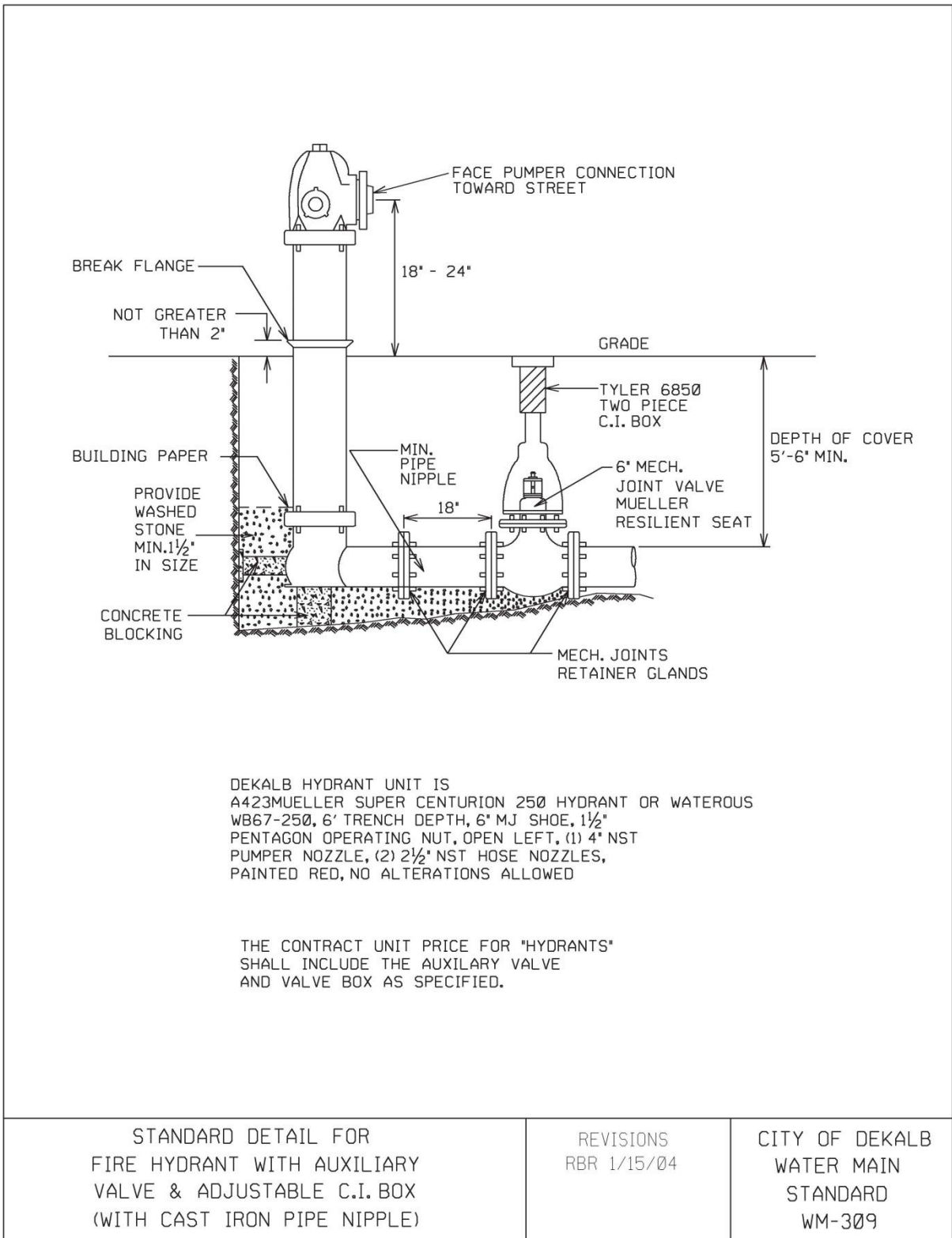
A. American Flow Control.-www.american-usa.com/products/valves-and-hydrants

- 1. 5 ¼” Waterous Pacer, WB67-250 (see specification sheet, page 3)
- 2. Mueller Super Centurion A423 – 250 (see specification sheet, page 3)
- 3. Product substitutions shall meet City of DeKalb Water Main Standard as indicated on specification sheet, page 3

PART 3. - EXECUTION

3.01 All Facility Fire Hydrant systems installed on Northern Illinois University property shall meet City of DeKalb Water Main Standard WM-309

- A. Install per manufacturer’s specifications.
- B. See specification sheet on page 3 of this document.



End of Division 21 1116

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

February 2015, Draft 00

22 1116 – Domestic Water Piping

PART 1. - GENERAL

Domestic Water Inside Supply Pipe

- 2.5” or less - Type L copper. No-lead solder or grooved fittings.
- 3” or more - Ordinary duty weight galvanized steel. Flanged or grooved fittings.
- Stainless steel ball Isolation valves on all branches off domestic mains.

This section of the NIU Design Requirements establishes minimum requirements only.

It should not be used as a complete specification.

June 2014, Draft 01

22 1316 – Sanitary and Waste Vent Piping

PART 1. GENERAL

1.01 Summary

A. This Section includes the following for soil, waste, and vent piping **inside** the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.02 Performance Requirements

A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:

1. Storm, Soil, Waste, and Vent Piping: 10 foot head of water.
2. Storm and Sanitary Sewer, Force-Main Piping: 100 psig.

1.03 Submittals

- A. Product Data: Provide for pipe, tube, fittings, and couplings.
- B. Shop Drawings: For a Sovent drainage system, include plans, elevations, sections, and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.04 Quality Assurance

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency. In addition, all pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute or receive prior approval of the engineer.
- B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2. PRODUCTS

2.01 Piping Materials

- A. Flexible Transition Couplings for Underground Non-pressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.
- B. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

2.02 Cast Iron Soil Piping

- A. Main Risers shall be cast iron.
- B. Storm sewer piping above ground shall be cast iron. Cast iron shall be used in supply air and return plenums.
- C. Hub-and-Spigot Pipe and Fittings: ASTM A 74, Service and Extra-Heavy classes.
 - 1. Gaskets: ASTM C 564, rubber.
- D. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
 - a). Heavy duty, Type 304, Stainless steel Couplings: ASTM A 666, Type 304, stainless steel shield; stainless steel bands; and sleeve.
 - 1). NPS 3 to NPS 4: 3 inch wide shield with 4 bands.
 - 2). NPS 5 to NPS 10: 4 inch wide shield with 6 bands.
 - b). Heavy duty, Cast iron Couplings: ASTM A 48, 2-piece, cast iron housing; stainless steel bolts and nuts; and sleeve.
 - c). Compact, Stainless steel Couplings: CISPI 310 with ASTM A 167, Type 301, or ASTM A 666, Type 301, stainless steel corrugated shield; stainless steel bands; and sleeve.
 - 1). NPS 1-1/2 to NPS 4: 2-1/2 inch wide shield with 2 bands.
- E. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

2.03 Copper Tubing

- A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
- B. Soft Copper Tube: ASTM B 88, Type Land M, water tube, annealed temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- C. Hard Copper Tube: ASTM B 88, Types L and M, water tube, drawn temper.
1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought copper fittings if indicated.
 2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end.
 3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
- 2.04 PVC Piping
- A. PVC piping may be used horizontally off of Main Riser
- B. Cellular-Core, Schedule 40, PVC Pipe: ASTM F 891, Schedule 40.
1. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. Fittings shall come from the same manufacturer as the piping.
- C. Schedule 40, PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.
1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns. Fittings shall come from the same manufacturer as the piping.
- D. PVC Special Fittings: ASTM F 409, drainage-pattern tube and tubular fittings with ends as required for application.
- E. Where kitchen sanitary sewer piping, such as floor drains serving dish washers, may exceed 140° F use CPVC.

- F. Laboratory sanitary sewer piping material shall be selected based upon what is most compatible with the expected effluent. Possible materials include CPVC, PP, PVFD.

2.05 Steel Piping

- A. Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.
1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.
 2. Malleable iron Unions: ASME B16.39; Class 150; hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface; and female threaded ends.
 3. Cast iron, Flanged Fittings: ASME B16.1, Class 125, galvanized.
 4. Steel piping, Grooved-End Fittings: ASTM A 47, galvanized, malleable iron casting; ASTM A 106, galvanized steel pipe; with dimensions matching steel pipe.
 - a). Steel piping, Keyed Couplings: AWWA C606, for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.
 5. Steel piping, Expansion Joints: Compound, galvanized steel fitting with telescoping body and slip-pipe section. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe section, and flanged ends.
 6. Steel piping, Double Expansion Joints: Compound, galvanized steel fitting with telescoping body and two slip-pipe sections. Include packing rings, packing, limit rods, chrome-plated finish on slip-pipe sections, and flanged ends.

- 2.06 PE Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105, PE film, 0.008 inch minimum thickness, tube or sheet.

2.07 Insulation

- A. Insulation shall be glass-fiber insulation; ASTM-C-547; 'K' value of 0.24 at 75°F; non-combustible, insulation for storm gravity drainage system shall be limited to horizontal branches only unless noted otherwise on the drawings.
1. Acceptable Manufacturers:
 - a). Manville Corporation.
 - b). Knauf.
 - c). Certain-Teed.
 - d). Owens Corning Fiberglass

B. Jackets

1. Interior Applications:

- a). Vapor-Barrier Jackets: Kraft reinforced-foil vapor barrier with self-sealing adhesive joints.
- b). PVC Jackets: One piece, premolded type.

2. Exterior Applications:

- a). Aluminum Jackets: ASTM-B-209; 0.020 inch thick; smooth finish.
- b). Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; smooth finish.

C. Accessories

1. Insulation Bands: 3/4 inch wide; 0.015 inch thick galvanized steel or 0.007 inch thick aluminum.
2. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 inch thick stainless steel.
3. Insulating Cement: ASTM-C-195; hydraulic-setting mineral wool.
4. Finishing Cement: ASTM-C-449.
5. Fibrous Glass Cloth: Untreated; 9 oz./sq. yd. weight.
6. Adhesives: Compatible with insulation.

D. Insulation thickness shall be:

1. Storm drainage piping (horizontal branches only)- 1/2"

PART 3. EXECUTION

3.01 Excavation

- A. Refer to Division 2 for excavating, trenching, and backfilling.

3.02 Piping Applications

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on above ground pressure piping, unless otherwise indicated.
- C. Above ground Storm, Soil, Waste, and Vent Piping: Use any of the following piping materials for each size range:
 1. NPS 1-1/4 to NPS 2-1/2: Copper DWV tube, copper drainage fittings, and soldered joints.

2. NPS 1-1/4 to NPS 10: Schedule 40 PVC with solvent cemented joints (for use off of main riser only).
3. NPS 3 to NPS 12: Service class, cast iron soil piping; gaskets; and gasketed joints.
4. NPS 3 to NPS 12: Service class, cast iron soil piping, hubless fittings.
5. NPS 3 to NPS 12: Schedule 40 Galvanized Steel pipe.

D. Underground Storm, Soil, Waste, Vent Piping:

1. Service class, cast iron soil piping; gaskets; and gasketed joints.
2. Copper piping shall not be used in this application

E. Underground Vent Piping NPS 4 and smaller:

1. Hubless, cast-iron soil pipe and fittings.

F. Above ground Storm and Sanitary-Sewage Force Mains: Use any of the following piping materials for each size range:

1. NPS 1-1/2 to NPS 4: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
2. NPS 1-1/2 to NPS 4: Schedule 40 Galvanized Steel pipe.
3. Schedule 40 PVC may be use for this application.

3.03 Piping Installation

- A. Install cleanouts at grade and extend to where building storm and sanitary drains connect to building storm and sanitary sewers.
- B. Install cleanout fitting with closure plug inside the building in storm and sanitary force-main piping.
- C. Install cast iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight.
- D. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight.
- E. Install cast iron storm and soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.

- F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- H. Install storm, soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Storm and Sanitary Drain: 2 percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
 - 2. Horizontal Storm and Sanitary Drainage Piping: 2 percent downward in direction of flow for piping NPS 2-1/2 and smaller; 1 percent downward in direction of flow for piping NPS 3 and larger.
- I. Install force mains at elevations indicated.
- J. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.04 Joint Construction

- A. Cast iron, Soil piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
 - 2. Hubless Joints: Make with rubber gasket and sleeve or clamp.
 - 3. Lead and Oakum Joints.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

- C. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- D. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.05 Hanger and Support Installation

- A. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a). 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b). Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c). Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Install hangers for cast iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8 inch rod.
 - 2. NPS 3: 60 inches with 1/2 inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8 inch rod.
 - 4. NPS 6: 60 inches with 3/4 inch rod.
 - 5. NPS 8 to NPS 12: 60 inches with 7/8 inch rod.
 - 6. NPS 15: 60 inches with 1 inch rod.
 - 7. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- D. Install supports for vertical cast iron soil piping every 15 feet.
- E. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 84 inches with 3/8 inch rod.
 - 2. NPS 1-1/2: 108 inches with 3/8 inch rod.
 - 3. NPS 2: 10 feet with 3/8 inch rod.
 - 4. NPS 2-1/2: 11 feet with 1/2 inch rod.
 - 5. NPS 3: 12 feet with 1/2 inch rod.
 - 6. NPS 4 and NPS 5: 12 feet with 5/8 inch rod.
 - 7. NPS 6: 12 feet with 3/4 inch rod.
 - 8. NPS 8 to NPS 12: 12 feet with 7/8 inch rod.

- F. Install supports for vertical steel piping every 15 feet.
- G. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/4: 72 inches with 3/8 inch rod.
 - 2. NPS 1-1/2 and NPS 2: 96 inches with 3/8 inch rod.
 - 3. NPS 2-1/2: 108 inches with 1/2 inch rod.
 - 4. NPS 3 to NPS 5: 10 feet with 1/2 inch rod.
 - 5. NPS 6: 10 feet with 5/8 inch rod.
 - 6. NPS 8: 10 feet with 3/4 inch rod.
- H. Install supports for vertical copper tubing every 10 feet.
- I. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8 inch rod.
 - 2. NPS 3: 48 inches with 1/2 inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8 inch rod.
 - 4. NPS 6: 48 inches with 3/4 inch rod.
 - 5. NPS 8 to NPS 12: 48 inches with 7/8 inch rod.
- J. Install supports for vertical PVC piping every 48 inches.
- K. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.06 Connections

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
 - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 - 4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Connect force-main piping to the following:

1. Sanitary Sewer: To exterior force main or sanitary manhole.
2. Sewage Pumps: To sewage pump discharge.
3. Storm Sewer: To exterior force main or storm manhole
4. Sump Pumps: To sump pump discharge

3.07 Field Quality Control

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm and sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional

air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.08 Cleaning

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.09 Protection

- A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

End of Division 22 1316

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

February 2015, Rev 01

22 4000 – Plumbing Fixtures

PART 1. GENERAL

1.01 Work Includes

A. Base bid:

1. Plumbing Contractor provides water closets, urinals, lavatories trim, supports and carriers specified and indicated on the drawings.

1.02 Section Includes

- A. Water closets
- B. Urinals
- C. Lavatories

1.03 Related Requirements

- A. Section 07 9005 - Joint Sealers: Seal fixtures to walls and floors.
- B. Section 22 1005 - Plumbing Piping.
- C. Section 22 1006 - Plumbing Piping Specialties.
- D. Section 22 3000 - Plumbing Equipment.

1.04 Reference Standards

- A. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- B. ASME A112.18.1 - Plumbing Supply Fittings; the American Society of Mechanical Engineers; 2005.
- C. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; the American Society of Mechanical Engineers; 2008.
- D. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; the American Society of Mechanical Engineers; 2005.

1.05 Submittals

- A. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- B. Maintenance Data: Include fixture trim exploded view and replacement parts lists.

- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in NIU's name and registered with manufacturer.
- D. Maintenance Materials: Furnish the following for NIU's use in maintenance of project.
 - 1. Extra Toilet Seats: One of each type and size.
 - 2. Flush Valve Service Kits: One for each type and size.

1.06 Quality assurance

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Substitutions approved through A&E Services.
- B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.07 Delivery, Storage and Handling

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2. PRODUCTS

2.01 Flush Valve Water Closets

- A. Water Closets: Vitreous china, ASME A112.19.2, elongated rim, wall hung, siphon jet flush action.
 - 1. Flush Volume: 1.6 gallon, minimum.
 - 2. Flush Valve: Exposed (top spud).
 - 3. Flush Operation: Sensor operated.
 - 4. Supply Size: 1-1/2 inches.
 - 5. Manufacturers:
 - a). American Standard Inc: www.americanstandard.com.
 - b). Kohler Company: www.kohler.com.
 - c). Crane: www.cranepumbing.com.
 - d). Substitutions: Of equal or greater quality. Contact A&E Services.
- B. Flush Valves: ASME A112.18.1, complete with vacuum breaker stops and accessories.

1. Left side handle convertible to IR Hands-free or;
2. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
3. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
4. Manufacturers:
 - a). Sloan Valve Company: www.sloanvalve.com.
 - b). Zurn Industries, Inc: www.zurn.com.
 - c). Moen Incorporated: (must be pre-approved by NIU Plumbing Shop or Physical Plant Director) www.moen.com
 - d). Substitutions: Of equal or greater quality. Contact A&E Services.

C. Seats:

1. Manufacturers:
 - a). Bemis Manufacturing Company: www.bemismfg.com.
 - b). Church Seat Company: www.churchseats.com.
 - c). Zurn industries, Inc: www.zurn.com.
 - d). Substitutions: Of equal or greater quality. Contact A&E Services.
2. Solid white antimicrobial plastic, open front, extended back, brass bolts, without cover.

D. Water Closet Carriers:

1. Carriers shall be 4 bolt carriers wall hung.
2. Manufacturers:
 - a). Wade Manufacturing Company: www.wadedrains.com.
 - b). Zurn Industries, Inc: www.zurn.com.
 - c). Jay R. Smith Manufacturing Company: www.jayrsmith.com.
 - d). Substitutions: Of equal or greater quality. Contact A&E Services.

2.02 Wall Hung Urinals

A. Wall Hung Urinal Manufacturers:

1. American Standard Inc: www.americanstandard.com.
2. Kohler Company: www.kohler.com.
3. Crane: www.cranepumbing.com.
4. Substitutions: Of equal or greater quality. Contact A&E Services

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.

1. Flush Volume: 1.0 gallon, Minimum
2. Flush Style: Washout.
3. Flush Valve: Exposed (top spud).
4. Flush Operation: Sensor operated.
5. Trap: Integral.
6. Supply Size: 3/4 inch.
7. Outlet Size: 2 inches.

C. Flush Valves: ASME A112.18.1, complete with vacuum breaker stops and accessories.

1. Sensor-Operated Type: Solenoid operator, battery powered, infrared sensor and over-ride push button.
2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.

D. Manufacturers:

1. Sloan Valve Company: www.sloanvalve.com
2. Zurn Industries, Inc: www.zurn.com
3. Moen Incorporated: (must be pre-approved by NIU Plumbing Shop or Physical Plant Director) www.moen.com
4. Substitutions: Of equal or greater quality. Contact A&E Services.

E. Urinal Carriers:

1. Manufacturers:
 - a). Wade Manufacturing Company: www.wadedrains.com
 - b). Zurn Industries, Inc: www.zurn.com
 - c). Jay R. Smith Manufacturing Company: www.jayrsmith.com
 - d). Substitutions: Of equal or greater quality. Contact A&E Services.
2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.03 Lavatories

A. Lavatory bowl is integral with countertop.

B. Hands-free lavatory:

1. Moen 8554
2. Substitutions: Of equal or greater quality. Contact A&E Services.

C. Accessories:

1. Metering/Mixing Lavatory faucets:

- a). Chicago 3300
- b). Substitutions: Of equal or greater quality. Contact A&E Services.

PART 3. EXECUTION

3.01 Examination

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

3.02 Preparation

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 Installation

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant, color to match fixture.

3.04 Adjusting

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.05 Cleaning

- A. Clean plumbing fixtures and equipment.

3.06 Protection

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.



End of Division 22 4000

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

January 2014, Rev 01

22 4500 – Emergency Showers and Eyewash Stations

PART 1. - GENERAL

1.01 General

- A. All new, planned for and renovated laboratories where hazardous materials will be or potentially be used, shall have emergency showers and eyewash stations evaluated and approved by A&E Services and Environmental Health and Safety.

1.02 Regulatory Documents

- A. 77 Illinois Administrative Code, Part 890
- B. ANSI/IESA Z358.1-2009

1.03 Related Documents

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.04 Summary

- A. This Section includes the following emergency plumbing fixtures:
 - 1. Emergency showers.
 - 2. Eye/face wash equipment.
 - 3. Combination units.
 - 4. Water-tempering equipment

- B. Related Sections include the following:

- 1. Other Standards of Division 22 may apply.

1.05 Definitions

- A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.
- C. Tepid: Moderately warm (ANSI Z358.1-2009 - 60° - 100° F)

1.06 Action Submittals

- A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.
- 1.07 Informational Submittals
- A. Field quality-control test reports.
- 1.08 Closeout Submittals
- A. Operation and Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.
- 1.09 Quality Assurance
- A. 77 Illinois Administrative Code, Part 890, Section 890.1180 “Flushing/Disinfecting of Potable Water System”
 - B. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."
 - C. NSF Standard: Comply with NSF 61, "Drinking Water System Components-- Health Effects," for fixture materials that will be in contact with potable water.
 - D. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

PART 2. - PRODUCTS

- 2.01 All emergency stations shall be Emergency Shower/Eyewash combinations unless approved by Environmental Health & Safety and A&E Services. Emergency eyewash stations shall not be installed on a faucet spout (77 Illinois Administrative Code, Part 890, Section 890.800 b))
- 2.02 Emergency Showers/Eye/Face Wash Equipment
- A. Barrier Free Emergency Showers/Eye/Face wash Equipment
 - 1. Products and design approved by A&E services
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:
 - a. Bradley Plumbing Fixtures <http://www.bradleycorp.com/products>
 - b. Haws Corporation <http://www.hawscor.com/emergency-equipment>
 - c. Speakman Company <http://www.speakmancompany.com/>

3. Description: Station with ABS plastic shower head, 1" NPTF chrome-plated brass stay-open ball valve, stainless steel actuating arm, heavy duty aluminum pull rod, 1-1/4" galvanized steel pipe stanchion and fittings with cast aluminum floor flange, two fine spray outlet heads, stainless steel receptor, and stay-open ball valve activated by epoxy coated cast aluminum flag handle. Each outlet head shall have including removable delrin spray cover, polyurethane filter, self-regulating flow control, and float-off dust cover. Include emergency sign. **Aerated outlets will not be accepted.**

2.03 Water Tempering Equipment:

- A. **Water tempering equipment is required for emergency showers where water source temperature does not meet the ANSI definition of tepid water (60°-100° F).**

B. Hot and Cold Water, Water Tempering Equipment:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or equivalent:
 - a. Lawler Manufacturing Co., Inc. <http://www.lawlervalve.com/>
 - b. Leonard Valve Company <http://www.leonardvalve.com/>
 - c. Powers, a Watts Industries Co. <http://www.powerscontrols.com/>
 - d. Speakman Company <http://www.speakmancompany.com/>
2. Description: Factory fabricated, hot and cold water tempering equipment with thermostatic mixing valve.
 - a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15 minute test period, and in case of unit failure to continue cold water flow, with union connections, controls, metal piping, and corrosion resistant enclosure.
 - b. Supply Connections: For hot and cold water.

PART 3. - EXECUTION

- 3.01 Connections of Emergency Shower/Eye Wash stations to the waste and or sanitary drain systems are neither necessary nor desired due to the possibility of hazardous chemicals/material entering the drainage system.
- 3.02 Emergency Plumbing Fixture Installation
 - A. Install according to manufacturer's instructions and at locations indicated in the project drawings.
 - B. Ensure dielectric fittings are installed as necessary

- C. Install thermometers in supply and outlet piping connections to water-tempering equipment.
 - D. Emergency Showers: Pull rod handle shall not be higher than 69" from the surface on which the user stands (ADA requires no higher than 48"). Showerhead shall be between 82" and 96" from the surface on which the user stands.
- 3.03 Connections
- A. Connect hot and cold water supply piping to hot and cold water, water tempering equipment. Connect output from water tempering equipment to emergency plumbing fixtures. (see 77 Illinois Administrative Code, Part 890, Section 890.800 a)
 - B. Where installing piping adjacent to emergency plumbing fixtures, allow space for service and maintenance of fixtures.
- 3.04 Identification
- A. Install equipment nameplates or equipment markers on emergency plumbing fixtures and equipment and equipment signs on water-tempering equipment.
- 3.05 Field-Quality Control
- A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.
 - B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.
 - C. Repaired, replaced or newly installed Emergency plumbing systems shall be flushed and disinfected according to 77 Illinois Administrative Code, Part 890.1180
 - D. Prepare test and inspection reports.
- 3.06 Adjusting
- A. Adjust or replace fixture flow regulators for proper flow.
 - B. Adjust equipment temperature settings.

End of Division 22 4500



This section of the NIU Design Requirements establishes minimum requirements only.

It should not be used as a complete specification.

November 2013, Rev 00

23 0713 – Ductwork Insulation

PART 1. GENERAL

1.01 Section Includes

- A. Ductwork Insulation
- B. Insulation Jackets

1.02 References

- A. IECC; International Energy Conservation Code 2012, C403.2.7
- B. ASHRAE Standard 90.1, 2010 – Energy Standard for Buildings; Tables 6.8.2A and 6.8.2B
- C. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- D. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- E. ASTM E84 - Surface Burning Characteristics of Building Materials.
- F. ASTM E136 - Standard Test Method for the Behavior of Materials in a Vertical Tube Furnace at 750° C.
- G. ASTM E814 - Fire Tests of Through Penetrations Firestops.
- H. ASTM E2336-04 – Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.
- I. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.
- J. NFPA 96 - Standard for the Installation of Equipment for Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.
- K. NFPA 255 - Surface Burning Characteristics of Building Materials.
- L. UL - XHEZ - Through Penetration Firestop Systems.
- M. UL 263 - Full Scale External Fire Tests with Hose Stream.
- N. UL 723 - Surface Burning Characteristics of Building Materials.

- O. UL 1479 - Fire Tests of Through Penetrations Firestops.
- 1.03 Quality Assurance
 - A. Applicator: Company specializing in ductwork insulation application with five years minimum experience. When requested, installer shall submit manufacturer's certificate indicating qualifications.
 - B. Materials: UL listed in Category HNKT; flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723.
 - C. Adhesives: UL listed, meeting NFPA 90A/90B requirements.
 - 1.04 Submittals
 - A. Submit shop drawings including product description, list of materials and thickness for each service, and location.
 - B. Submit manufacturer's installation instructions.

PART 2. PRODUCTS

- 2.01 Materials
 - A. Type A: Flexible Fiberglass - Outside Wrap; ANSI/ASTM C553; commercial grade; 0.28 maximum 'K' value at 75°F; foil scrim Kraft facing, 1.0 lb./cu. ft. density. Type 100, ASTM C 1136, Type II, AP (all Purpose) Facing, or FSK (Foil-Scrim-Kraft) Facing.
 - B. Type B: Semi-rigid Fiberglass Board Wrap – Outside Application; ANSI/ASTM C612, Class 1; 0.25 maximum 'K' value at 75°F; 3lb/cubic ft. density. FSK or ASJ as specified by A&E Services.
- 2.02 Jackets
 - A. Vapor Barrier Jackets: Kraft reinforced foil scrim vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 25 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

PART 3. EXECUTION

- 3.01 Installation
 - A. Install materials in accordance with manufacturer's instructions, codes, and industry standards.

- B. Install materials after ductwork has been tested.
- C. Clean surfaces for adhesives.
- D. Provide insulation with vapor barrier when air conveyed may be below ambient temperature.
- E. Exterior Duct Wrap - Flexible, Type A:
 - 1. Apply with edges tightly butted.
 - 2. Cut slightly longer than perimeter of duct to insure full thickness at corners. Do not wrap excessively tight.
 - 3. Seal butt joints with adhesive backed tape.
 - 4. Apply so insulation conforms uniformly and firmly to duct.
 - 5. Provide high-density insulation inserts at trapeze duct hangers and straps to prevent crushing of insulation. Maintain continuous vapor barrier through the hanger.
 - 6. Tape all joints with Royal Tapes #RT 350 (216-439-7229), Venture Tape 1525CW, or Compac Type FSK. No substitutions will be accepted without written permission from the Architect/Engineer.
 - 7. Press tape tightly to the duct covering with a squeegee for a tight continuous seal. Fish mouths and loose tape edges are not acceptable.
 - 8. All laps must be stapled or stitched and covered with tape.
 - 9. Vapor barrier must be continuous.
 - 10. Mechanically fasten on 12" centers at bottom of ducts over 24" wide and on all sides of vertical ducts.
- F. Continue insulation with vapor barrier through penetrations unless code prohibits.
- G. Provide 2" wide, 24" high, 26 gauge, galvanized sheet metal corner protection angles for all externally insulated ductwork extending to a floor or curb.

3.02 Duct and Plenum Insulation schedule, IECC C403.2.7

- A. Provide duct insulation on new and existing remodeled ductwork in the following schedule as approved by A&E Services:

Service	Insulation Type	Jacket	"R" Value	Insulation Thickness
Outside Air duct	Rigid fiberglass	FSK/ASJ	R-8	2"
Mixed Air duct	Rigid fiberglass	FSK/ASJ	R-6	2"
Exposed Supply duct	Rigid fiberglass	FSK/ASJ	R-6	2"
Concealed Supply duct	Rigid fiberglass	FSK/ASJ	R-6	2"
Exhaust and relief ducts	Rigid fiberglass	FSK/ASJ	R-6	2"

Heat Recovery units	Rigid fiberglass	FSK/ASJ	R-6	2”
Circular duct, hidden	Flexible	FSK only	R-6	2”

End of Division 23 0713

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

February 2014, Rev 02

23 0719 – HVAC Piping Insulation

PART-1. GENERAL

1.01 Section Includes

- A. Piping Insulation
- B. Insulation Jackets

1.02 References

- A. IECC; International Energy Conservation Code 2012, C403.2.8
- B. ASHRAE Standard 90.1, 2010 – Energy Standard for Buildings; Tables 6.8.3A and 6.8.3B
- C. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- D. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- E. ANSI/ASTM C534 - Elastomeric Foam Insulation.
- F. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- G. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- H. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.
- I. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- J. ASTM C591 - Unfaced Preformed Rigid Cellular Polyisocyanurate Insulation.
- K. ASTM C578 - Preformed Cellular Polystyrene Thermal Insulation.
- L. ASTM E84 - Surface Burning Characteristics of Building Materials.
- M. NFPA 255 - Surface Burning Characteristics of Building Materials.
- N. UL 723 - Surface Burning Characteristics of Building Materials.
- O. National Commercial & Industrial Insulation Standards - 1999 Edition - as published by Midwest Insulation Contractors Association and endorsed by National Insulation Contractors Association.

1.03 Quality Assurance

- A. Applicator: Company specializing in piping insulation application with five years minimum experience.
- B. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255, or UL 723 (where required).

1.04 Submittals

- A. Submit shop drawings per contract. Include product description, list of materials and thickness for each service, and locations.

PART-2. PRODUCTS

2.01 Insulation

- A. Type A: Glass fiber; ANSI/ASTM C547; 0.24 maximum 'K' value at 75°F; noncombustible. All purpose, white kraft jacket bonded to aluminum foil and reinforced with fiberglass yarn, 25/50 flame spread/smoke developed rating.
- B. Type B: Elastomeric cellular foam; ANSI/ASTM C534; flexible plastic; 0.28 maximum 'K' value at 75°F, 25/50 flame spread/smoke developed rating. Maximum 3/4" thick per layer where multiple layers are specified.

1. The preferred products are:

- a. Armacell Armaflex <http://www.armacell.com>
- b. For higher temperature range applications including Chilled Water and Heating Hot Water in common piping the preferred product is Armacell HT Armaflex.

- C. Type E: Hydrous Calcium Silicate; ASTM C533; rigid molded pipe insulation; asbestos free; 0.40 'K' value at 300°F; 1200°F maximum service temperature; 16 gauge stainless steel tie wires on maximum 12" centers.

2.02 Vapor Barrier Jackets

- A. Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Beach puncture resistance ratio of at least 50 units. Tensile strength: 35 psi minimum. Single, self-seal acrylic adhesive on longitudinal jacket laps and butt strips.

2.03 Jacket Covering

- A. Aluminum Jackets: ASTM B209; 0.016" thick; stucco embossed finish with Z edge seams and aluminum bands for outdoor use. Where colored jacket covers are

called for, provide factory-applied hard film acrylic paint in color selected by Architect.

PART-3. EXECUTION

3.01 Preparation

- A. Install insulation after piping has been tested. Pipe shall be clean, dry and free of rust before applying insulation.

3.02 Installation

- A. Install materials per manufacturer's instructions, building codes and industry standards.
- B. Continue insulation with vapor barrier through penetrations. This applies to all insulated piping. Maintain fire rating of all penetrations.
- C. On exposed piping, locate and cover seams in least visible locations.
- D. On insulated piping operating below 60°F, insulate fittings, valves, unions, flanges, strainers, flexible connections, flexible hoses, and expansion joints. Seal all penetrations of vapor barrier.
- E. On piping operating below 60°F in locations that are not mechanically cooled (e.g., penthouses, mechanical rooms, tunnels, chases at exterior walls, etc.), Type B insulation shall be used.
- F. On insulated piping operating above 140°F, insulate fittings, valves, flanges, and strainers.
- G. On insulated piping operating between 60°F and 140°F, do not insulate flanges and unions, but bevel and seal ends of insulation at such locations. Insulate all fittings, valves and strainers.
- H. **Blocking:** On all insulated piping, provide at each support an insert of same thickness and contour as adjoining insulation, between the pipe and insulation jacket, to prevent insulation from sagging and crushing. The insert shall be suitable for planned temperatures, be suitable for use with specific pipe material, and shall be a 180° cylindrical segment the same length as metal shields. Inserts shall be a cellular glass or molded hydrous calcium silicate, with a minimum compressive strength of 50 psi. High density polyisocyanurate insulation with a compressive strength of 24 psi is acceptable for pipe sizes below 6", 50 psi over 6", and operate below 260°F. Factory fabricated inserts may be used. Rectangular blocks, plugs, or wood material are not acceptable. Temporary wood blocking may be used by the Piping Contractor for proper height; however, these must be removed and replaced with proper inserts by the Insulation Contractor.

- I. Steam and condensate piping systems installed in utility tunnels shall be insulated with Type “E”.
- J. Neatly finish insulation at supports, protrusions, and interruptions.
- K. Install metal shields between all hangers or supports and the pipe insulation. Shields shall be galvanized sheet metal, half-round with flared edges. Adhere shields to insulation. On cold piping, seal the shields vapor-tight to the insulation as required to maintain the vapor barrier, or add separate vapor barrier jacket.
- L. Shields shall be at least the following lengths and gauges:

	Pipe Size	Shield Size
1.	½” to 3-1/2”	12” long x 18 gauge
2.	4”	12” long x 16 gauge
3.	5” to 6”	18” long x 16 gauge
4.	8” to 14”	24” long x 14 gauge

- M. Where exposed insulated piping extends above the floor, provide a sheet metal guard around the insulation extending 12" above the floor. Guard shall be .016" cylindrical smooth or stucco aluminum and shall fit tightly to the insulation.
- N. All piping and insulation that does not meet 25/50 that is located in an air plenum shall have written approval from the Authority Having Jurisdiction and the local fire department for authorization and materials approval. If approval has been allowed, the non-rated material shall be wrapped with a product that has passed ASTM E84 and/or NFPA 255 testing with a rating of 25/50 or below.
- O. All balance valves with fluid operating below 60°F shall be insulated with a removable plug wrapped with vapor barrier tape to allow reading and adjusting of the valve. All balance valves with fluid operating above 140°F shall be insulated and an opening shall be left in the insulation to allow for reading and adjusting the valve.

3.03 Insulation

A. Type A Insulation:

- 1. All Service Jackets: Seal all longitudinal joints with self-seal laps using a single pressure sensitive adhesive system. Outwardly clinching staple shall be used on all laps and butt joints.
- 2. Insulation without self-seal lap may be used if installed with Benjamin Foster 85-20 or equivalent Chicago Mastic, 3M or Childers lap adhesive.
- 3. Apply insulation with laps on top of pipe.

4. Fittings, Valve Bodies and Flanges: For 4" and smaller pipes, insulate with 1 lb. density insulation wrapped under compression to a thickness equal to the adjacent pipe insulation. For pipes over 4", use mitered segments of pipe insulation. Finish with preformed plastic fitting covers. Secure fitting covers with pressure sensitive tape at each end. Overlap tape at least 2" on itself. For pipes operating below 60°F, seal fitting covers with vapor retarder mastic in addition to tape.

B. Type B Insulation:

1. Elastomeric Cellular Foam: Where possible, slip insulation over the open end of pipe without slitting. Seal all butt ends, longitudinal seams, and fittings with adhesive. At elbows and tees, use mitered connections. Do not compress or crush insulation at cemented joints. Joints shall be sealed completely and not pucker or wrinkle. Paint the outside of outdoor insulation with two coats of latex enamel paint recommended by the manufacturer.
2. Self-seal insulation may be used on pipes operating below 170°F.
3. To reduce air gaps and the possibility of condensation, Elastomeric Cellular Foam insulation shall be factory sized in diameter to the pipe being insulated.
4. To reduce air gaps and the possibility of condensation, Elastomeric Cellular Foam insulation shall be factory sized in diameter to the fitting being insulated.

C. Type E Insulation:

1. Use pre-molded half sections. Butt longitudinal and circumferential joints tightly. Wire in place with 16 gauge stainless steel wire on maximum 12" centers. Single layer, butt joints staggered on 9" to 18" centers.
2. Apply in two layers. Stagger all joints between layers. Wire each layer individually.

3.04 Jacket Cover Installation

A. Metal Covering:

1. Provide vapor barrier as specified for insulation type. Cover with aluminum jacket covering with seams located on the bottom of horizontal piping. Include fittings, joints and valves.
2. Seal all interior and exterior butt joints with metal draw bands and sealant. Seal all exterior joints watertight.
3. Interior joints do not need to be sealed.

4. Use metal covering on the following pipes:
 - a. All exposed piping in areas noted on drawings.
 - b. All exposed piping below 8'-0" above floor.
 - c. All piping in mechanical rooms and/or tunnels that are subject to damage from normal operations. (Example: Piping that must be stepped over routinely.)

3.05 Schedule

Minimum Pipe Insulation Thickness (thickness in inches)

Fluid Operating Temp. and Pressure	Insulation Type	Nominal Pipe or Tube Size (inches)				
		<1	1 to <1-1/2	1-1/2 to <4	4 to <8	≤8
Steam High; >120 psig	A, E	4.5	5.0	5.0	5.0	5.0
Steam Med; >15 - <120 psig	A, E	3.0	4.0	4.5	4.5	4.5
Steam low; <15 psig	A	2.5	2.5	2.5	3.0	3.0
HHW, Condensate; 141 - 200	A	1.5	1.5	2.0	2.0	2.0
Domestic HW; 105 - 140	A	1.0	1.0	1.5	1.5	1.5
CHW; 40 - 60	B	0.5	0.5	1.0	1.0	1.0
Refrigeration; < 40	B	0.5	1.0	1.0	1.0	1.5
All Steam, Condensate piping in utility tunnels	E	All				

End of Division 23 0719

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

September 2012, rev. 00

26 0501 – Minor Electrical Demolition

PART 1. GENERAL

1.01 Section Includes

A. Electrical demolition

1.02 The Owner (NIU) determines which sections (if any) of the existing Fire Alarm and/or Fire Suppression systems shall remain in service during demolition.

1.03 The Owner determines which sections (if any) of and existing telephone system shall remain in service during demolition.

PART 2. PRODUCTS

2.01 Materials and Equipment

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3. EXECUTION

3.01 Examination

A. Demolition drawings are based on casual field observation and existing record documents. The drawings are intended to indicate the scope of work required and do not indicate every box, conduit, or wire that must be removed. **THE CONTRACTOR SHALL VISIT THE SITE PRIOR TO SUBMITTING A BID AND VERIFY EXISTING CONDITIONS.**

B. Where walls, ceilings, structures, etc., are indicated as being removed on general drawings, the Contractor shall be responsible for the removal of all electrical equipment, devices, fixtures, raceways, wiring, systems, etc., from the removed area.

C. Where ceilings, walls, structures, etc., are temporarily removed and replaced by others, this Contractor shall be responsible for the removal, storage, and replacement of equipment, devices, fixtures, raceways, wiring, systems, etc.

D. Verify that abandoned wiring and equipment serve only abandoned equipment or facilities. Extend conduit and wire to facilities and equipment that will remain in operation following demolition. Extension of conduit and wire to equipment shall be compatible with the surrounding area.

E. Coordinate scope of work with all other Contractors and the Owner at the project site. Schedule removal of equipment and electrical service to avoid conflicts.

- F. Bid submittal shall mean the Contractor has visited the project site and has verified existing conditions and scope of work.

3.02 Preparation

- A. Maintain existing Fire Alarm and/or Fire Suppression Systems as required by Owner.
 - 1. Temporary disabling of an in-service system requires that the Owner be notified 24 hours in advance.
- B. Existing Electrical Service: Maintain existing system in service.
- C. Disconnect electrical systems in walls, floors, structures, and ceilings scheduled for removal.
- D. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations. Assume all equipment and systems must remain operational unless specifically noted otherwise on drawings.
- E. Remove, relocate, and extend existing installations to accommodate new construction.
- F. Remove abandoned wiring and raceway to source of supply.
- G. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces. Remove all associated clamps, hangers, supports, etc. associated with raceway removal.
- H. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is removed. Provide blank cover for abandoned outlets that are not removed. Patch openings created from removal of devices to match surrounding finishes.
- I. Disconnect and remove abandoned panel-boards and distribution equipment.
- J. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- K. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories. Provide for proper recycling or disposal of existing lamps and ballasts removed from the site in accordance with EPA and State of Illinois regulations.

- L. Repair adjacent construction and finishes damaged during demolition and extension work. Patch openings to match existing surrounding finishes.
- M. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- N. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.
- O. HID and fluorescent lamps, determined by the Toxicity Characteristic Leachate procedure (TCLP), to be hazardous waste shall be disposed of in a permitted hazardous waste disposal facility or by a permitted lamp recycler.
- P. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- Q. Floor slabs may be post-tensioned. X-ray all penetrations prior to cutting and/or drilling to avoid any tension cables or utilities encased in floor construction.
- R. Floor slabs may contain conduit systems. The Contractor is responsible for taking any measures required to ensure no conduits or other services are damaged. This includes X-ray or similar non-destructive means.
- S. The Contractor is responsible for all costs incurred in repair, relocations, or replacement of any cables, conduits, or other services if damaged without proper investigation.

3.03 Cleaning and Repair

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Distribution and Branch Panelboards: Clean exposed surfaces and check tightness of electrical connections. Lubricate where required. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

End of Division 26 0501

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

December 2012, rev 00

22 0513 – Medium Voltage Cables

PART-1. GENERAL

1.01 Section Includes

- A. Medium Voltage Cables
- B. Cable Terminations

1.02 References

- A. IEEE C2 – National Electrical Safety Code: Institute of Electrical Engineers; 2007
- B. IEEE 48 – Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV; Institute of Electrical Engineers; 1996 (R2009)
- C. NETA STD ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009
- D. NFPA 70 – National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements

1.03 Submittals

- A. Product Data: Provide for cable, terminations, and accessories.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Project Record Requirements: Record actual sizes and locations of cables.

1.04 Quality Assurance

- A. Comply with NFPA 70.
- B. Manufacturer's Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience and with service facilities within 100 miles of the Project.

- C. Installer Qualifications: Authorized installer of specified manufacturer with service facilities within 100 miles of the Project.
- D. Products: Listed and classified by Underwriters laboratories Inc. as suitable for the purpose specified and indicated.

PART-2. PRODUCTS

2.01 Manufacturers

A. Wire and Cable

- 1. Okonite
- 2. Prysmian

B. Connectors

- 1. 3M Corporation
- 2. Cooper Power System

C. 15 kV Power Cable

- 1. Primary voltage power cable shall be 15,000 volts; single conductor Class “B” stranded copper, ethylene propylene thermosetting type elastomer insulation (EPR), tape shielded and PVC jacketed. The cable shall be suitable for wet or dry location in conduit underground duct system and direct burial. Contractor shall indicate if cable is compact or compressed stranded.
- 2. The cable shall be rated 105 degrees C for normal operations, 140 degrees C for emergency overload operation, and 250 degrees C for short circuit conditions.
- 3. The insulation system shall consist of a triple tandem extruded semi-conducting thermostat EPR strand screen, ethylene propylene rubber insulation, and a semiconducting thermoset EPR insulation screen. The insulation shall contain no polyethylene nor exceed 72 percent by weight of ethylene in the copolymer to the limit the degree of susceptibility to treeing. The insulation thickness shall be 220 mils (133 percent insulation level).
- 4. The metallic shielding shall be a 5 mil bare copper tape with a 2 V@ percent nominal overlap.
- 5. The overall jacket shall be polyvinylchloride of a minimum average thickness of 80 mils.
- 6. The cable shall be manufactured and tested in complete and strict accordance with AEIC CS6-82 and applicable sections of ICEA CS6.

D. 15kV Termination

- 1. Termination kits shall be capable of properly terminating a 15kV single conductor polymer-insulated cable. Kits shall meet Class 1 requirements and

be designed proof tested per IEEE 48- 1 975 and be capable of passing a test sequence per draft and revisions of IEEE 404-1 986. Kits as specified shall accommodate any common form of cable shielding/construction without the need for special adaptors or accessories, and shall accommodate a wide range of cable size and, also, be capable of being properly installed on out-of-round or out-of-tolerance cable as per relevant IDEA standards. Kits shall accommodate commercially available connectors.

2. Terminations for single conductor cable shall consist of cold-shrink stress control and outer non-tracking insulation tubes along with a high relative permittivity stress relief mastic for insulation shield cutback treatment with a cold shrink sealant for environmental sealing. Outdoor terminations shall include rain shields.
3. Termination kits shall be manufactured by 3M Corporation and/or Cooper Power Systems.
4. **Hold Point** Existing medium voltage cable is closed transition. Prior to spicing any cable in manhole, care will be taken to properly identify and maintain phasing. This shall be witnessed by representatives of the NIU Electric Shop, (815)753-6264.
5. Deadbreak separable splices shall be equipped with peroxide-cured EDPM insulation, capacitive test points, and shall meet IEEE Standard 386 for separable insulated connector systems. Provide splices as indicated on Drawings. Cooper SSPL series or similar.
6. All 600A connector plugs and 2001600A load adapters shall be EDPM insulation only.

PART-3. EXECUTION

3.01 Examination

- A. Verify that conduit, ductbank, trench, or manholes are ready to receive cable.
 1. Cable racks within manholes shall be heavy duty nonmetallic cable rack mounting hardware, drop-in anchor installation as manufactured by Underground Devices, Inc. www.udevices.com. Quantities and sizes to be determined by job specifics.
- B. Verify that field measurements are as indicated.
- C. Verify routing and termination locations of cable bank prior to rough-in.
- D. Cable routing is shown in approximate locations unless dimensioned. Route as required to complete wiring system.

3.02 Preparation

- A. Use swab to clean conduits before pulling cable.

3.03 Installation

- A. General: Install electrical cables, wires and connectors as indicated, in compliance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices as well as Owner's requirements.
1. Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.
 2. Pull conductors together where more than one is being installed in a raceway.
 3. Use pull compound or lubricant, where necessary; compound must not deteriorate conductor insulation.
 4. Use pulling means, including fish tape, cable or rope which cannot damage raceway.
 5. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members and follow surface contours, where possible.
 6. No conductor splices shall be made without Engineer's written approval.
 7. Install splices and taps which have mechanical strength. Current and insulation rating shall be equivalent-or-better than conductor. All splices shall be compression type with cold shrink wrap and taped.
 8. Use splice and tap connectors which are compatible with conductor material.

3.04 Field Quality Control

- A. Prior to energization, high pot test cables and connectors using a non-destructive high voltage insulation resistance tester. Provide written test reports for all cables and connectors tested and submit them to the Engineer's or Owner's representative prior to energizing. Correct malfunctions where detected.
- B. Subsequent to wire and cable hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

3.05 Protection

- A. Protect installed cables from entrance of moisture

End of Division 26 0513

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

September 2012, rev. 00

26 0553 – Identification for Electrical Systems

PART 1. GENERAL

1.01 Summary

A. Section Includes:

1. Identification for raceways.
2. Identification of power and control cables.
3. Identification for conductors.
4. Underground-line warning tape.
5. Warning labels and signs.
6. Instruction signs.
7. Equipment identification labels.
8. Miscellaneous identification products.

1.02 Submittals

- ##### A. Product Data: For each electrical identification product indicated.

1.03 Quality Assurance

- ##### A. Comply with NFPA 70, including any identification requirements not included below.
- ##### B. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- ##### C. Comply with ANSI Z535.4 for safety signs and labels.
- ##### D. Adhesive-attached labeling materials shall comply with UL 969.

1.04 Coordination

- ##### A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. **Use consistent designations throughout Project.**
- ##### B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- ##### C. Coordinate installation of identifying devices with location of access panels and doors.

- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2. PRODUCTS

2.01 Power Raceway Identification Materials

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.02 Power and Control Cable Identification Materials

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.03 Conductor Identification Materials.

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

- C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- D. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.04 Underground-Line Warning Tape

A. Tape:

- 1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications lines.
- 2. Printing on tape shall be permanent and shall not be damaged by burial operations.
- 3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

- 1. Comply with ANSI Z535.1 through ANSI Z535.5.
- 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, with applicable voltage.
- 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE
 - a). Detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core, bright-colored, continuous-printed on one side with the description of the utility, compounded for direct-burial service.
 - b). Overall Thickness: 5 mils (0.125 mm).
 - c). Foil Core Thickness: 0.35 mil (0.00889 mm).
 - d). Weight: 28 lb/1000 sq. ft. (13.7 kg/100 sq. m).
 - e). 3-Inch (75-mm) Tensile According to ASTM D 882: 70 lbf (311.3 N), and 4600 psi (31.7 MPa).

2.05 Warning Labels and Signs

- A. **Comply with NFPA 70 and 29 CFR 1910.145.**
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.06 Instruction Signs

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

2.07 Equipment Identification Labels

A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

B. Stenciled Legend (Outdoor Equipment): In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.08 Cable Ties

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black except where used for color-coding.

- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: Black.

- C. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F (Minus 46 to plus 140 deg C).
 - 5. Color: Black

2.09 Miscellaneous Identification Products

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3. EXECUTION

3.01 Installation

- A. **Verify identity of each item before installing identification products.**

- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification tags for Raceways:
 - 1. For other than fire alarm systems, locate tags at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
 - 2. For fire alarm systems, provide factory painted red conduit with matching fittings and outlet boxes throughout (such as Steel City Fire Alarm series).
- G. Cable Ties: Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.
- H. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds 16 inches (400 mm) overall.
- I. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.02 Identification Schedule

- A. Accessible Raceways and Cables (Except Fire Alarm) within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend, system voltage, panel number and circuit number.
- B. Accessible Fire Alarm Raceways and Cables within Buildings: Provide factory painted red conduit with matching fittings and outlet boxes throughout (such as Steel City Fire Alarm series). All fire alarm cable shall be red (see Division 28 for additional requirements).

- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for all conductors.
 - a). Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b). Colors for 208/120-V Circuits:
 - 1). Phase A: Black.
 - 2). Phase B: Red.
 - 3). Phase C: Blue.
 - 4). Neutral: White
 - 5). Ground: Green.
 - c). Colors for 480/277-V Circuits:
 - 1). Phase A: Brown.
 - 2). Phase B: Orange.
 - 3). Phase C: Yellow.
 - 4). Neutral: Gray or white with colored stripe.
 - 5). Ground: Green with white stripe.
 - d). Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- E. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- F. Locations of Underground Lines: Identify with underground-line warning tape for all power, lighting, communication, and control wiring and optical fiber cable.

- G. **Workspace Indication:** Install Federal Safety Yellow-Orange floor paint in oblique stripes to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- H. **Warning Signs and Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting:**
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
 4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a). Power transfer switches.
 - b). Controls with external control power connections.
- I. **Operating Instruction Signs:** Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. **Emergency Operating Instruction Signs:** Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer and/or load shedding.
- K. **Equipment Identification Labels:** On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. **Labeling Instructions:**
 - a). **Indoor Equipment:** Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
 - b). **Outdoor Equipment:** Engraved, laminated acrylic or melamine label or stenciled legend 4 inches (100 mm) high].
 - c). **Elevated Components:** Increase sizes of labels and letters to those appropriate for viewing from the floor.

- d). Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

- a). Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
- b). Enclosures and electrical cabinets.
- c). Access doors and panels for concealed electrical items.
- d). Switchgear.
- e). Switchboards.
- f). Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
- g). Substations.
- h). Emergency system boxes and enclosures.
- i). Motor-control centers.
- j). Enclosed switches.
- k). Enclosed circuit breakers.
- l). Enclosed controllers.
- m). Variable-speed controllers.
- n). Push-button stations.
- o). Power transfer equipment.
- p). Contactors.
- q). Remote-controlled switches, dimmer modules, and control devices.
- r). Battery-inverter units.
- s). Battery racks.
- t). Power-generating units.
- u). Monitoring and control equipment.
- v). UPS equipment.

End of Division 26 0553

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

December 2012, rev 00

26 1200 – Medium Voltage Transformers

PART-1. GENERAL

1.01 Scope

A. This specification covers the electrical and mechanical characteristics of 45-10,000kVA Three-Phase Step- Down Pad-Mounted Distribution Transformers. KVA ratings for transformers with secondary voltages not exceeding 1,000-10,000 kVA.

B. Applicable References

1. All characteristics, definitions, and terminology, except as specifically covered in this specification, shall be in accordance with the latest revision of the following ANSI IEEE, NEMA, and Department of Energy standards:
 - a. C57.12.00 - IEEE Standard for Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers.
 - b. C57.12.28 - Pad-Mounted Equipment - Enclosure Integrity.
 - c. C57.12.34 -IEEE Standard Requirements for Pad-Mounted, Compartmental-Type, Self-cooled, Three-Phase Distribution Transformers (2500 kVA and Smaller) -High Voltage: 34500GrdYI19920 Volts and Below; Low-Voltage: 480 Volt 2500kVA and Smaller.
 - d. C57.12.90 -IEEE Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers and IEEE Guide for Short-Circuit Testing of Distribution and Power Transformers.
 - e. C57.12.91 - Guide for Loading Mineral-Oil-Immersed Transformers.
 - f. NEMA TR 1-1993 (R2000) - Transformers, Regulators and Reactors, Table 0-2 Audible Sound Levels for Liquid-Immersed Power Transformers.
 - g. NEMA 260-1 996 (2004) - Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas.
 - h. 10 CFR Part 431 - Department of Energy - Energy Conservation Program for Commercial Equipment; Distribution Transformers Energy Conservation Standards; Final Rule.

C. Submittals

1. Data Submittal

- a. The following data shall be submitted:
 - 1) Percent Impedance
 - 2) Typical bid drawing

- 3) Approval drawing - drawings shall show final dimensions and features. When requested, approval drawings shall be provided per quoted lead time.
- 4) Record Drawing - drawings shall show final dimensions and features. When requested, record drawings shall be provided.

PART-2. PRODUCTS

2.01 Ratings

- A. The transformer shall be designed in accordance with this specification and the kVA rating shall be as indicated on the Drawings.
- B. The primary voltage, configuration, and the basic lightning impulse insulation level (BIL) shall be: loop feed, 41 60 Delta x 13200 Delta (dual primaries), 95 kV BIL.
- C. The secondary Voltage, configuration, and the basic insulation level (BIL) of the secondary voltage shall be 480Y/277V, 30 kV BIL.
- D. The transformer may be furnished with full capacity high-voltage taps. The tap changer shall be clearly labeled to reflect that the transformer must be de-energized before operating the tap changer as required in Section 4.3 of ANSIC57.12.34. The tap changer shall be operable on the higher Voltage only for transformers with dual voltage primaries. The unit shall have one of the following tap configurations:
 1. Two - 2 % taps above and below rated voltage (split taps).
- E. The average winding temperature rise above ambient temperature, when tested at the transformer rating, shall not exceed 65°C.
- F. The percent impedance voltage, as measured on the rated voltage connection, shall be per Table 2. For target impedances, the tolerance on the impedance shall be +/- 7.5% of nominal value for impedance values greater than 2.5%. The tolerance on the impedance shall be +1-10.0% for impedance values less than or equal to 2.5%.

2.02 Construction

- A. The core and coil shall be vacuum processed to ensure maximum penetration of insulating fluid into the coil insulation system. While under vacuum, the windings will be energized to heat the coils and drive out moisture, and the transformer will be filled with preheated filtered degassed insulating fluid. The core shall be manufactured from burr-free, grain-oriented silicon steel and shall be precisely stacked to eliminate gaps in the corner joints. The coil shall be insulated with B stage, epoxy coated, diamond pattern, insulating paper, which shall be thermally

cured under pressure to ensure proper bonding of conductor and paper. Coils shall be either aluminum or copper (eliminate a metal if one is required over the other).

- B. The dielectric coolant shall be listed less-flammable fluid meeting the requirements of National Electrical Code Section 450-23 and the requirements of the National Electrical Safety Code (IEEE C2-2002), Section 15. The dielectric coolant shall be non-toxic*, non-bioaccumulating and be readily and completely biodegradable per EPA OPPTS 835.31 00. The base fluid shall be 100% derived from edible seed oils and food grade performance enhancing additives. The fluid shall not require genetically altered seeds for its base oil. The fluid shall result in zero mortality when tested on trout fry (Per OECD G.L. 203). The fluid shall be certified to comply with the US EPA Environmental Technology Verification (ETV) requirements, and tested for compatibility with transformer components. The fluid shall be Factory Mutual Approved, UL Classified Dielectric Medium (UL-EOUV) and UL Classified Transformer Fluid (UL-EOUV), Envrotermps FR 3 fluid.
- C. Tank and Cabinet Enclosure:
1. The high-voltage and low-voltage compartments, separated by a metal barrier, shall be located side-by-side on one side of the transformer tank. When viewed from the front, the low-voltage compartment shall be on the right. Each compartment shall have a door that is constructed so as to provide access to the high-voltage compartment only after the door to the low-voltage compartment has been opened. There shall be one or more additional fastening devices that must be removed before the high voltage door can be opened. Where the low-voltage compartment door is of a flat panel design, the compartment door shall have three-point latching with a handle provided for a locking device. Hinge pins and associated barrels shall be constructed of corrosion-resistant material, passivated AISI Type 304 or the equivalent.
 2. A recessed, captive, penta-head or hex-head bolt that meets the dimensions per ANSI C57 .12.28 shall secure all access doors.
 3. The compartment depth shall be in accordance with C57.12.34, unless additional depth is specified.
 4. The tank base must be designed to allow skidding or rolling in any direction. Lifting provisions shall consist of four lifting lugs welded to the tank.
 5. The tank shall be constructed to withstand 7 psi without permanent deformation, and 15 psi without rupture. The tank shall include a 15 psig pressure relief valve with a flow rate of minimum 35 SCFM.
 6. The exterior of the unit shall be painted Munsell 7GY3.2911.5 green
 7. The tank shall be complete with an anodized aluminum laser engraved nameplate. This nameplate shall meet Nameplate B per ANSI C57.12.00.

2.03 High Voltage Bushings and Terminals

- A. High voltage bushings will be installed in the high voltage termination compartment located on the front left of the transformer and requiring access via the low voltage termination compartment on the front right.
 - B. Bushing Style:
 1. 15/25/35 KV DEADFRONT, CURRENTS ABOVE 200 AMPS: The high voltage bushing shall be a 600A dead-break primary one-piece bushing externally removable, 30 rated, integral design. An optional 900 A bushing is available upon request.
 - C. Bushing Configuration
 1. 15/25 KV LOOP FEED DEADFRONT: The transformer shall be provided with six (6) high voltage bushings. ANSI C57.12.34 for loop feed configurations. The bushing heights shall be in accordance with Figure 3 minimum dimensions. ANSI C57.12.34.
- 2.04 Low Voltage Bushings and Terminals
- A. Bushing Style
 1. Voltages less than 700 Volts: The transformer shall be provided with tin-plated spade-type bushings for vertical takeoff. The spacing of the connection holes shall be 1.75" on center, per ANSI C57.12.34 figure 13a. The quantity of connection holes shall be 12, holes.
 2. Transformers 300 kVA and below, and 500 kVA with 480Y/1277 secondary will have two piece low voltage bushings with studs and screw on spades. Transformers 500 kVA with 208Y/120 secondary and all transformers above 500 kVA will have one-piece bushings.
 3. Standard I Maximum bushing hole quantities; kVA 750-1 500, 208Y/120V - 12 standard, 20 maximum.
 4. Bushing supports shall be provided for transformers requiring 10 or more connection holes. Bushing supports shall be affixed to the cabinet sidewalls; tank mounted supports mountings are not acceptable.
 - B. Bushing Configuration
 1. The transformer shall be provided with bushings in a staggered arrangement in accordance with Figure 1 1 a dimensions (Figure 12a dimensions may be specified when a larger termination compartment for greater working space is desired) of ANSI C57.12.34.
 2. Switching

- a. Primary Switching: The primary switching scheme provided with the transformer shall be one four position T-blade sectionalizing switch. Refer to Appendix I for the schematics of these switching options.
- b. Make-before-break option for four-position, sectionalizing switch: This switch option provides improved system reliability by eliminating momentary interruptions during switching operations.

2.05 Overcurrent Protection

- A. BAY-O-NET (The high-voltage overcurrent protection scheme provided with the transformer shall be an externally removable load break expulsion Bay-O-Net fuse assembly with a flapper valve to minimize oil spillage.

2.06 Over Voltage Protection

- A. The overvoltage protection scheme provided with the transformer shall protect the high-voltage or low voltage winding.
- B. DEAD-FRONT BUSHINGS: Externally mounted, Distribution Class M.O.V.E. Dead-front elbow arresters shall be supplied. M.O.V.E. arresters are for installation on 200 A rated dead-front bushing interfaces only. If transformer bushings are rated 600 A or 900 A, BT-TAP elbow connectors, T-OP II elbow connectors, or 600 A bushing adapters, each with a load-reducing tap plug for arrester connection, are required.

2.07 Labeling

- A. A temporary bar code label shall be attached to the exterior of the transformer in accordance with ANSI CS7.12.34.

2.08 Finish Performance Requirements

- A. The tank coating shall meet all requirements in ANSI CS7.12.28 including:
 1. Salt Spray
 2. Crosshatch adhesion
 3. Humidity
 4. Impact
 5. Oil resistance
 6. Ultraviolet accelerated weathering
 7. Abrasion resistance - taber abramer
- B. The enclosure integrity of the tank and cabinet shall meet the requirements for tamper resistance set forth in ANSI CS7.12.28 including but not limited to the pry test, pull test, and wire probe test.

2.09 Production Testing

A. All units shall be tested for the following:

1. No-Load (85°C or 20°C) losses at rated current
2. Total (85°C) losses at rated current
3. Percent Impedance (85°C) at rated current
4. Excitation current (100% voltage) test
5. Winding resistance measurement tests
6. Ratio tests using all tap settings
7. Polarity and phase relation tests
8. Induced potential tests
9. Full wave and reduced wave impulse test

B. Minimally, transformers shall conform to efficiency levels for liquid immersed distribution transformers, as specified in Table 1.1 of the Department of Energy ruling. "10 CFR Part 431 Energy Conservation Program for Commercial Equipment: Distribution Transformers Energy Conservation Standards; Final Rule; October 12, 2007." Manufacturer shall comply with the intent of all regulations set forth in noted ruling. This efficiency standard does not apply to step-up transformers.

C. In addition, the manufacturer shall provide certification upon request for all design and other tests listed in C57.12.00, including verification that the design has passed short circuit criteria per ANSI C57.12.00 and C57.12.90.

D. In the event of proposal bid evaluated with guaranteed losses due to a loss evaluation (see section 10.0), manufacturer shall conform to guaranteed average losses as specified in ANSI C57.12.00. The no-load losses of a transformer shall not exceed the specified no-load losses by more than 10%, and the total losses of a transformer shall not exceed the specified total losses by more than 6%.

2.10 Approved Manufacturers

A. Cooper Power Systems

2.11 Accessories

A. The following accessories and options shall be provided:

1. Bolted main tank cover (1 000 kVA & below)
2. Welded main tank cover with bolted handhole (1 500 kVA & above)
3. 1.0" upper fill plug
4. 1.0" drain plug in LV compartment (500 kVA & below)
5. 1.0" drain valve with sampling device in LV compartment (750 kVA & above)
6. Automatic pressure relief valve

7. Metal drip shield (when bayonets specified)
8. Ground provisions per C57.12.34 section 9.1 1.
9. Meet NEMA TR-1 sound levels
10. Liquid level gauge
11. Dial-type thermometer gauge
12. Pressure vacuum gauge
13. 1.0" drain valve w/ sampling device in (LV or HV) compartment (500 kVA & below)
14. Upper fill valve
15. Pressure vacuum bleeder
16. Fault indicator provisions
17. Ground connectors
18. Danger high voltage warning signs
19. FM Global (FM) Approved transformer (to comply with NEC 450-23 listing restrictions for installations on, near, or inside of buildings)
20. Combination UL Listed & Classified transformer (to comply with NEC 450-23 listing restrictions for installations on, near, or inside of buildings) per UL XPLH
21. UL Listed transformer (certifying compliance with ANSI standards only) per UL XPLH

PART-3. EXECUTION

3.01 Shipping

- A. Transformers, 1000 kVA and below, shall be palletized. Transformers, 1500 kVA and larger, shall be loaded and unloaded with overhead cranes, so a pallet is not to be provided for these transformers.

3.02 Service

- A. The manufacturer of the transformer shall have regional service centers located within 2 hours flight time of all contiguous 48 states. Service personnel shall be factory trained in commissioning and routine service of quoted transformers.
- B. Description of positions:
 1. Feed from A & B
 2. Feed from A only
 3. Feed from B only
 4. Open - the loop is closed and the transformer is de-energized



This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

September 2012, rev. 00

26 2416 – Panelboards

PART 1. GENERAL

1.01 Summary

A. Section includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.
3. Load centers.

1.02 Definitions

A. SVR: Suppressed voltage rating.

1.03 Submittals

A. Product Data: For each type of panelboard, switching and overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of Nationally Recognized Testing Laboratories (NRTL) listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.

C. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D. Typewritten Panelboard Schedules: For installation in panelboards. Submit final versions with close-out documents after load balancing.

- E. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.
- 1.04 Quality Assurance
- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
 - 1. Square-D (Schneider Electric) is the preferred manufacturer
 - B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - C. Comply with NEMA PB 1.
 - D. Comply with NFPA 70.
 - E. Comply with UL 50, UL 67 , UL746C, NEMA PB, and Federal Specification W-P-115C Type 1 Class 1.
- 1.05 Delivery, Storage and Handling
- A. Remove loose packing and flammable materials from inside panelboards; store in heated space to prevent condensation.
 - B. Handle and prepare panelboards for installation according to NECA 407.
- 1.06 Project Conditions
- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry work above panelboards is complete.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a). Ambient Temperature: Not exceeding minus 23 deg F (minus 5 deg C) to plus 104 deg F (plus 40 deg C).
 - b). Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.07 Coordination

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

1.08 Extra Materials

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Spare Breakers: Provide three spare 20-amp 1-pole 120-v AFCI breakers, three spare 20-amp 1-pole, 120-v GFCI, and three spare 20-amp, 1-pole, 120-v SWD rated circuit breakers, all bolt-on type, all listed for use in the lighting and appliance panelboards, and stored in the spare fuse cabinet specified elsewhere.

PART 2. PRODUCTS

2.01 General Requirements for Panelboards

- A. Square-D (Schnieder Electric) is the preferred manufacturer.
- B. Enclosures: Flush- and surface-mounted cabinets.
1. Rated for environmental conditions at installed location. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - a). Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - b). For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
 3. Standard Finishes:

- a). Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b). Back Boxes: Galvanized steel.
4. Directory Card: Inside panelboard door, **detailed typewritten circuit assignments with room numbers and areas identified, mounted in metal directory frame.**
- C. Incoming Mains Location: Top and bottom (contractor to coordinate with feeder installation).
- D. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Neutral: Bus: 100% rated.
 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box (or insulated where indicated).
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Main and Neutral Lugs: Mechanical type.
 2. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 3. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices scheduled as "Space" or "3-Pole Space." Spaces shall be sized to accommodate the largest frame overcurrent device available for the application.
- G. Panelboard Short-Circuit Current Rating: Series rating shall be permissible where integral or remote upstream overcurrent protective devices have been coordinated by the manufacturer, and the panel is thus labeled by an NRTL. Include size and type of allowable upstream and branch devices, listed and labeled for series-connected short-circuit rating by an NRTL. Do not use series ratings where drawing notes indicate specific coordination requirements.
- 2.02 Lighting and Appliance Branch-Circuit Panelboards
- A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
 - B. Mains: Circuit breaker or lugs only as scheduled; feed-thru lugs as scheduled.
 - C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

- D. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
 - 1. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 - 2. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.
 - E. Standard Finishes:
 - 1. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - 2. Back Boxes: Galvanized steel.
 - F. Directory Card: Inside panelboard door, typewritten circuit assignments, mounted in metal directory frame.
- 2.03 Accessory Components and Features
- A. Accessory Set: Include any tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation (such as for locking-type circuit breakers).

PART 3. EXECUTION

3.01 Examination

- A. Receive, inspect, handle, and store panelboards according to NECA 407.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Installation

- A. Install panelboards and accessories according to NECA 407.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Mount top of trim 72 inches above finished floor unless size of unit dictates otherwise.

- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box. Adjust interiors to minimize voids between interior cover and wall finish.
- E. Install overcurrent protective devices and controllers not already factory installed.
- F. Install filler plates in unused spaces.
- G. Stub two 1-inch (27-GRC) empty conduits from any flush panelboard into the nearest accessible ceiling space or custodial closet, whichever is closer.
- H. Arrange conductors in gutters into groups and loosely (to prevent conductor overheating) bundle and wrap with wire ties after completing load balancing.
- I. Comply with NECA 1.

3.03 Identification

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create the directory; handwritten directories are not acceptable. For load centers, if any, provide a clear plastic pouch inside the door to hold the directory in the correct orientation.
- C. Panelboard Nameplates: Label each panelboard and load center with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.04 Field Quality Control

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.

- C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- D. Panelboards will be considered defective if they do not pass tests and inspections. Replace defective units and retest.
- E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.
- 3.05 Adjusting
- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
1. Measure as directed during period of normal system loading.
 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.
- 3.06 Touch-Up and Cleaning
- A. Prior to building occupancy, clean all enclosures of accumulated dust and debris.
- B. Clean or restore all finished surfaces to factory finish. Provide surface preparation and touch-up painting per painting sections.



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September 2012, rev 00

26 2923 – Variable Frequency Controllers

PART 1. GENERAL

1.01 Description

- A. This specification is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.
- B. The drive manufacturer shall supply the drive and all necessary options as herein specified. VFD's that are manufactured by a third party and "brand labeled" shall not be acceptable. All VFDs installed on individual projects shall be from the same manufacturer.
- C. New or replacement products installed in existing facilities shall be consistent with existing equipment.
- D. Products shall be provided by:
 1. Toshiba (www.toshiba.com)
 2. ABB (www.abb.us/drives)
 3. Allen Bradley (www.ab.com)

1.02 Quality Assurance

- A. Referenced Standards:
 1. Standard 519-1992, IEEE Guide for Harmonic Content and Control.
 2. UL508C
 3. ICS 7.0, AC Adjustable Speed Drives
 4. IEC 16800 Parts 1, 2 and 3
 5. NEC 430.120, Adjustable-Speed Drive Systems
 6. IBC 2006 Seismic – referencing ASC 7-05 and ICC AC-156
- B. Qualifications:
 1. VFDs and options shall be UL listed as a complete assembly. The base VFD shall be UL listed for 100 KAIC without the need for input fuses.
 2. CE Mark – The VFD shall meet product standard EN 61800-3 for the First Environment restricted level. (RFI / EMI Filter spec).

1.03 Submittals

- A. Submittals shall include the following information:

1. Outline dimensions, conduit entry locations and weight.
2. Customer connection and power wiring diagrams.
3. Complete technical product description including a complete list of options.
4. Compliance to IEEE 519 – harmonic analysis for particular jobsite including total harmonic voltage distortion and total harmonic current distortion (TDD).
 - a). All VFD's shall include a minimum of 3% impedance reactors, no exceptions.

PART 2. PRODUCTS

2.01 Variable Frequency Drives

- A. The VFD package as specified herein shall be enclosed in a UL Listed Type enclosure, (enclosures with only NEMA ratings are not acceptable).
 1. Environmental operating conditions: 0 to 400 C (32 to 1040 F) continuous. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing. All circuit boards shall have conformal coating.
 2. Enclosure shall be UL rated and shall be UL listed as a plenum rated VFD.
- B. All VFDs shall have the following standard features:
 1. All VFDs shall have the same customer interface, including digital display, and keypad, regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
 2. The keypad shall include Hand-Off-Auto selections or equivalent and manual speed control. There shall be fault reset on the keypad.
 3. The VFD shall have internal 3% impedance reactors to reduce the harmonics to the power line and to add protection from AC line transients.
 4. The input current rating of the VFD shall be no more than 3% greater than the output current rating. VFD's with higher input current ratings require the upstream wiring, protection devices, and source transformers to be oversized per NEC 430.120.
 5. The VFD shall provide a programmable loss-of-load (broken belt / broken coupling) Form-C relay output. The drive shall be programmable to signal the loss-of-load condition via a keypad warning, Form-C relay output, and / or over the serial communications bus.
- C. All VFDs to have the following adjustments:
 1. Run permissive circuit - There shall be a run permissive circuit for damper or valve control. Regardless of the source of a run command (keypad command, input contact closure, time-clock control, or serial communications), the VFD shall provide a dry contact closure that will signal the damper to open (VFD

motor does not operate). When the damper is fully open, a normally open dry contact (end-switch) shall close. The closed end-switch is wired to a VFD digital input and allows VFD motor operation. A minimum of two separate safety interlock inputs shall be provided. When any safety is opened, the motor shall be commanded to coast to stop and the damper shall be commanded to close.

2. The VFD control shall include a programmable time delay for VFD start and a keypad indication that this time delay is active. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates.
3. The VFD shall include a fireman's override input. The mode shall override all other inputs (analog/digital, serial communication, and all keypad commands), except customer defined safety run interlocks, and force the motor to run at a preset speed or in a separate PID mode.

D. EMI / RFI filters: All VFD's shall include EMI/RFI filters. The onboard filters shall allow the entire VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted. No Exceptions.

E. Bypass Controller

1. A complete factory wired and tested bypass system consisting of a door interlocked, pad lockable circuit breaker, output contactor, bypass contactor, and fast acting VFD isolation fuses.
2. The bypass enclosure door and VFD enclosure must be mechanically interlocked such that the disconnecting device must be in the "Off" position before either enclosure may be accessed.
3. The VFD and bypass package shall have a UL listed short circuit current rating (SCCR) of 100,000 amps and this rating shall be indicated on the UL data label.
4. Drive Isolation Fuses - To ensure maximum possible bypass operation, fast acting fuses, exclusive to the VFD, shall be provided to allow the VFD to disconnect from the line prior to clearing upstream branch circuit protection. This maintains bypass operation capability in the event of a VFD failure. Bypass designs, which have no such fuses will not be accepted.
5. The system (VFD and Bypass) tolerated voltage window shall allow the system to operate from a line of +30%, -35% nominal voltage range. The system shall incorporate circuitry that will allow the drive or bypass contactor to remain "sealed in" over this voltage tolerance at a minimum.
6. The bypass shall maintain positive contactor control throughout the voltage tolerance window of nominal voltage $\pm 10\%$.

7. Motor protection from single phase power conditions - the bypass system must be able to detect a single phase input power condition while running in bypass, disengage the motor in a controlled fashion, and give a single phase input power indication. Bypass systems not incorporating single phase protection in bypass mode are not acceptable.
8. The bypass system shall NOT depend on the VFD for bypass operation. The bypass system shall be designed for stand-alone operation and shall be completely functional in both Hand and Automatic modes even if the VFD has been removed from the system for repair / replacement.
9. The bypass control shall include a programmable time delay for bypass start and keypad indication that this time delay is in process. A Form C relay output provides a contact closure to signal the VAV boxes open. This will allow VAV boxes to be driven open before the motor operates at full speed in the bypass mode. The time delay shall be field programmable from 0 – 120 seconds.

PART 3. EXECUTION

3.01 Installation

- A. Installation shall be the responsibility of the contractor.
- B. Power wiring shall be completed by the contractor, to NEC code 430.122 wiring requirements based on the VFD input current.
- C. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the VFD installation manual.

3.02 Start-up

- A. Certified factory start-up shall be provided for each drive by a factory authorized service center.

3.03 Warranty

- A. The VFD Product Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts, labor, travel time and expenses. A toll free 24/365 technical support line shall be available.



End of Division 26 2923

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

April 2014, rev 00

26 5100 – Interior Lighting

PART-1. GENERAL

1.01 Section Includes

- A. Interior luminaries
- B. Emergency lighting units
- C. Exit signs
- D. Ballasts
- E. Lamps
- F. Luminaire accessories

1.02 Reference Standards

- A. IECC – International Energy Conservation Code - 2012
- B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated-2002.
- C. IEEE C62.41.2 - Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (R2008).
- D. IESNA LM-63 - ANSI Approved Standard File Format for Electronic Transfer of Photometric Data and Related Information; 2002.
- E. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- F. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- G. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- H. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Fluorescent Ballasts; National Electrical Manufacturers Association; 2004.
- I. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; National Electrical Manufacturers Association; 2006.

- J. NFPA 70 - National Electrical Code; National Fire Protection Association; 2008.
 - K. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.
 - L. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
 - M. UL 935 - Fluorescent-Lamp Ballasts; Current Edition, Including All Revisions.
 - N. UL 1598 - Luminaires; Current Edition, Including All Revisions.
 - O. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.
- 1.03 Administrative Requirements
- A. Coordination
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
- 1.04 Submittals
- A. Shop Drawings
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. Ballasts: Include wiring diagrams and list of compatible lamp configurations.

2. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.

C. Samples:

1. Provide one sample(s) of each luminaire proposed for substitution upon request.

D. Field Quality Reports

- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

- F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

- G. Maintenance Materials: Furnish the following for NIU's use in maintenance of project.

1. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
2. Extra Lamps: Ten percent of total quantity installed for each type, but not less than two of each type.
3. Extra Ballasts: Two percent of total quantity installed for each type, but not less than one of each type.

- H. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.05 Quality Assurance

- A. Conform to requirements of NFPA 70.

- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 Delivery, Storage, and Protection

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.07 Field Conditions

- A. Maintain field conditions within manufacturers required service conditions during and after installation.

1.08 Warranty

- A. Provide five year manufacturer warranty for all linear fluorescent ballasts.
- B. Provide five year pro-rata warranty for batteries for emergency lighting units.
- C. Provide ten year pro-rata warranty for batteries for self-powered exit signs.

PART-2. PRODUCTS

2.01 Manufacturers

- A. The manufacturers shall be as indicated on lighting fixture schedule.

2.02 Luminaire Types

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.03 Luminaires

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.

2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.

H. Fluorescent Luminaires:

1. Provide ballast disconnecting means complying with NFPA 70 where required.
2. Fluorescent Luminaires Controlled by Occupancy Sensors: Provide programmed start ballasts.

I. LED Luminaires:

1. Listed and labeled as complying with UL 8750.

J. Luminaires Mounted in Continuous Rows:

1. Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.04 Emergency Lighting Units

- A. In areas with high potential for intentional damage (dormitories) the preference is lighting units that are robust:

1. Preferred manufacturer:

- a. Big Beam Emergency Systems, Inc., Crystal Lake, IL.
<http://www.bigbeam.com> , industrial products.

- B. In areas with lesser potential for intentional damage (classroom areas), less robust units are acceptable.

1. Preferred manufacturers:

- a. Big Beam Emergency Systems, Inc., Crystal Lake, IL.
<http://www.bigbeam.com> , commercial products
- b. EELP Life Safety and Lighting Products, <http://www.eelp.net>

- C. Emergency lighting units shall comply with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

- D. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

- E. Battery:
 - 1. Sealed maintenance-free nickel cadmium unless otherwise indicated.
 - 2. Size battery to supply all connected lamps, including emergency remote heads where indicated.
 - F. Diagnostic:
 - 1. Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
 - G. Provide low-voltage disconnect to prevent battery damage from deep discharge.
 - H. Provide overload and short circuit protection.
 - I. Self-Diagnostics:
 - 1. Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.
 - J. Accessories:
 - 1. Provide compatible accessory mounting brackets where indicated or required to complete installation.
 - K. Warranty; Minimum warranty 5 years
- 2.05 Exit Signs
- A. In areas with high potential for intentional damage (dormitories) the preference is lighting units that are robust:
 - B. Preferred manufacturers:
 - 1. Big Beam Emergency Systems, Inc., Crystal Lake, IL. <http://www.bigbeam.com>, industrial products.
 - 2. EELP Life Safety and Lighting Products, <http://www.eelp.net/>
 - C. In areas with lesser potential for intentional damage (classroom areas), less robust units are acceptable.
 - D. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single or double as indicated or as required for the installed location.
2. Directional Arrows: As indicated or as required for the installed location.

E. Self-Powered Exit Signs:

1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
4. Provide low-voltage disconnect to prevent battery damage from deep discharge.
5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.

F. Warranty; Minimum warranty 5 years

2.06 Ballasts

A. Manufacturers:

1. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. All Ballasts:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

C. Fluorescent Ballasts:

1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic programmed start ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
 - a. Input Voltage: Suitable for operation at voltage of connected source, with variation tolerance of plus or minus 10 percent.
 - b. Total Harmonic Distortion: Not greater than 20 percent.
 - c. Power Factor: Not less than 0.95.

- d. Thermal Protection: Listed and labeled as UL Class P, with automatic reset for integral thermal protectors.
 - e. Sound Rating: Class A, suitable for average ambient noise level of 20 to 24 decibels.
 - f. Lamp Compatibility: Specifically designed for use with the specified lamp, with no visible flicker.
 - g. Lamp Operating Frequency: Greater than 20 kHz, except as specified below.
 - h. Lamp Current Crest Factor: Not greater than 1.7.
 - i. Lamp Wiring Method:
 - 1). Rapid Start Ballasts: Series wired.
 - j. Provide automatic restart capability to restart replaced lamp(s) without requiring resetting of power.
 - k. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category A.
 - l. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of CFR, Title 47, Part 18, for Class A, non-consumer application.
 - m. Provide high efficiency T8 lamp ballasts certified as NEMA premium where indicated.
 - n. Ballast Marking: Include wiring diagrams with lamp connections.
2. Non-Dimming Fluorescent Ballasts:
 - a. Lamp Starting Method:
 - 1). T8 Lamp Ballasts: Instant start unless otherwise indicated.
 - 2). Compact Fluorescent Lamp Ballasts: Programmed start unless otherwise indicated.
 - b. Lamp Starting Temperature: Capable of starting standard lamp(s) at a minimum of 0 degrees F, and energy saving lamp(s) at a minimum of 60 degrees F unless otherwise indicated.

2.07 Lamps

A. All Lamps:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.

3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
 4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp, furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect or Owner to be inconsistent in perceived color temperature.
- B. Compact Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
 2. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
 3. Color Rendering Index (CRI): Not less than 80.
 4. Average Rated Life: Not less than 10,000 hours for an operating cycle of three hours per start.
- C. Linear Fluorescent Lamps: Wattage and bulb type as indicated, with base type as required for luminaire.
1. Low Mercury Content: Provide lamps that pass the EPA Toxicity Characteristic Leaching Procedure (TCLP) test for characteristic hazardous waste.
 2. T8 Linear Fluorescent Lamps:
 - a. Correlated Color Temperature (CCT): 3,500 K unless otherwise indicated.
 - b. Color Rendering Index (CRI): Not less than 80.
 - c. Average Rated Life: Not less than 20,000 hours for an operating cycle of three hours per start.

PART-3. EXECUTION

3.01 Examination

- A. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- B. Verify that suitable support frames are installed where required.
- C. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 Installation

- A. Coordinate locations of outlet boxes provided under Section 26 0537 as required for installation of luminaires provided under this section.
- B. Install products according to manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members, or to building structure.
 - 4. Secure pendant-mounted luminaires to building structure.
 - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
- F. Suspended Luminaires:
 - 1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to un-switched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
 - 2. Install lock-on device on branch circuit breaker serving units.
- J. Exit Signs:
 - 1. Install lock-on device on branch circuit breaker serving exit sign units.
- K. Install lamps in each luminaire.

- L. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- 3.03 Field Quality Control
- A. Inspect each product for damage and defects.
 - B. Operate each luminaire after installation and connection to verify proper operation.
 - C. Test self-powered exit signs and emergency lighting units to verify proper operation upon loss of normal power supply.
 - D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by the Architect or Owner's representative.
- 3.04 Adjusting
- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect or Owner's representative. Secure locking fittings in place.
 - B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by authority having jurisdiction.
 - C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by or authority having jurisdiction.
- 3.05 Cleaning
- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- 3.06 Closeout Activities
- A. Just prior to Substantial Completion, replace all lamps that have failed.
- 3.07 Protection
- A. Protect installed luminaires from subsequent construction operations.

End of Division 26 5100

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

September 2012, rev. 00

26 5600 – Exterior Lighting

PART 1. GENERAL

1.01 Related Documents

- A. Deviation from this standard must be approved by the Project Architect.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- C. Div. 26 0533 Conduit
- D. Div. 26 2813 Fuses
- E. Div. 26 2816 Disconnect Switches

1.02 Summary

- A. This Section includes the following:
 - 1. This Section specifies the exterior lighting fixtures for, structures, and exterior areas.
 - 2. Specification for exterior lighting for buildings is architecture specific and shall be approved by the Project Architect.
 - 3. Provide all labor, materials, and equipment as necessary to complete all work as indicated on the drawings, and as specified herein.
 - 4. The Contractor shall furnish and install all fixtures, as shown on the drawing. Fixtures shall conform to the types and manufacturers as hereinafter specified.
 - 5. The Contractor shall furnish all lamps and necessary hangers, supports, wiring, etc., for installation of fixtures.
- B. Related Sections include the following:
 - 1. Applicable sections of Division 26 – Electrical

1.03 Definitions

- A. CRI: Color-rendering index.
- B. HID: High-intensity discharge.
- C. Luminaire: Complete lighting fixture, including ballast housing if provided.

- D. Pole: Luminaire support structure, including tower used for large area illumination.
 - E. Standard: Same definition as "Pole" above.
- 1.04 Submittals
- A. Shop Drawings: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, for the following:
 - 1. Lighting fixtures
 - 2. Poles
 - 3. Street light conductors
 - 4. Pull boxes/handholes
 - B. Field quality test reports
- 1.05 Quality Assurance
- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - B. Comply with NFPA 70, "National Electrical Code"
- 1.06 Delivery, Storage, and Handling
- A. Package aluminum poles for shipping according to ASTM B 660.
 - B. Store aluminum and steel poles on decay-resistant-treated skids at least 12 inches above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
 - C. Remove factory-applied pole wrappings upon receipt. Tarp and protect until prior to installation. Handle poles with web fabric straps.

PART 2. PRODUCTS

2.01 Area Lights

- A. New area light poles manufacturer shall Holophane
 - 1. NIU Standard Description:

- a). North Yorkshire Aluminum Pole 17 inch base (NYA): North Yorkshire Pole, 12 feet, L5J Sitelink 5 inch, 17 inch Round Base for Sitelink, 3X3 Tenon, Anchor bolts, galvanized steel, Powder Coat Paint, Black.
- b). Base size may be adjusted to accommodate existing installations.
- c). Banner Arms shall be Holophane SLBA24A0.75T2D1. Quantity of 2 per pole.

2. NIU Standard Pole Part Number:

- a). Holophane Sitelink NYA 12 L5J 17 P07 ABG BK

B. Installation:

1. The post shall be provided with four, hot dipped L-type anchor bolts. A door shall be provided in the base for anchorage and wiring access. A grounding screw shall be provided inside the base opposite the door.

C. Area light luminaire Manufacturer shall be Holophane:

1. NIU Description for LED applications:

- a). Granville II LED (GVD): II LED (GVD), 80W 400mA Driver, 5000 Series CCT, Auto-Sensing Voltage (120-277), Modern Style – Swing Open Design, Black, Distribution to be determined (X), Not Trim, Painted Cast Aluminum Standard, Black.
- b). NIU Standard Part Number: GVD 80 5K AS M B 5 S B

2.02 Exterior Building Light Fixtures

A. Preferred Light Source: LED

- B. Exterior Building Light Fixtures to be evaluated for Architectural merit on an individual building basis.

2.03 Street Lights

A. 27 Foot Street Light Standards

1. Standards shall be aluminum poles, type as manufactured by the following:
 - a). USS Manufacturing 27 foot pole with 8 foot mast arm. USS part number USS8050D27ABSP-ANOD
2. Street light standard anchor bolts shall be galvanized steel, size as noted on the drawing.
3. Base size may be adjusted to accommodate existing installations.

B. 27 Foot Street Light Luminaires

1. Luminaires shall be of a size and type as manufactured by:
 - a). Lumark , LED, part number: LDRCT3B04EBK
2. Distribution and wattage to be coordinated with design

2.04 Parking Lot Lighting

A. Standard shall be steel poles

1. Basis of design shall be poles manufactured by WJM, square non-tapered steel. Part No. SS5001128BKDM28BC.
2. Base size may be adjusted to accommodate existing installations.

B. Luminaires shall be size and type as manufactured by Lumark.

1. Type RVLED Ridgeview area lighting. Part No. LDRXXXB04XXXBK.
2. Distribution (XXX as noted in part number) and accessories (XXX as noted in part number) to be specified by Project Engineer.

2.05 Lighting Conduit Requirements

1. Schedule 40, in greenspace
2. Schedule 80 under roadways or parking lots

2.06 Lighting Conductors (To be added)

2.07 Lighting Handholes

A. Handholes shall be manufactured by Quazite.

2.08 Lighting Fusing

- A. Install one fuse in each phase conductor at each pole, accessible from handhole at base of pole.
- B. Fuses for street lights and area lights shall be Buchanan Breakaway, in-line fuses, type D65 with KTK-5 or approved equivalent. Fuses shall be sized for the fixtures being protected.

PART 3. EXECUTION

3.01 Lubrication

- A. Lubricate all pole mounting screws and bolts, handhole screws, and any other threaded device with an anti-seize lubricant to prevent long term corrosion and aid in future maintenance.

3.02 Street Lights

A. Parkway Street Light Bases

1. Bases for Parkway street light poles shall be constructed as shown on the drawing. Bases shall be 24" diameter and minimum 6" above grade.
 2. Bases for Parking Lot street light poles shall be constructed as shown in the drawings. Bases shall be 24" minimum diameter and 30" above grade.
 3. Bases shall be made of a 3,000 psi stone concrete mixture.
 4. Chamfer top edge of the base according to detail.
 5. After the base has cured the form shall be removed.
 6. Base size may be adjusted to accommodate existing installations
- B. Install the street light pole with one nut above and one nut below the standard base. The nut below shall be used as a leveling nut.
- C. After the pole is plumb, grout the opening between the concrete base and pole base full from the conduit to the edge of the standard base.

3.03 Grounding

- A. Each street and walk light shall be grounded with a 5/8 inch x 8 foot copperweld ground rod driven adjacent to the base, covered by a minimum of 6 inches of earth and connected to the standard or post with a No. 6 stranded THW copper wire in accordance to detail.
- B. Install a No. 6 AWG THWN ground wire from the luminaire grounding lug to the ground rod for concrete poles in accordance to detail.

3.04 Trenching

- A. The Contractor shall use a trenching machine or back hoe in digging trench for conductors. Trench shall have a minimum width of 6 inches and a maximum width of 12 inches. Depth of trench shall be a minimum of 30 inches.
- B. Trench shall be free of stones or debris before conductors are installed.
- C. When backfilling, fill first 6 inches of trench with sand. Earth removed may only be used in this first 6 inches of fill if it is hand shoveled and kept free of stone, cinders, and other debris.
- D. Backfill with spoils shall not be permitted under roadways.

- E. All backfill placed under roadways, sidewalks, parking areas, or other surfaced areas shall be compacted to 95 maximum density. All backfill placed in lawn or field areas shall be compacted to 90 maximum density. Density tests shall conform to A.A.S.H. Test T-180 and field test T-147.
- F. Failures of any surface areas caused by settlement shall be repaired at the contractor's expense for a period of 3 years after completion of contract.

3.05 Street Light Handholes

A. Pull Box Location

1. A street light pull box shall be located at all locations where a three-way splice is made with the street light circuit cable or as otherwise shown on the drawings.
2. A street light pull box shall be located at all locations where a three-way splice is made with the street light circuit cable and a tap is made with the conductors feeding the light, or as otherwise shown on the drawings.
3. A box is not necessary where only a tap is made to serve the light, unless noted otherwise. The street light cable shall be looped in to and out of the light standard and the tap made in the handhole.

B. Hand Hole (Turf Box) Installation

1. Install street light conduits to enter the bottom of the street light pull box.
2. Install 6 inches of crushed limestone around the conduits to form a level base for the pull box to set on. Install the pull box on the limestone so that the top of the box even with grade.
3. Install crushed limestone inside the pull box to a depth of 2 inches around the conduits. Leave conduits extended a minimum of 3 inches above the limestone.

3.06 Conductor Installation

A. Care shall be taken not to cross conductors in the trench.

B. Connections Made In Street Light Standard or Area Light Pole.

1. Extend the street light conductors up into pole so that 10 inches of each conductor is accessible out through hand hole.
2. Install 3#10 AWG USE stranded copper conductors from luminaire to hand hole.

C. Connections Made In Street Light Pull Box

1. Extend the street light conductors up into pull box so that 24 inches of each conductor is accessible from the end of the conduit.

2. Install 3#10 AWG USE stranded copper conductors from luminaire to pull box.
3. Street light conductors shall be connected to luminaire conductors in hand holes utilizing a weather proof rated connector.

3.07 Conductor Splicing

- A. Street light conductors shall be installed in continuous lengths from light to light with connections in the base of lights or street light pull boxes. Where a pipe in an existing base is filled, drill an additional hole in base to insert new conductors.
- B. Buried splices shall not be permitted.

3.08 Street Light and Area Light Fuses

- A. Install Buchanan Breakaway, in-line fuses, type D65 with KTK-5 or approved equivalent in the pole handhole.

3.09 Field Quality Control

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
- C. Illumination Tests:
 1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IESNA testing guide(s):
 - a). IESNA LM-5, "Photometric Measurements of Area and Sports Lighting."
 - b). IESNA LM-50, "Photometric Measurements of Roadway Lighting Installations."
 - c). IESNA LM-52, "Photometric Measurements of Roadway Sign Installations."
 - d). IESNA LM-64, "Photometric Measurements of Parking Areas."
 - e). IESNA LM-72, "Directional Positioning of Photometric Data."
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

End of Division 26 5600

This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

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27 0526 Common Work Results for Communications; Grounding / Protection**Grounding and Protection General**

- A. Communication bonding and grounding shall be in accordance with the NEC and NFPA.
- B. Horizontal cables shall be grounded in compliance with ANSI/NFPA 70 and local requirements and practices.
- C. Horizontal equipment includes cross connect frames, patch panels and racks, active telecommunication equipment and test apparatus and equipment.
- D. Telecommunications Bonding Backbone
 - 1. Provide a Telecommunications Bonding Backbone utilizing a #6-AWG or larger bonding conductor that provides direct bonding between equipment rooms and telecommunications closets.
 - 2. Always provide Telecommunications Bonding Backbone when using non-shielded backbone copper cable.
- E. It shall be the responsibility of the contractor to ensure that the telecommunication grounding system for this facility is continuous, complete, and meets or exceeds all applicable codes and standards.

Telecommunications Grounding Busbar

- A. All products are to be listed by UL or ETL.
- B. Specifications:
 - 1. Pre-drilled solid copper
 - 2. Bolt hole sizing and spacing: NEMA standard
 - 3. Minimum thickness: 0.25"
 - 4. Minimum dimensions: 4" H x 12" W, sized to accommodate all indicated and required connections
 - 5. Mounting: Minimum 2" insulated standoff brackets
 - 6. Cover: Lettered plexi-glass

Bonding conductor for telecommunications.

- A. Specifications
 - 1. Gage: #6 AWG through 3/0 based on length
 - 2. Insulation: Green PVC 600V insulated

Two Hole Compression Lugs

- A. Specifications
 - 1. UL listed for use up to 35 KV
 - 2. Temperature rated 90 degrees Celsius
 - 3. CSA certified to 600V
 - 4. Meets J-STD-607-A
 - 5. Electroplated tinned copper
 - 6. Two hole minimum

Grounding and Bonding Installation Methods

- A. . Ground all equipment as per manufacturer's recommendations, IEEE 1100, NEC and TIA/EIA guidelines.
- B. Provide equipment grounding conductor from equipment grounding lugs to ground bar. Size conductor based on length.
- C. Provide green insulated grounding conductors from main ground busbar to one of the following, in order of preference.
 - 1. Dedicated Telecommunications Grounding Rod or Grounding Field.
 - 2. Building Steel
 - 3. Electrical service ground.
- D. Provide green insulated grounding conductors from main ground busbar to each of the following.
 - 1. Telecom Equipment Racks and Cabinets
 - 2. Conduits and conduit sleeves
 - 3. Cable tray
- E. Provide a green insulated grounding conductor from each end of the metallic sheath on the telephone backbone cable to the ground bar.
- F. Remove paint and or finish on all equipment racks, cable trays, etc., exposing bare metal at all locations where grounding conductor is terminated.
- G. Equipment racks that contain AC equipment may be bonded together, DC racks may also be bonded together. AC to DC rack bonding shall not occur.

Grounding and Bonding Testing

- A. Certify system is complete and functional.

- B. Test all cabling and connections. Perform final functional tests in presence of NIU technician.
- C. Complete certified testing report.

Building entrance protection.

- A. All protection modules are to be UL listed.
- B. Solid state protectors are to be used.
- C. 66 block style termination on the Customer Side or inside termination.

27 0543 Underground: Ducts, Cables and Raceways for Communication Systems**Direct Bury Category 3 UTP Copper Cable.**

- A. Specifications
 1. Solid Annealed, Copper Conductors
 2. Conductor insulation is foamed polyolefin with solid skin of same material.
 3. Color coded to industry standards
 4. Insulated conductors are twisted into pairs of varying lengths to minimize crosstalk.
 5. Pairs are stranded into units.
 6. Cable core is filled with a waterproofing compound and wrapped in a non-hygroscopic core tape.
 7. Flooding compound is applied over the core and to all surfaces of the shield/armor to resist moisture and entry and corrosion.
 8. Cable is finished with a black polyethylene jacket printed with footage markers.
 9. Conform to ANSI ICEA 7CFR-1755-890.

Fiber Optic Cables in Duct System Air Blown Fiber

- A. Single-mode Specifications
 1. Meets SMF-28e standard or ULL compliant
 2. Minimum performance attenuation of .5db/km at 1310nm, .5db/km at 1300nm, .5db/km at 1500 nm.
 3. Number of fibers in cable to be determined by NIU DoIT.
 4. NO bend insensitive fiber is to be used.
- B. Multi-mode Specifications
 1. 50u/125 OM3 bend insensitive fiber.
 2. Minimum performance attenuation of 3.5 db/km at 850nm, 1.2db/km at 1300nm.
 3. Number of fibers in cable to be determined by NIU DoIT.

C. Acceptable Manufacturers

1. AFL MicroCore Blown Fiber Optic Cable

D. Installation Methods

1. All manufacturers recommended installation methods to be followed.
2. Testing of spools for acceptance
3. Testing end to end after installation, see 27 1323 for testing requirements.

Fiber Optic Duct – Microduct system.

A. Specifications

1. Microducts, depending on application, shall have either:
 - a) an OD of 12mm and ID of 10mm. With an orange oversheath for multiple ducts. Microduct colors shall be: Blue, Orange, Green, Brown, Slate, White, Red
 - b) an OD of 8.5 and ID of 6mm.
2. System may be direct buried or installed within existing duct system.
3. All ducts installed in the outside plant shall include a copper tracer wire, minimum 20AWG, for locate purposes.

B. Installation Methods

1. All empty and unused microducts are required to be capped with manufacturers approved caps, for both inside and outside plant.
2. All oversheaths, microducts and tracer wires shall be labeled in accordance with DoIT's labeling standards (see section 27 0553)
3. Manufacturer's installation methods shall be followed. Proper support and maintenance of bend radius shall maintained.
4. Microducts shall be joined together to form pathways based upon DoIT's fiber plan. Coupling of microducts is to be determined by project.
5. Manufacturers recommended couplers shall be used to create contiguous fiber pathway.
6. Microduct organizers shall be used.
7. Microduct system installed in Manholes. See Attachment A.
 - a) Oversheath shall be run a minimum of two feet into manhole.
 - b) Oversheath shall be cut away and microducts shall be run around the perimeter of the manhole once.
 - c) Oversheath and microducts shall be installed tightly against walls and should be fastened to walls or existing cable management system. Special care shall be taken to keep ducts out of the way of people coming in and out of the manhole.
 - d) Microducts and fiber cables installed within shall be installed as high as possible within the manhole to avoid submersion.

- e) Microducts shall be fastened together to maintain tight grouping.
 - f) Tracer wire shall be installed with ample slack and shall be mounted to a j-hook or other fastener to allow for easy access to wire from above. Tracer wire shall have enough slack to allow for wire to extend 3ft above ground level. Person accessing wire shall be able to easily reach tracer wire without having to enter the manhole. Tracer wire may need to be extended to accommodate easy access from above. Manufacturer's recommendations for bonding together of tracer wires shall be followed.
 - g) Fiber optic cables run through microducts shall have a manufacturer provided gas tube block installed if the fiber cable and microduct next appears within a building. This only applies to cables/ducts that next appear in a building. Not manhole to manhole.
8. Microduct system installed in handholes:
- a) Oversheath shall be run a minimum of two feet into handhole
 - b) Oversheath shall be cut away and microducts shall be run around the perimeter of the handhole once.
 - c) Oversheath and microducts shall be installed tightly against walls.
 - d) Microducts shall be fastened together to maintain tight grouping.
 - e) Tracer wire shall be installed with ample slack and shall be mounted to side of handhole with a j-hook or other fastener to allow for easy access to wire from above.
 - f) Fiber optic cables run through microducts shall have a manufacturer provided gas tube block installed if the fiber cable and microduct next appears within a building. This only applies to cables/ducts that next appear in a building. Not manhole to manhole.
9. Building Entrance:
- a) All spaces around oversheath shall be sealed with Dura-Line recommended seal: Hyrda-Seal S-60.
 - b) All spaces around microducts shall be sealed at building entrance. See Dura-Line technical bulletin "FuturePath – Recommended Void Sealing Methods" DCEB-08008.
 - c) All cables installed through microducts shall be sealed with a gas-block connector.
 - d) Unused microducts are to be capped with manufacturers recommended seal.
- C. Microduct system spliced in direct bury situation (no protective enclosure).
- 1. Tracer wire shall be bonded together in accordance with manufacturer's recommendations.
 - 2. Shall conform to standards set out within Dura-Line Technical Bulletin DCEB-09003 "Recommended Procedures for Splicing and Bonding Armored Future Path.PDF"
- D. Acceptable Manufacturers
- 1. Dura-Line 7-way FuturePath 12.7mm/10mm

2. Dura-Line eAbf 8.5mm/6mm

27 0553 Identification for Communication System – Campus Labeling Standards.

General Guidelines, University standard is based upon following entities

- A. ANSI/TIA/EIA 606-B, Administrative Standard for Commercial Telecommunications Infrastructure
- B. UL 969, latest edition Marking & Labeling Systems
- C. NFPA-70 NEC Current adopted edition enforced by NIU.
- D. ANSI/IEEE C2-2007 National Electric Safety Code, latest edition
- E. BISCITDMM (Telecommunications Distribution Methods Manual) latest edition.
- F. BISCITOSPDRM (Outside Plant Design Reference Manual) latest edition
- G. Where conflicts occur between codes and or specifications, the one establishing the more stringent requirements shall be followed.
- H. Naming conventions based upon TIA/EIA 606-B (Class 3) and UL 969 for system of labeling material, including label stock, laminating adhesives and inks used by label printers
- I. It is intended that documentation be thorough and provided such that there is NO ambiguity. There should be NO assumption of common knowledge on how a product “should” be installed.

Labels

- A. Labeling shall be provided for each of the items (at a minimum) indicated below or as directed by NIU.
 1. All communication: racks, wall enclosures, cabinets, field cabinets.
 2. All communication rooms, including all documentation of fire ratings for plywood or other materials equipment is mounted to.
 3. Fiber termination shelves, patch panels and ports shall be labeled.
 4. Copper building entrance terminals shall be labeled including all cables terminate inside building.
 5. Patch cords shall be labeled.
 6. All backbone copper and fiber cables
 7. Copper termination shelves.
 8. Entire grounding system, including busbars and conductors.
 9. All hand holes and manholes. The following items shall all be labeled.
 - a) All cables within manhole / hand hole, including any grounding conductors.
 - b) All conduits entering system.
 - c) Cardinal directions for Manholes.
 - d) Handhole or manhole number.
 - e) All ducts or microducts in system.
 10. All outside plant cables.

11. All abandoned cables that remain shall be tagged for future use and identification.
- B. All labels shall meet the exposure (inside or outside), legibility, defacement and adhesion requirements as specified in UL 969 and herein.
 - C. All labels shall be printed or generated by “mechanical device” (i.e. handheld/portable system, laserjet or inkjet printer). Handwritten labels are NOT acceptable.
 - D. The size, color and contrast of all labels should be selected to ensure that the identifiers are easily read.
 - E. Labels shall use black ink print on white background unless otherwise noted. Backbone and Outside Plant Fiber Optic Labels may be black ink on yellow background.
 - F. Labels affixed to cables shall be flexible and allow for cable movements, bending and twisting.

Labeling inside of Data Centers and Central Office. Cabinet / Equipment Rack in Data Centers and Central Office

- A. Data Centers and Central office have different requirements for labeling than do building/premise areas.
- B. All cabinets and racks in Data Centers (WL 1104 and SP 133) and Central Office (TS 200) shall have their grid coordinates clearly labeled on Top and Bottom, and front and back. Coordinates are determined by the front right of any rack or cabinet. Any cabinets with doors, shall have labels on both inside and outside of door, cabinet name clearly visible with door closed.
- C. Racks and Cabinets shall have Rack Units clearly marked on their rails. Pre-printed or embossed labels preferred. First space (U 1) at the bottom, last space (e.g. U42, U48, U52) at top.
- D. In Central Office all racks shall be labeled “AC equipment” or “DC equipment”.
- E. In Data Centers, or any communications closets, DC equipment racks shall be clearly labeled as “DC equipment rack/cabinet”.
- F. All termination blocks, in rack shall have the U space it is occupying clearly labeled on front of panel or equipment, (e.g. a piece of equipment spanning 2 U’s starting at U12 and ending in U13 (inclusive) shall have a label of “U12-U13”). This includes Fiber and Copper systems.
- G. Any network equipment shall have a label with the following format: BBRRRR-LLNN-USU-UEU-T. Leading unused positions may be omitted.
 - 1. BB = Two position Building Code
 - 2. RRRR = 4 position Room number
 - 3. LL = two position letters of grid coordinates

4. NN = two position numbers of grid coordinates
5. SU = three position Starting (lower) U number in rack
6. EU = the position Ending (upper) U number in rack
7. T = Type of device (assigned by NIU Network Engineering Group, e.g. Switch, Router, Firewall, etc.)
8. Example: SP133-A9-U13-U15-S is a Network Switch in the Swen Parson Hall Machine Room 133 in a cabinet location at grid location A9, occupying the 13th through 15th U space in the rack.

Equipment Racks, Equipment Cabinets and Equipment Enclosures, Telecommunication closets MDF / IDF.

- A. Racks and Cabinets shall have Rack Units clearly marked on their rails. Pre-printed or embossed labels preferred. First rack unit space (U 1) at the bottom, last space (e.g. U42, U48, U52) at top.
- B. DC equipment racks shall be clearly labeled as “DC equipment rack/cabinet”.
- C. Racks shall be sequentially labeled with Building Code – Room Number Rack 1, Rack 2, etc. Label shall appear at top and bottom of rack in both front and back. (example: MB229-Rack1) is a 2 post rack in Music Building Room 229.
- D. Wall enclosures shall be clearly labeled with same standard as Racks, however with the name WIC (wall enclosure) instead of Rack. All wall enclosures shall also be labeled with the following information
 1. Type of cable terminated in WIC (e.g. Copper, Fiber).
 2. Count of cable, number of fibers or pairs of copper.
 3. Unique cable identifier of any cable being terminated in cabinet.
 4. Type of termination, connector type and polish
 5. Inside door of wall enclosure shall include space for documenting individual fibers/conductors.
 6. Labeling on faceplate that includes 1st position and last position of termination. See Attachment A for labeling examples.
 - 7.

Horizontal Cabling Copper termination blocks/patch panels and wall plates.

- A. Termination blocks/patch panels shall have a label per cable terminated. The label shall indicate the following information about the far end of the wire. See Attachment A for examples.
 1. Room number
 2. Jack letter (A through Z, if there are more than 26 jacks in a room, the format is: AA, AB, AC, AD, AE etc...)

3. –AP if the run is an access point.
 4. In the format of RR-J-AP(optional if wire is for AP) Example: 126a-J is jack J in room 126a.
- B. Termination block shall have starting and ending U clearly labeled on front of panel.
- C. Wall plates
1. Room number
 2. Jack letter (A through Z, if there are more than 26 jacks in a room, the format is: AA, AB, AC, AD, AE etc...)
- D. Surface mounted junction boxes.
1. Shall follow same labeling convention as wall plates. Labels shall be clearly visible and shall not require users to move furniture or obstructions to read labels.

Backbone / Trunking Cabling Copper termination blocks/patch panels. Inside plant.

- A. All 66 blocks shall be labeled to indicate pairs; 1, 25, 26 and 50. The following labeling methods are acceptable. A combination of all 3 methods is preferred.
1. labels affixed to cover of 66 block.
 2. labeled on surface of 66 block
 3. labeled on wall that 66 block is mounted to.
- B. All backbone/trunking cables shall be labeled to indicate far and near end locations. Labels shall be attached to outside jacket of trunking cable and shall be in the format of: Near end room number / number of pairs in cable, unique cable identifier, / far end room number. Example: 107E / 50pr, Cable #1 / 229. Is the first trunking cable in the building that starts in room 107E and ends in room 229, and has 50 pair of wire. **See Appendix A for example.**

Fiber Distribution Cabinets (FDC) and Fiber Wall enclosures (WIC).

- A. Identification of fiber counts and each fiber's position within cabinet.
1. Slot for individual faceplate mounting shall be labeled left to right using Alphabetic Characters A through L (assumes 12 slot Cabinet).
 2. Individual fibers within a faceplate shall be numbered so as to allow NO ambiguity on fiber count to position. See examples. Labels denoting; first, second, middle two, and last two fibers shall be labeled on the front face of each faceplate. Documentation on individual cards or attached to a drawer or cover is to be in addition to numbering on the faceplate. **See Appendix A.**
- B. Identification of fibers near end and far end destinations.
- C. Identification of FDC or WIC in an MDF/IDF.

1. Outside cover shall have one label indicating where the enclosure is installed including:

- a) Building Code
- b) Room number,
- c) Rack number or WIC number

(1) In the case of FDC in rack, the U space (starting and ending U) in rack.

2. A second label shall be applied, (inside or outside of cover is acceptable) and shall include:

- a) Type of Fiber
- b) Count of cable
- c) Unique cable identifier of cable (if cable is from outside plant).
- d) Relationship of cable to slots it installed to.
- e) Example: single-mode 144, cable 3002, slots A-L.

D. Identification of fiber paths within enclosure.

1. An electronically preprinted document shall be attached on the inside of the door of a WIC or on in the case of a FDC, on the back side of the protective door, or on the documentation shelf. This document may be a spreadsheet printed to fit the door of the enclosure. The document shall include:

- a) Unique number assigned to fiber cable being terminated.
- b) Total number of fibers terminated within cabinet and their relationship to slot numbers within cabinet.
- c) Far end fiber termination location, including all information on cabinet, slot and fiber counts terminated.
- d) Distance of fiber (expressed in feet for distances under 5200ft, and in miles over 5200ft).

2. Documents shall be submitted electronically in Excel or PDF format as part of installation documentation.

Protectors for Entrance cables copper systems.

- A. Outside door of copper protector shall have a label that shows; Cable number, count of the cable, and total number of pairs in the protector.
- B. Termination block portion of protector shall be labeled to reflect the cable count of the cable being protected. Example: Cable 5 pairs 50 through 275 shall have labels on termination block starting at pair 50 and continuing through 275. There shall be no ambiguity as to what position on the termination block is equal to what copper

- conductor. This is mentioned as protectors are sometimes pre-printed with numbering schemas, labeling needs to reflect the cable count of the entrance cable.
- C. Outside jacket of copper cable coming in from outside plant shall contain a label showing the following: Current location of cable, count of cable, Next Accessible location. Example: BH 107E/ 300pr, Cable 7 / MH 109. Is a cable that comes from Manhole 109, is a 300 pair cable that is cable number 7, and is terminated in Barsema Hall room 107E.

Grounding and Bonding labeling:

- A. Use TMGB for the Telecommunications Main Grounding Busbar.
- B. Use TGB for the Telecommunications Grounding Busbar.
- C. Label each Telecommunications Grounding Busbar with: type of busbar, building code and room number.

Example: TMGB – AL106 is the Main busbar in Altgeld hall room 106. Example 2: TGB – AL 205 is the distribution bus bar (tied to the main) in Altgeld room 205.

- D. Label both ends of all grounding conductors. Label shall show near and far end locations:

Example: TB AL 06 / TMGB AL205 is the conductor tying the distribution bus bars between rooms 106 and main bus bar in room 205 in Altgeld Hall.

Example 2: AL106-A-S / TGB AL 106 is a conductor running from the AL106-A-S switch to the bus bar in room 106.

Outside Plant:

- A. NIU shall be provided with electronic copies of photographs clearly showing all labels mentioned below. All photographs shall be in JPG format. File name of photograph shall include the following: Type of structure being photographed (manhole, handhole, pedestal or Building Code Room number (for building entrance). Numeric designation of structure, Date. Multiple pictures of same location shall be designated by a, b, c etc.

Example 1: MH109E_09-28-2014.jpg is a picture of Manhole 109e taken on September 28th 2014.

Example 2: MH109E_09-28-2014a.jpg is the second picture of Manhole 109e taken on September 28th 2014.

Example 3: LH108B_11-14-2013.jpg is a picture taken of Lowden Hall room 108B building entrance on November 14th 2013.

Example 4: PD27_10-08-2012.jpg is a picture taken of Pedestal

Building Entrance

- A. In buildings all ducts coming from the outside are to assigned number and labeled. The label shall include: Origin building and room number / Duct # / Destination – duct # in destination. Destination is the next point that the duct may be accessed (e.g. manhole/handhole). This includes both metal conduits / rigid ducts as well as direct buried microducts. In the case of duct going to a Manhole, the cardinal direction shall be included and labels shall match what is in the Manhole System.

Examples: The first duct in Lowden Hall room 108B that enters Manhole 109 through duct #9, shall be labeled (LH 108B / Duct 1 / MH109 - 9)

Communication Cables & Tracer Wires

- A. All communication cables within a manhole or hand hole shall a self-laminated tag affixed to them (recommended Panduit PST-FOBLNK).
- B. Label shall include the following information:
1. Type of cable (e.g. Fiber Optic)
 2. Count of cable (e.g. number of conductors or number of fibers)
 3. Cable number designation (assigned by university)
 4. Current location of cable
 5. Next accessible location of cable
- C. Format of label shall be the following: Current location of cable/ Type of Cable – Count #Cable number / Next Accessible location. Example: MH 122E / Copper – 400 pair #3 / HH 140, is a cable that starts in Manhole 122e, is a copper cable with 400 pair (800 conductors), that is cable #3, it next appears in handhole number 140.
- D. Tracer wires shall also be labeled with either a flag style or wrap around label. Label shall be affixed to end of wire so as to allow locating technician to easily read label without having to enter a manhole. Tracer wire label shall have the following information:
1. Next location that tracer wire is accessible
 2. Duct number (when applicable) that wire is run through
 3. Current location of tracer wire
 4. **Example1: MH122E-3 / HH140 this is a tracer wire label that is in manhole 122E, where the tracer wire leaves the 3rd duct and next appears in handhole 140.**
 5. **Example 2: MH122E-3 / MH118-9 this is a tracer wire label that is in manhole 122E, where the tracer wire leaves the 4th duct, and next appears in Manhole 118 entering through duct 9.**

Multi Cell Ducts

- A. All Multi Cell Ducts shall have a self-laminated tag affixed to the outside jacket / oversheath (recommended Panduit PST-FOBLNK). Label shall include the following information: Current location of duct and duct number / next accessible location of duct and duct number (if applicable).

Example: HH 140 / MH 122E-3. This is a multi-cell duct from handhole 140 next appearing in f Manhole 122E entering through the 3rd duct.

- B. Individual ducts that are connected to other ducts shall also be labeled in the same format as the outside jacket / oversheath.

Manholes

- A. Manholes shall have their number spray painted in two locations with telecommunications orange paint on a surface that is clearly visible from someone standing outside of the manhole. It is preferred that the rim immediately below the cover/lid is used. A stencil is to be used to produce clean / crisp characters. NIU Architectural & Engineering Group can provide Manhole numbering. New Manholes shall be assigned a number by A&E and DoIT.
- B. All penetrations that have duct work running through them shall be assigned a number. Numbers shall be hand written with a Black Paint marker or spray painted with the use of stencil and telecom orange spray paint. Labels shall be written above ducts and easily visible whenever possible. Pre-fabricated, holes in sides of manholes that do not have ductwork attached to them shall not be labeled.
- C. Cardinal directions (North, South, East and West) shall be painted on each wall of the manhole.
- D. Cable inventory sheets shall be filled out for all cables. **For an example see: Appendix A.**

Handholes and Pedestals

- A. Handholes that are prefabricated and in ground, shall have their number spray painted in two locations with telecommunications orange paint on a surface that is clearly visible from someone standing outside of the handhole. A stencil is to be used to produce clean / crisp characters. NIU Architectural & Engineering Group can provide Manhole numbering. New Manholes shall be assigned a number by A&E and DoIT.
- B. Pedestals shall have a label either stenciled with paint or have a printed label affixed on two clearly visible locations on the inside of the pedestal.

- C. Pedestals shall have rugged weatherized labels on the outside that are pre-printed with the following information:
1. NIU
 2. “815-753-8100”
 3. Pedestal number

27 1116 Communication Cabinets, Racks, Frames and Enclosure

Communication Racks and Frames, Free Standing Equipment Racks

A. Specifications

1. Provide two post open frame rack for mounting standard 19-inch rack width equipment.
2. 84" height (52U Rack Units).
3. Printed rack space identification on all equipment rails, position 1 at bottom 52 U at top.
4. UL Listed for 1500 lbs load rating.
5. Mounting holes in top flanges for securing ladder rack.
6. Provide dual sided 3 x 3 vertical finger ducts on both sides of rack, front and back, for the full height of the rack frame.
7. Provide covered double sided horizontal finger ducts between each patch panel, or space allocate for active equipment.
8. Bottom of rack with holes for bolting to floor.
9. Isolation pad to prevent rack to floor contact.
10. 12-24 threaded equipment mounting rails.
11. Black finish.
12. TIA/EIA compliant (310-D)
13. Bushings / “O” rings and other mounting hardware required to ensure that rack is isolated from floor or from other telecom equipment (e.g. stabilizing rods, ladder rack). Only path to ground should be through grounding and bonding system. This includes sleeves to ensure that floor bolts do not make direct metal to metal contact with rack.

B. Rack Execution installation

1. Install racks as per manufacturer’s recommendations.
2. Provide rack alignment kits for all racks installed side-by-side.
3. Secure top of racks to structure above per the manufacturer’s instructions.
4. Bolt racks to floor using machine bolts and expansion anchors. Ensuring grounding isolation.
5. Install isolation pads beneath rack to ensure isolation from floor.
6. Ground racks using the manufacturer’s ground lug kit for all bonding conductors.
7. Maintain proper bend radius for all cable transitioning into and out of the racks using drop out fittings.

8. Racks shall be positioned and rooms shall be designed to allow for a minimum of 3 feet of clearance in both front and back of rack. It is to be assumed that equipment may be installed / removed from both the front and back of the rack.

Fiber Distribution Cabinets (FDC) and Fiber Wall enclosures (WIC).

A. Specifications

1. For FDC: Rack installation compatible into universal WECO/TIA 19”/23” rack.
2. Textured black powder coat finish.
3. LGX 118 compliant mounting positions.
4. Single-mode and multi-mode fibers shall each have their own splice cabinet / enclosure. No mixing of fiber types in single cabinet or enclosure is permitted.

B. Acceptable Manufacturers

1. AFL Telecommunications Xpress Fiber Management (XFM) Rack Mount
2. AFL Telecommunications WME-02, WME-04 Wall Mount Enclosures

27 1123 Communications Cable Management and Ladder Racks

Vertical Management

A. Specifications

1. High capacity dual sided (front and back) vertical manager.
2. Cable management fingers
3. Dual hinged door
4. Two managers that are dual sided required, one on each side (left and right) of rack.
5. Cable spindles and wire management are required inside of cable channel.
6. Sized to handle total capacity of wires run to telecommunications room. Not to number of anticipated initial connections.
7. Racks that are installed side by side may share a common vertical manager as long as the common manager is sized to handle the capacity of both equipment racks.

Horizontal Wire Management

A. Specifications

1. Compatible with standard 19” equipment racks.
2. Welded steel construction
3. Finished in durable powder coat.
4. Provide horizontal management suited for cable load above and below all patch bays, routers, and hubs.

5. Provide one horizontal wire manager (2u in height) for every 144 runs terminated within a rack. Provide (1) additional wire manager for each rack.

27 1300 Communications Backbone Cabling

27 1313 Backbone Communications Copper Cable Splicing and Terminations

A. Specifications

1. Modular rack mounted
2. ANSI/EIA/TIA Category 6 RJ-45 Connectors
3. 48- port count

B. Acceptable Manufacturers:

1. Panduit NKPPN48P (flat)

C. All patch panels are to be clearly labeled following university standards on labeling.

Communications Copper Backbone Cabling - Category 3 UTP Copper Cable

A. Specifications

1. 24 AWG bare copper wire insulated with thermoplastic.
2. Three layer core construction jacketed in flame retardant PVC
3. ANSI/TIA/EIA-568-C.2, UL 444 and C22.2 No. 214-02
4. Plenum-NFPA 262, CMP
5. ANSI/TIA/EIA-568-B.2 Category 3 Backbone Cable
6. 6.6 nF/100 m nom. Mutual capacitance
7. 9.4 ohms/100 M Max, DC resistance

Communications Copper Cable Splicing and Terminations - Category 3, 66 block termination punch down block.

A. Specifications

1. 50 pair capacity
2. 66 block kit
3. Special Red Service Markers shall be provided for all alarm circuits.
4. Category 5e
5. Terminates 22-26 AWG (0.81-.41mm) solid insulated or 18-19 AWG (1.02-0.91mm) solid stripped cable
6. Clear snap on covers shall be provided for each block.
7. Adhesive backed, lined labels for snap on cover.
8. Block
 - a) Height 254mm (10 in)
 - b) Width 86.4mm (3.4 in)
 - c) Depth 30.5mm (1.2 in)

27 1323 Communications Optical Fiber Backbone

- A. Microduct systems for use with air blown fiber shall be the standard for indoor installations.
- B. Plenum rated jackets shall be used.
- C. Installation Methods
 - 1. Install all cabling and secure in a high state of dress utilizing wire management system.
 - 2. Use only hook and loop (Velcro) type straps to secure and dress fiber cables.

Communications Optical Fiber Splicing and Terminations

- A. University uses LC- UPC connectors for all single-mode fiber. LC for all multi-mode fiber.
- B. Multi-mode fiber shall be Laser Optimized OM3, unless otherwise specified.
- C. LC duplex adaptors for both single-mode and multi-mode cable.
- D. Ferrell color
 - 1. Single-mode UPC connector Blue
 - 2. Single-mode APC connector Green
 - 3. Multi-mode 50/125 OM3 Laser Optimized Aqua
 - 4. Multi-mode 62.5/125 Beige
- E. Based on LGX 118 footprint
- F. Utilize cassette based, patch and splice enclosures. Both patch face plates and splice enclosures are to be housed in individual cassette, 24 fibers per cassette. Lower counts of fibers per cassette (e.g. 12) may be used only with permission of DoIT.
- G. All terminations shall factory pre-terminated fusion style connectors. No mechanical connectors are allowed.
- H. Secure fiber jacket in a minimum of two locations.
- I. Install minimum two meters of unjacketed fiber strands coiled on the enclosure routing guides.
- J. Acceptable Manufacturers - face plates.

1. AFL Global FM000939 multi-mode adapter plate. Part of LightLink Poli-Mod system.
 2. AFL Global FM000936 single-mode adapter plate. Part of LightLink Poli-Mod system.
- K. Air blown fiber shall use Fan out kits and Router kits to maintain binding groups within enclosures. All fibers shall be routed through Fan out or router kits (both terminated and unterminated).
- L. Unterminated fiber within enclosures shall be of sufficient length to allow for future termination. A minimum of 5 meters within enclosures.
- M. Fibers shall be laid out into FDC's and WIC's in accordance to NIU's standard. See Attachment A for examples.

Communication Optical Fiber Optic Testing

- A. All fiber optic cables shall be tested with the following tests and criteria.
1. Tests shall be run on each fiber, no "loop back" testing is allowed.
 2. Continuity test to ensure no "frogging" of fibers have occurred. Verification may be done with VFL for distances under 5km.
 3. All fiber connections, including bulkheads and patch cables shall be cleaned and inspected to ensure that cables are free from defect or debris. Testing shall be done using a microscope in compliance with IEC 61300-3-35. Testers shall certify that the each fiber was cleaned and inspected prior to each OLT (Optical Loss Test) and OTDR tests.
 4. OLT, documenting the dB loss of fiber. Note: testing requires the use of a power source and separate power meter as no looping of fiber is allowed.
 5. OTDR (Optical Time-Domain Reflectometer) tests in both directions with the following criteria
 - a) Test to be run a minimum of 1 minute
 - b) Tests shall be taken at 1310nm and 1550nm for single-mode fiber.
 - c) Tests shall be taken at 850nm and 1300nm for multi-mode fiber.
 - d) Launch and receive cables of a minimum distance of 100 meters shall be used for all OTDR testing.
 - e) All events shall be shown on test results. No minimum threshold to ignore events shall be allowed.
 - f) Pulse widths may be auto selected by test equipment. Special care shall be taken to ensure that pulse widths fall within manufacturer's recommendations for distance of fiber being tested.
 6. A summary of all fiber testing and installation shall be provided by filling out 27_13_23_26_Fiber_Testing_Cut_Sheet.xls

7. OTDR test results shall be provided in both manufacturers original test gear format as well as in a PDF or Word Document format. Electronic copies are required.

27 1500 Communications Horizontal Cabling – Network Wiring

27 1501 Communications Horizontal Cabling Applications – General

- A. University has standardized on a universal KeyStone solution. The Panduit NetKey system is used. Termination of wire is to be individual modules on each end. No proprietary manufacturer's termination is to be used.
- B. Each network channel requires one network cable per telecommunications jack. No splitting of wires is allowed.
- C. All communication wires between end points and the nearest communication closet shall be category 6 compliant, regardless if wire is to be used for network or telephone connections.
- D. Each telecommunications outlet that requires both network and telephone connections, shall consist of TWO Category 6 wires, 1 for network and 1 for telephone and or future network connections.
- E. Wiring shall be installed by certified Panduit NetKey installers.
- F. All channels must be warrantied. All wires must pass category 6 standards and must be tested with Panduit approved test gear.
- G. Testing documentation is to be provided to NIU in an electronic format.

Voice Communications Horizontal Cabling

- A. Both voice and data will utilize Category 6 wiring for Horizontal cabling. See section 27 15 13

Data Communications Horizontal Cabling

- A. Both voice and data will utilize Category 6 wiring for Horizontal cabling. See section 27 15 13

27 1513 Communications Copper Horizontal Cabling UTP (Unshielded Twisted Pair)

- A. Specifications
 1. All cable must be NEC type OFNP or NEC type CMP unless otherwise noted.

2. NEC CMP Rated
3. 4 pair, 23 AWG, solid bare annealed copper
4. Flame Retardant semi-rigid PVC insulation
5. Longitudinal rip cord
6. ANSI/EIA/TIA Category 6 compliant
7. Color of cable jacket:
 - a) Network Communication cable in general is blue when cable is run above ceilings or in conduit/raceway. Different colors (primarily white or black) cable may be required if cable is to be exposed and visible. Aesthetics of space may dictate a different color of wire jacket and is to be approved by NIU DoIT.
 - b) Security door access – orange
 - c) Security Camera system – orange
8. All cable will be terminated onto a module / female RJ-45. No wire will be terminated directly to a male RJ-45 plug.
9. Acceptable Manufacturers
 - a) Panduit PUP6004BU-UY/CMP-0042PDN-7RB-06 TX6000 Category 6 UTP cable.

Communications Copper Horizontal Cabling installation methodology.

A. General

1. Follow all ANSI/EIA/TIA installation guidelines.
2. Follow all cable solution provider installation guidelines.
3. Install all cabling and secure utilizing wire management and hook and loop (Velcro) straps. No plastic cable ties shall be used to secure any cabling.
4. Install cable management to support and train cables within space as required to meet bend radius and support requirements.
5. Do not exceed 90 meters in length for any Category 6 cables.
6. Maintain wire twists to within .5 inches of termination.
7. Remove no more than 1.0 inches of cable jacket.

27 1543 Communications Faceplates and Connectors

Category 6 RJ-45 Modules / Telecommunications Jacks

A. Specifications

1. Category 6 module featuring 110-termination technology
2. Keystone compliant form factor.
3. Backwards compatible to Category 3
4. ANSI/EIA/TIA 568-B.2-1 Category 6 compliant.
5. Sweep tested through 250 MHz
6. UL 94VO Polycarbonate construction
7. Accepts 24 through 22 AWG solid copper conductors

8. Standard jack color is Off White (Panduit Color Code IW), unless aesthetics of space dictate otherwise.
9. University uses the TIA-568B wiring schema.

B. Acceptable Manufacturers

1. Panduit NK688MIW

Telecommunications Faceplate

A. Specifications

1. Single gang plate
2. 4 ports capacity
3. UL 1863 Compliant
4. Faceplate finish and style shall match electrical faceplates.
5. Clear label cover.
6. All unused positions shall have blanking plates installed.
7. For wall mounted faceplates in residence halls and areas that are high usage for public access (e.g. computer labs, cafés, hoteling spaces, libraries) angled faceplates are required.
8. All installed modules will be oriented to prevent dust and debris from settling on pins and for ease of use. Pins will be up for flat faceplates. Pins will be down (to allow for easy access to patch cable clip) for any angled faceplate. See Attachment A for examples.

B. Acceptable Manufacturers

1. Panduit NK4FIWY (straight)
2. Panduit NK4VSFIWY (angled)

Horizontal cabling, surface mounted raceway.

A. Specifications

1. Off White (IW) in color (unless aesthetics of space dictate otherwise).
2. Rigid PVC
3. UL 94V-0; FT4

B. Installation Methods

1. Raceway must be mounted to surface with screw or fastener. Use of adhesive backing only is not allowed. Minimum of 3 fastener per 8 feet of track.

C. Acceptable Manufacturers

1. Panduit LD-5

2. Panduit T-70

27 1600 Communications Connecting Cords, Devices and Adapters.

27 1619 Communications Copper Patch Cords, Station Cords and Cross Connect Wire.

A. Specifications

1. ANSI/EIA/TIA Category 6
2. 4 pair RJ 45
3. Strain relief in boot
4. Tested to 250 MHz
5. All cables are to be factory assembled, no field fabrication or field termination allowed.
6. Jacket color of patch cables and cross connect wires as follows:
 - a) Blue – Data / VoIP connection.
 - b) Orange – Door Access, Security, camera systems and Public Announcement systems.
 - c) Green – Lights out and management (data centers and central office only).
 - d) Purple – Out of band device management. Typically only one of these cables per network switch.
 - e) White/Red jumper wire for any alarm system that utilizes the telephone system. Examples: Category 3 ‘dry loops’ to police department for security alarms or fire alarm systems.

B. Acceptable Manufacturers

1. Panduit NK6PC***Y NetKey Patch Cable.

Communications Fiber Patch Cords, Station Cords, Cross Connect Fiber.

- A. Fiber shall be installed in a method that maintains minimum bend radius and allows for proper strain relief of connectors.
- B. Fibers shall be of appropriate length as to prevent slack loops in fiber management systems.
- C. All cables are to be factory assembled, no field fabrication or field termination allowed.
- D. All cables shall be factory tested with test results clearly labeled in packaging.

27 2100 Data Communications Network Equipment.**27 2129 Data Communications Switches and Hubs**

- A. Information in this section is for informational purposes only as it relates to power and space planning. Any equipment provisioning or procurement decisions are to be made by NIU's Division of Information Technology's Network Engineering Team.
- B. In general NIU uses the Cisco family of products for in building Access Switches.
- C. Switch family / model is determined by the total number of active connections. Not by the total number of wires installed in the switch closet.
 - 1. 75 or more – Cisco Catalyst 4500 family of switches.
 - a) Dual power supplies sufficient to run all ports at maximum POE output.
 - b) Each 4500 power supply (two power supplies per 4500 chassis) shall have a dedicated electrical circuit. There shall be a minimum of two circuits per 4500 chassis.
 - 2. Less than 75 and more than 40 connections – Two Cisco 2900 switches stacked.
 - 3. 40 or less connections – One Cisco 2900 switch.
- D. Power receptacles shall utilize a twist lock configuration. (e.g. NEMA L5-20R / L6-20R).
- E. Sufficient environmental systems shall be provided to provide manufacturers recommended operating temperature and moisture levels. For planning it is assumed that network switch gear will be working at 100% power output.
- F. American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) guidelines Technical Committee 9.9 are followed. Temperatures listed are measured at the equipment's air intake.
 - 1. Low-end temp: 64.4 degrees Fahrenheit
 - 2. High-end temp: 80.6 degrees Fahrenheit
 - 3. Low-end moisture 40% relative humidity and 41.9 degrees Fahrenheit dew point
 - 4. High-end moisture 60% relative humidity and 59 degrees Fahrenheit dew point.

27 2133 Data Communications Wireless Access Points (Wi-Fi)**General Wireless**

- A. In general NIU uses the most current enterprise class CISCO Access Point (AP). At the time of this writing this is the Cisco Aironet 3602.
- B. Due to the consistent and evolving changes in wireless technologies, the Division of Information Technology's Network Engineering team to be consulted prior to

any design or procurement to ensure the most current methodologies are implemented.

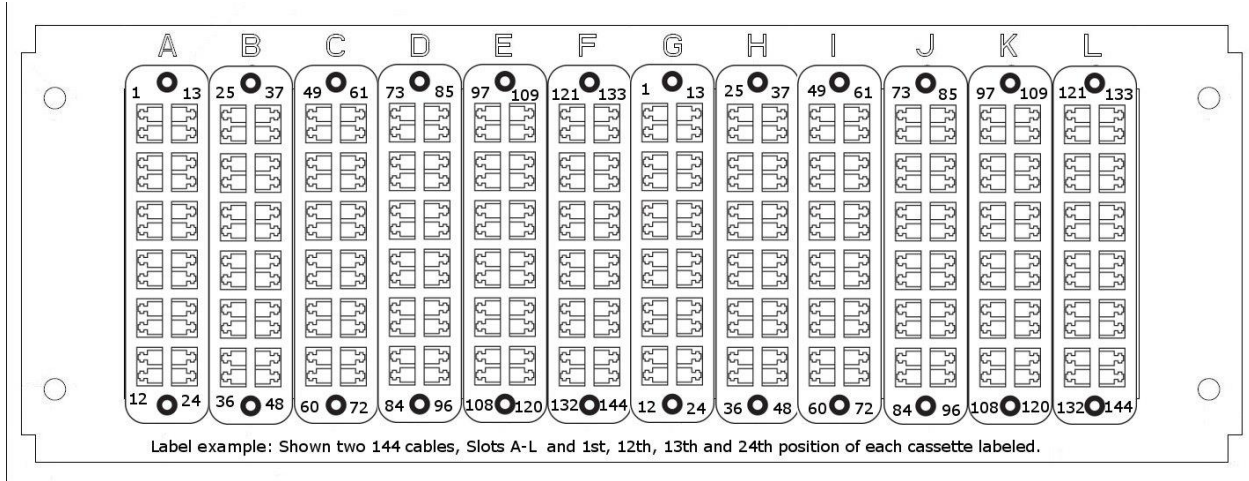
Wireless Installation Methods

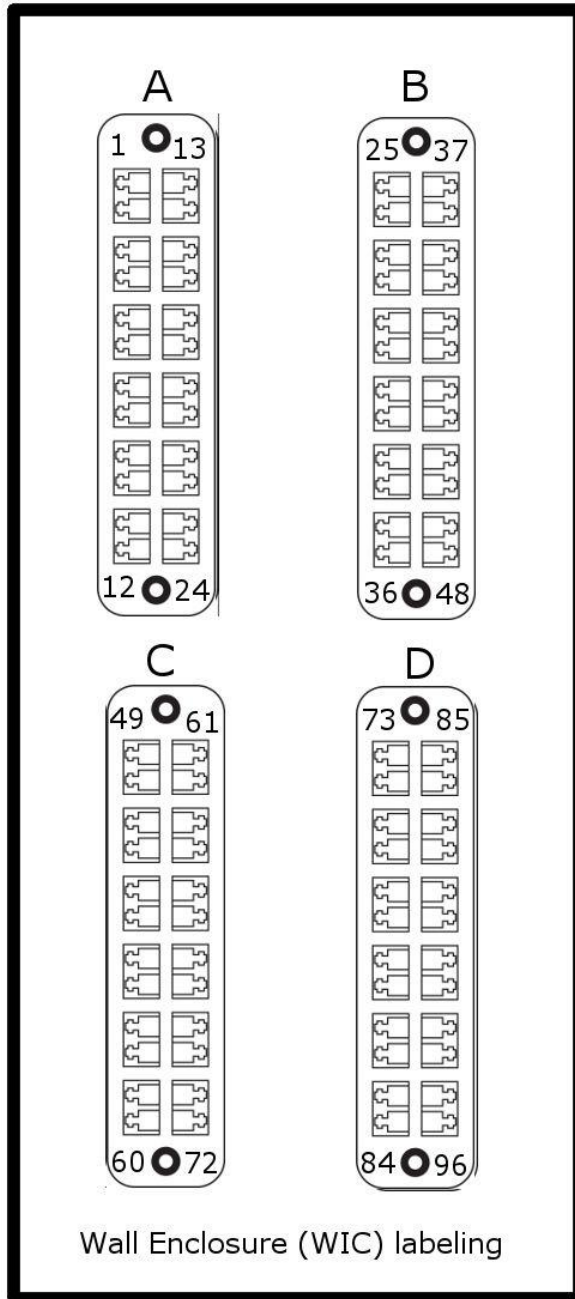
- A. AP's to be ceiling mounted.
- B. Follow all manufacturers recommended installation methods.
- C. AP's shall be installed in a method that takes into consideration signal propagation patterns. There can be no obstructions within 3 feet in any azimuth direction from the antennas of the AP coming within 20 inches below the elevation of the horizontal plane of the AP. Such obstructions may include:
 - 1. Hanging signage (e.g. entry, exit, fire escape).
 - 2. Cameras
 - 3. Pillars
 - 4. A/V projectors.
- D. Consideration shall be taken to ensure that AP's are not installed in close proximity to fire suppression systems. In particular attention should be paid to ensure that AP's do not block or obstruct water distribution through sprinkler heads.
- E. 8.2 Wireless AP Placement and Design
 - 1. NIU's Network Engineering Team will provide AP placement and design maps.
 - 2. Engineering team requires the following information to create AP install maps.
 - 3. To scale maps of space in electronic format. Either DWG (preferred) or PDF.
 - 4. Anticipated density of devices/users.
 - 5. Anticipated bandwidth required of devices.
 - 6. Construction materials used to construct space.
 - 7. Furniture and other materials to be placed in space.
- F. Installation maps are created based upon a comprehensive view of the space or building. In particular access points are placed based upon potential future use of wireless in adjacent spaces. (e.g. AP's on floors above or below or in nearby rooms.)

NIU Campus Cable Standards Appendix A.

Revised 3/27/2015

27 0553 Fiber Distribution Cabinets (FDC) and Wall Enclosure (WIC) labeling examples.





27 0553 Manholes – cable inventory example sheet.

5-8-14

NORTHERN ILLINOIS UNIVERSITY

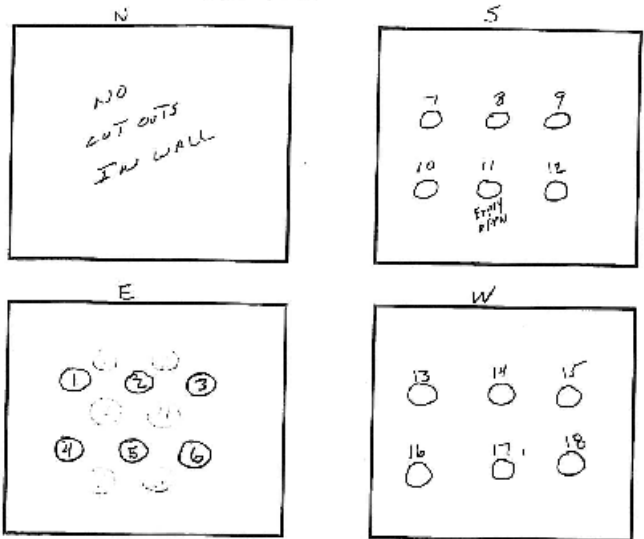
Manhole No. 100

WASH LEVEL - 6"

SIZE 4'x6.5'-8' DEEP

Pic # 73-89

DEPTH from RIM - 14'



Conduit No.	Conduit ID.	No. of cables	Cable Sizes
1	4"	2 + 1 WIRE	2 @ 1/2" - 12 GA WIRE - BROWN
2	4"	4	1 1/4" - 2 @ 3/4" - 1 @ 1/2"
3	4"	1	1"
4	4"	PULL COED	
5	4"	1 + 1 WIRE	1/2" - 12 GA WIRE - WHITE
6	4"	5	3/8" - 14 - 44 - 2 @ 3/8"
7	4"	2	2 @ 1/2"
8	4"	5 @ 3/8"	5 @ 3/8" - 2 clusters / 10 TOTAL CABLES
9	4"	1	1"
10	4"	5	2 @ 1/4" - 1/2" - 3/4" - 3/4"
11	4"	EMPTY OPEN	
12	4"	2 + 2 @ 3/8"	3/4" - 3/8"
13	4"	1 WIRE	12 GA WIRE - BROWN
14	4"	1 + 1 WIRE	1" - 12 GA WIRE (BROWN) + 1 SUBMERSE ORANGE (1")
15	4"	1 WIRE	12 GA BROWN
16	4"	5	3 @ 3/8" - 2 @ 1/4"
17	4"	1 WIRE	12 GA BROWN
18	4"	"	"
19			
20			

* SOUTH WALL HAS TEEG. OUTLET FOR PUMP

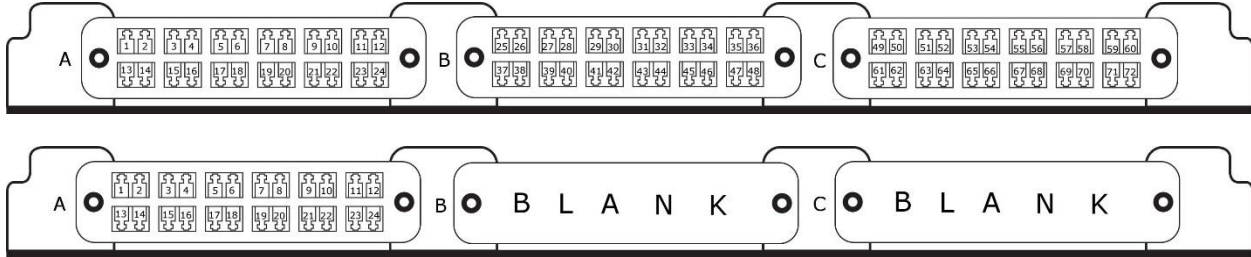
* 1 @ 3/4" AT NW CORNER SECTION TO 3/4" CABLE DUCT # 12 - S. WALL

* 1 @ 3/8" FROM N. CORNER SECTION TO DUCT # 12

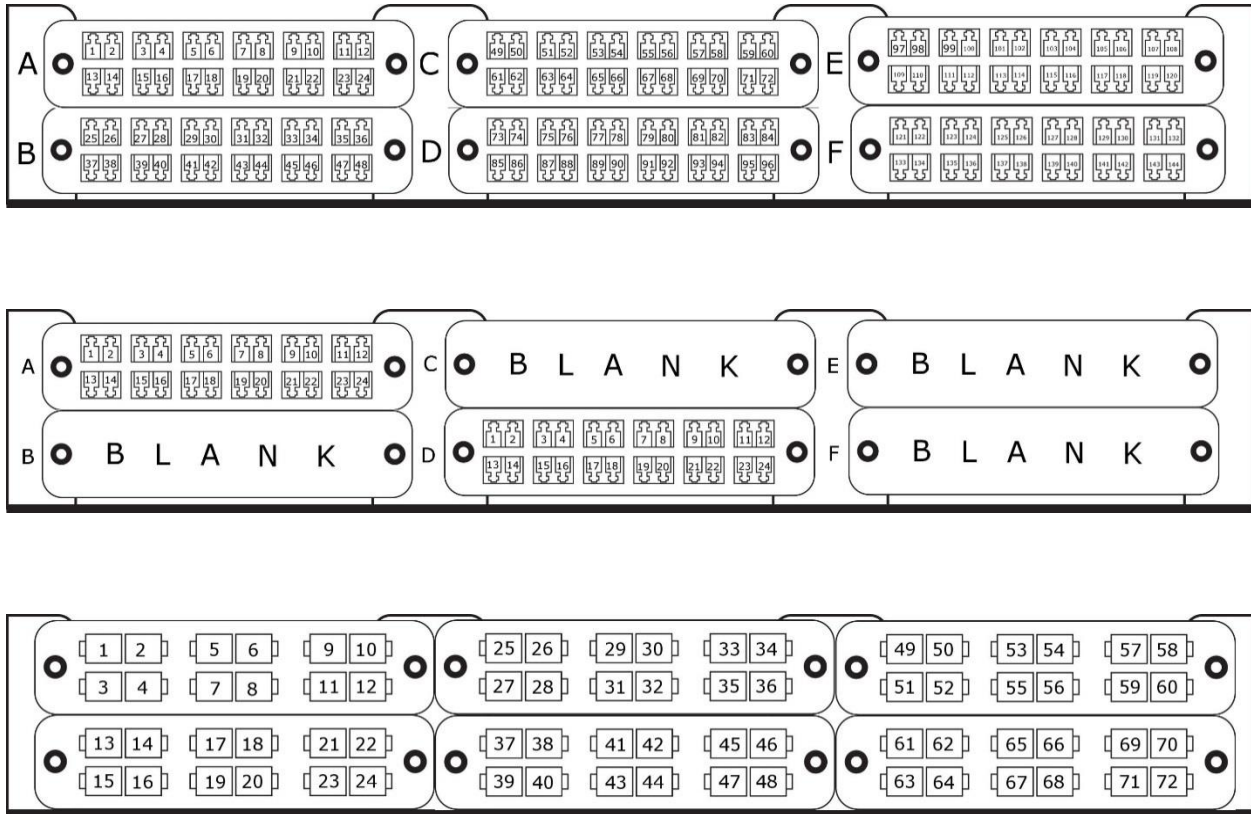
SEE PLS

27 1323 Communications Optical Fiber Splicing and Terminations

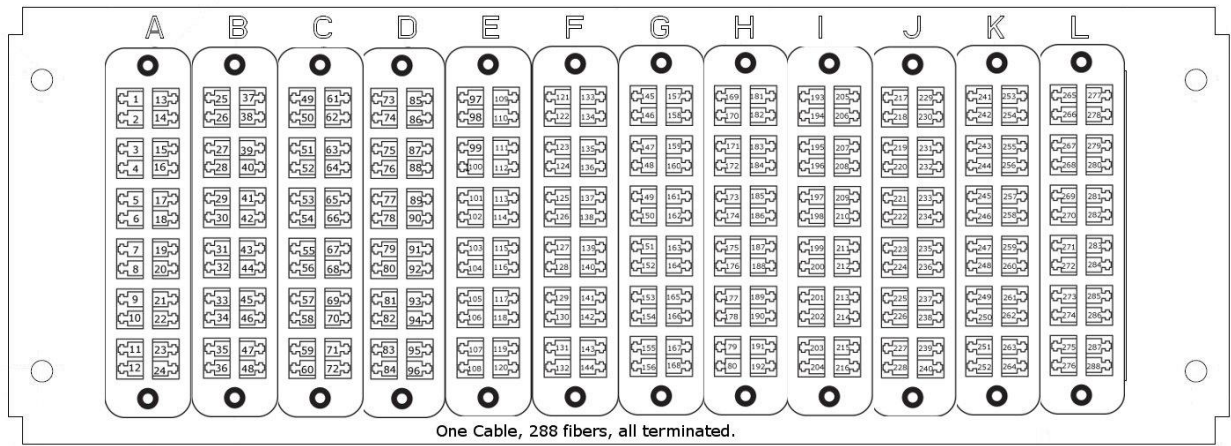
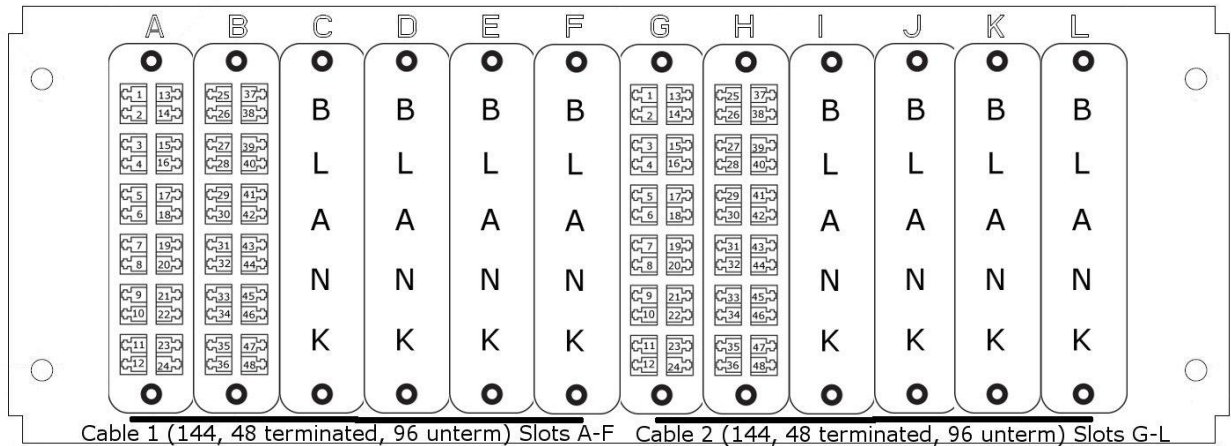
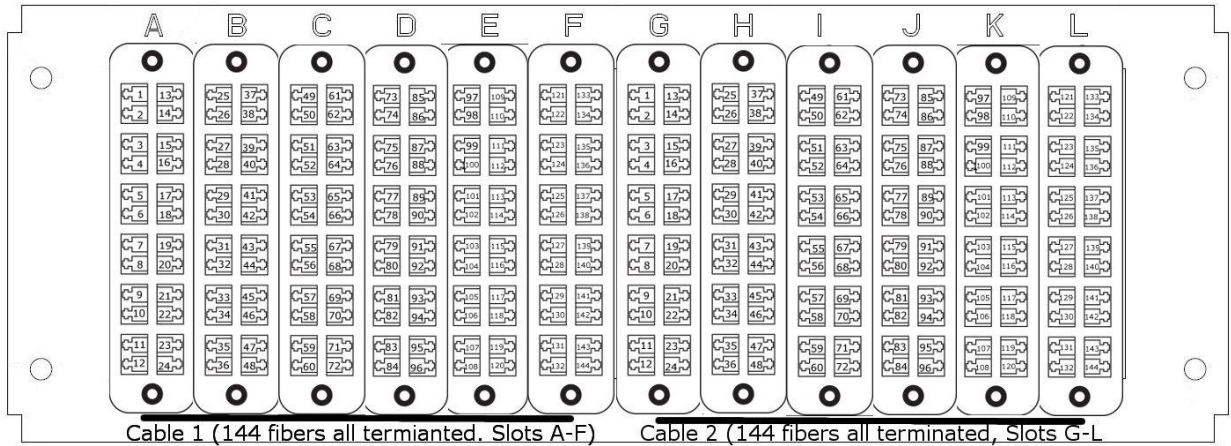
Examples of fiber counts: 1U 19” rack FDC

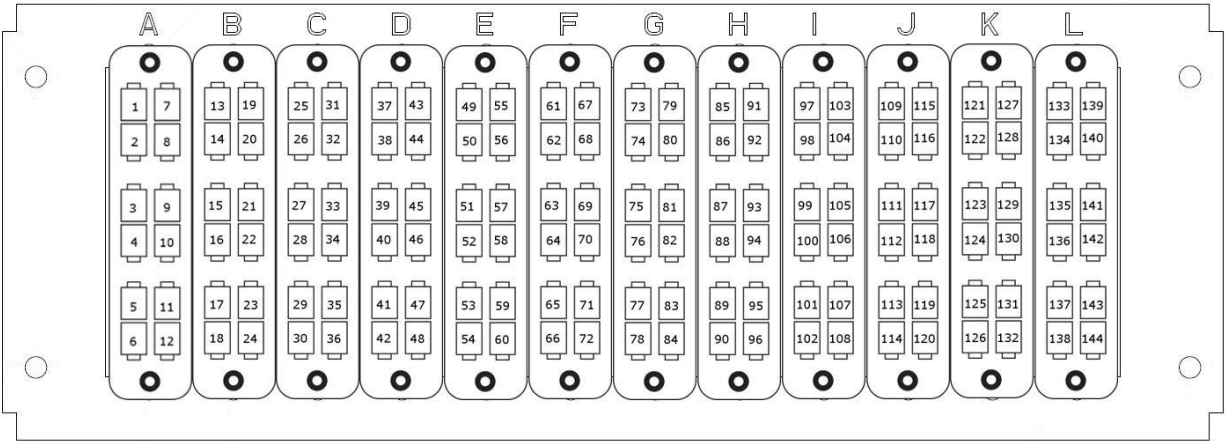


Examples of fiber counts: 2U 19” rack FDC

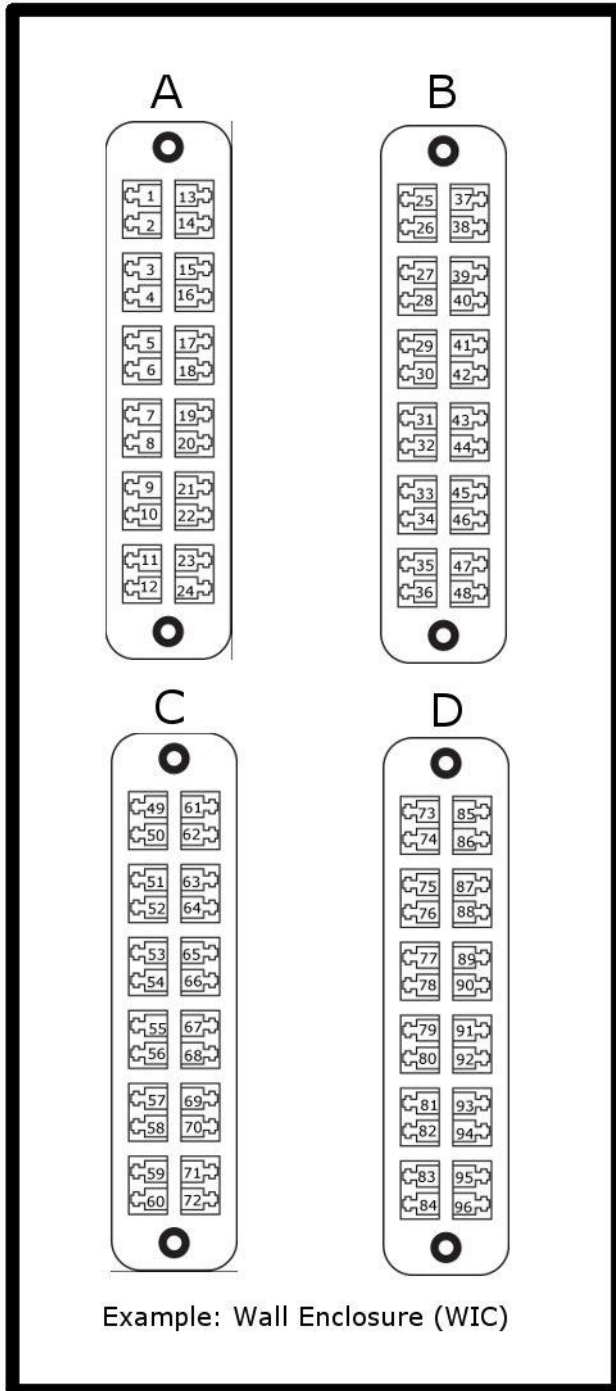


Examples of fiber counts: 4U 19” rack FDC

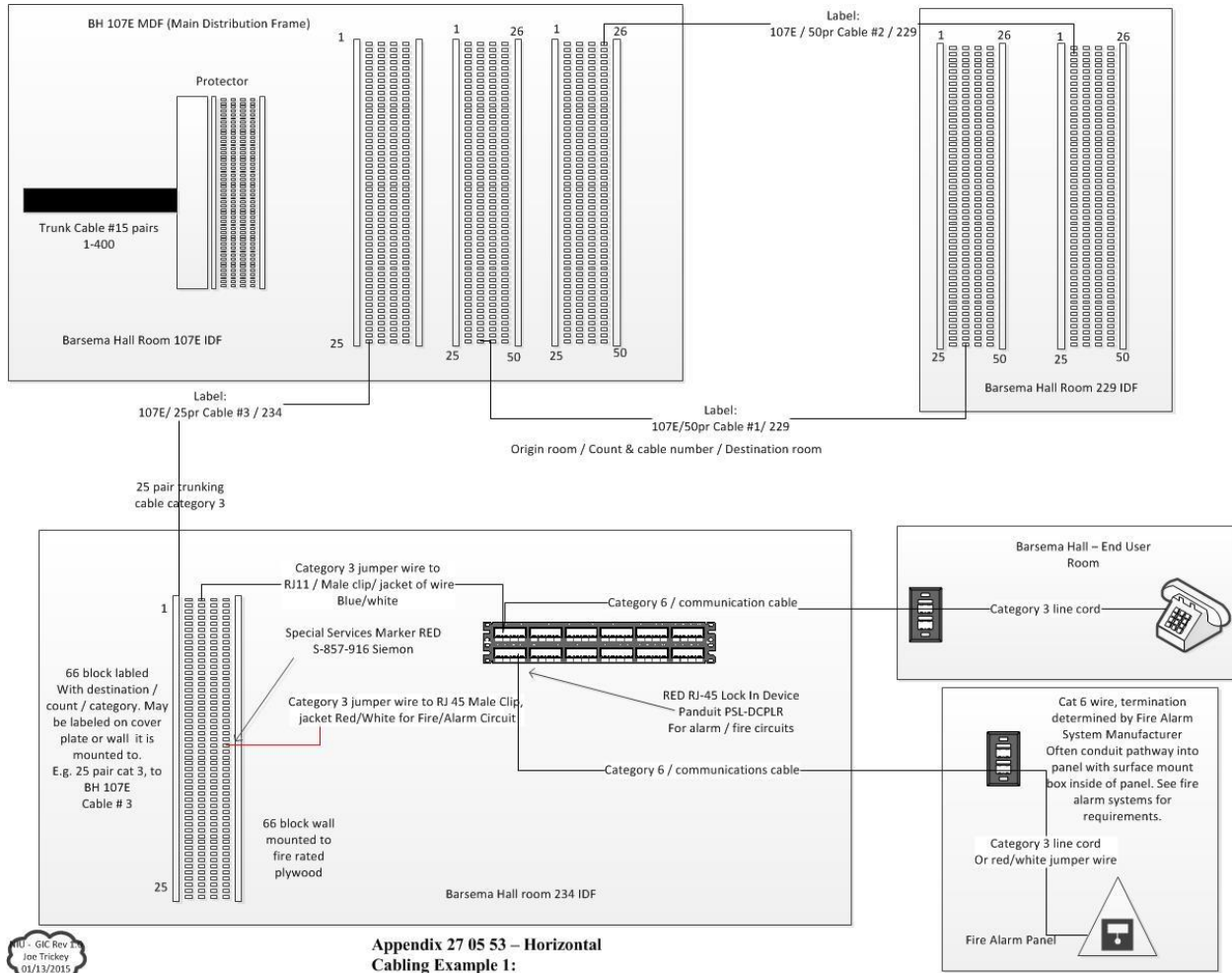




Examples of fiber counts: Wall Enclosure (WIC) 4 position



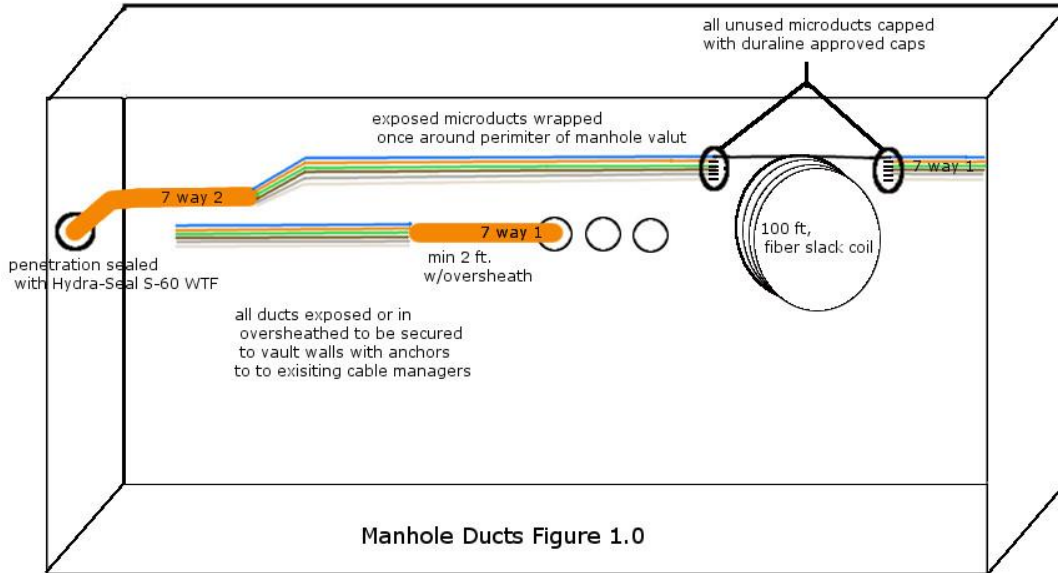
Example: 27 0553 Horizontal Cabling Example



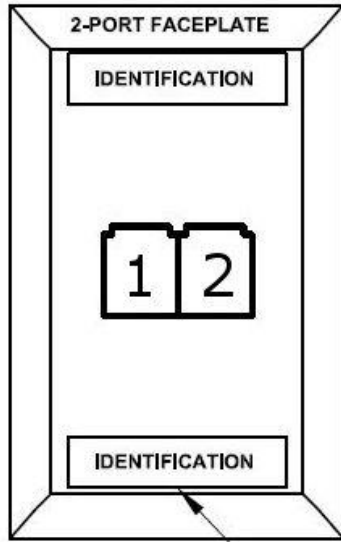
NIU - GIC Rev 1
Joe Trickey
01/13/2015

Appendix 27 05 53 – Horizontal Cabling Example 1:

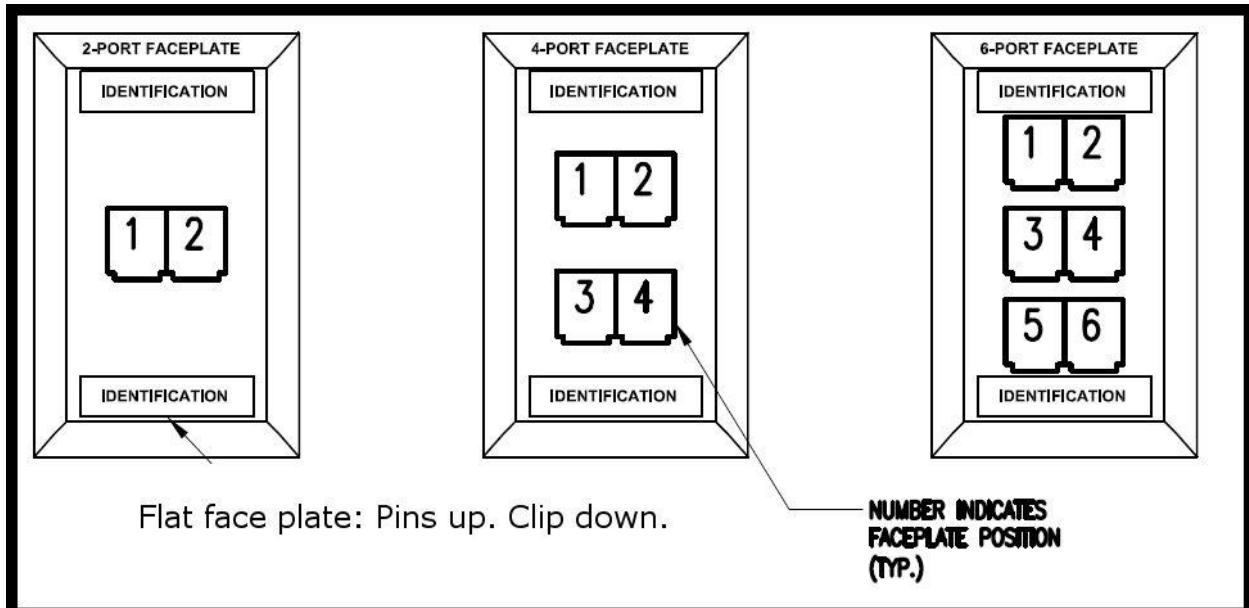
Example: 27 0543 Manhole Duct/fiber installation example



27 1543 Telecommunications Faceplate



Angled faceplate, pins down, clip up.



Flat face plate: Pins up. Clip down.

NUMBER INDICATES
FACEPLATE POSITION
(TYP.)

Building Codes Appendix B

AA	Art Annex (2211 Sycamore Road)
AB	Visual Arts Building
AD	Adams Hall
AL	Altgeld Hall
AN	Anderson Hall
AS	Art Studio
AV	Barsema Alumni & Visitors Center
BC	Broadcast Center (801 N. First)
BH	Barsema Hall
CB	Center for Black Studies
CC	Child Care Center
CF	Center for Study of Family Violence
CH	Chessick Practice Center
CL	Campus Life Building
CO	Cole Hall
CP	Chilled Water Plant
CU	Credit Union
CV	Convocation Center
DC	New Residence Hall Community Center
DB	Dorland Building
DD	Douglas Hall
DH	Davis Hall
DU	DuSable Hall
EB	Engineering Building
EF	Evans Field House
EP	East Heating Plant
FO	Founders Library

FR	Faraday Hall
FW	Faraday West (La Tourette)
GA	Gabel Hall
GC	Zeke Giorgi Law Clinic (Rockford)
GD	Gilbert Hall
GH	Graham Hall
GN	Grant Towers North
GO	Grounds
GR	Greenhouse
GS	Grant Towers South
HC	Holmes Student Center
HE	Hoffman Estates
HR	Human Resource/Printing Services
HS	Health Service Center
IA	IASBO/Public Admin. Bldg.
JH	Jacobs House (429 Garden)
LB	National Bank and Trust (155 N. Third)
LC	Latino Center
LD	Lincoln Hall
LH	Lowden Hall
LT	Lorado Taft
LW	Wellness & Literacy - Monsanto Red Bldg.
MB	Music Building
MC	McMurry Hall
MO	Montgomery Hall
MS	Motorcycle Safety
NC	Neptune Central
NE	Neptune East
NN	Neptune North
NP	Naperville Education Center

NS	Nursing School
NV	Northern View Community
NV1	One Northern View Circle (Community Ctr.)
NV2	Two Northern View Circle - Apartment Bldg. VA Three Northern View Circle - Apartment Bldg.
NV3	VB
NV4	Four Northern View Circle - Apartment Bldg. VC
NV5	Five Northern View Circle - Apartment Bldg. VD
NV6	Six Northern View Circle - Apartment Bldg. VE
NW	Neptune West
OH	Oderkirk Carriage House
OR	One Room School House
OS	Outdoor Recreation Center
PD	Parking Garage / Parking Deck
PK	Parking, Durmad House 121 Normal Rd
PM	Psychology/Computer Science Bldg.
PP	Physical Plant
PR	President's House (901 Woodlawn)
PS	Univ Police & Pub Safety
PT	Pottinger House (520 College View Crt.)
RC	Recreation Center
RE	New Residence Hall East
RF	Rockford Educational Center
RH	Reavis Hall
RT	Radio Tower Shed
RW	New Residence Hall West
SB	Stevens Building
SC	Speech and Hearing Clinic
SG	Still Gym
SH	Still Hall

SI	Building Services
SN	Stevenson Towers North
SP	Swen Parson Hall
SR	Monat, William Bldg. (Social Science Research)
SS	Stevenson Towers South
ST	Stadium
TA	Taft - Taft House
TB	Taft - Poley House
TD	Taft - Pump House
TE	Taft – Garage
TG	Taft - Grover House
TH	Taft - Arts & Crafts
TI	Taft - Sanitation Bldg.
TK	Taft - Browne House
TL	Taft - Dickerson House
TM	Taft - Clarkson House
TN	Taft - Dining Hall
TO	Taft - Heckman Dorm
TP	Taft - Log Cabin
TQ	Taft - Dir. Mobile Home
TR	Taft-Water Pressurization
TB	Transmitter Building
TC	Taft Campus
TS	Telephone and Security Bldg.
TV	Television Center
UA	University Apartments
UC	University City (817 W. Lincoln)
WH	Watson Hall
WI	Williston Hall
WL	Wellness & Literacy - Monsanto Main Bldg.

WP	West Heating Plant
WR	Women's Resources / Arndt House
WZ	Wirtz Hall
YC	Yordon Center (AAPC)
ZH	Zulauf Hall

<http://www.niu.edu/maps/bldgabb.shtml>

End of Division 27 0000

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

December 2012, rev 00

27 5313 – Clock Systems

PART 1. GENERAL

1.01 Summary

A. Section Includes:

1. Discussion of Owner's existing campus-wide Master clock system.
2. Secondary indicating clocks.

B. Description:

1. The clock system continually synchronizes clocks throughout the facility.
2. Time system is a synchronized master-satellite time system.
3. Clocks are synchronized to within 10 milliseconds 6 times per day; the system has an internal oscillator that maintains plus or minus one second per day between synchronizations so that clock accuracy shall not exceed plus or minus 0.2 seconds.
4. The system has an internal clock so that failure of the GPS signal shall not cause the clocks to fail in indicating time.
5. The system incorporates fail-safe design so that failure of any component shall not cause failure of the system. Upon restoration of power or repair of failed component the system resumes normal operation without the need to reset the system or any component thereof.
6. Clock locations shall be as indicated.

C. NIST: The National Institute of Science and Technology

D. UTC: Universal Time Coordinated. The precisely measured time at zero degrees longitude; a worldwide standard for time synchronization.

1.02 Performance Requirements

- A. Perform an area survey to ensure signal reception and connectivity from the master system to the area where installation is being considered.

1.03 Submittals

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes (including available colors) for each product indicated and describe features and operating sequences, both automatic and manual, for the following:

1. Indicating clocks.

2. Time clocks

- B. Operating License: Submit evidence of application for additional operating licenses as may be required prior to installing the equipment. Furnish the license or, if the license has not been received, a copy of the application for the license to the Owner prior to operating equipment. When license is received, deliver original license to Owner.
- C. Manufacturer's Instructions: Submit complete installation, set-up, and maintenance instructions.

1.04 Quality Assurance

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2. PRODUCTS

2.01 Clocks

- A. Manufacturer:
 - 1. Primex Wireless (<http://www.primexwireless.com>)
- B. Product: Provide Primex Wireless; Traditional Series Clocks #14330 (2-sided clock), #14306 (Small clock), and #14339 (Large clock).
 - 1. Operation: Electric, with auto-adjust for Daylight Savings Time.
 - 2. Construction: High impact polycarbonate frame and lens.
 - 3. Mounting: Wall, as indicated in drawings.
 - 4. Frame color: Black
- C. Selection of other styles and models of the Primex series shall be submitted in writing to the Capital Architecture Planning and Safety (CAPS) office.

2.02 Time Clocks

- A. Commeg Systems, Inc. (<http://www.commeg.com>)
- B. Product: Provide Commeg Systems, Inc.; TimePro Series Maximus Biometric Clock with attached printer to coordinate with University system.

- C. Selection of other styles and models of the Commeg Systems series shall be submitted in writing to the Capital Architecture Planning and Safety (CAPS) office.

PART 3. EXECUTION

3.01 Installation

- A. Install batteries as necessary.
- B. Set clock in accordance with manufacturer's instructions.
- C. Observe clock until valid signals are received and clock adjusts to correct time.
- D. Install the clock on the wall in the indicated location, hanging method and suitable fasteners as approved by the clock manufacturer.

3.02 Field Quality Control

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installation, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.03 Adjusting

- A. Program system according to Owner's requirements. Set system so signal devices operate on Owner-required schedules and are activated for durations selected by Owner. Program equipment-control output circuits to suit Owner's operating schedule for equipment controlled.

3.04 Demonstration

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain clock-and-program-control system components.

End of Division 27 5313



This section of the NIU Design and Construction Standards establishes minimum requirements only. It should not be used as a complete specification.

August 2013, Rev 00

31 1000 – Site Clearing

PART 1. - GENERAL

1.01 Summary

- A. Review NIU Environmental Health & Safety (EHS), Contractor Safety Handbook, http://www.niu.edu/ehs/constructionsafety/Contractor%20Safety%20Handbook_2013.pdf
- B. Contacting the Illinois Historic Preservation Agency if there is a potential for disruption of historic sites or materials as necessary
- C. Consider contacting JULIE prior to any subsurface disturbances as necessary

1.02 Work Includes

A. Base Bid.

1. General Contractor provide;
 - a. Remove surface debris.
 - b. Remove concrete sidewalks, curbs, and stairs.
 - c. Remove trees and shrubs.
 - d. Remove root system of trees and shrubs.

1.03 Topographic and Property Survey

- A. Topographic and property surveys giving lot size, ground elevations, obstructions on site, locations and depths of sewers, conduits, pipes, existing structures, curbs, pavements, and tracts have been obtained from reliable sources. The accuracy of this data is not guaranteed, and is furnished solely as an accommodation to the Contractor. Use of this data shall be at the Contractor's discretion. No additional compensation will be granted due to the Contractor's lack of knowledge of site conditions. Prior to bid submission, conduct any additional surveys and soil tests you may deem necessary to verify the accuracy of the information provided. Additional surveys and tests made by the Contractor shall be made at no cost to the Owner.

1.04 Related Work

1. Building Demolition.
2. Tree Pruning.
3. Earthwork.

4. Excavation.
5. Planting: Shrub and tree relocation.

1.05 Regulatory Requirements

- A. Conform to applicable Federal, State, and City codes and Standards, for disposal of debris.
- B. Coordinate clearing work with utility companies.
- C. Comply with all local ordinances relative to erosion control. The contractor is responsible for obtaining any permit required under the National Pollution Discharge Elimination System (NPDES) from the Illinois Environmental Protection Agency, Division of Water Pollution Control.

1. Project sizes greater than one acre, the contractor is required to submit a “Notice of Intent for General Permit to Discharge Storm Water Associated with Construction Activities (NOI)
2. IEPA Uncontaminated Soil Certification LPC 663 if any material is hauled offsite.

1.06 Project Conditions

- A. Restore damaged improvements to original condition when acceptable to Architect. Reestablish control monuments if disturbed during site clearing operations.
- B. Provide protection of property adjoining project; limit work to construction area shown on Drawings.
- C. Dispose of materials removed from site off-site.
- D. Traffic: Conduct site cleaning operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction.
- E. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 1. Protect improvements on adjoining properties and on Owner's property.
 2. Restore damaged improvements to their original condition, as acceptable to parties having jurisdiction.
- F. Protection of Existing Trees and Vegetation: Protect existing trees to remain in place, against unnecessary cutting, breaking or skinning of roots, skinning and

bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. Provide temporary guards to protect trees and vegetation to be left standing.

1. Repair or replace trees indicated to remain, which are damaged by site clearing or construction operations, in a manner acceptable to Architect. Employ licensed arborist to repair damages to trees.
2. Replace trees which cannot be repaired and restored to full-growth status, as determined by arborist.

G. Salvageable Improvements: Carefully remove items indicated to be salvaged, and store on Owner's premises where indicated or directed.

1.07 Joint Utility Locating Information for Excavators (JULIE)

A. Joint Utility Locating Information for Excavators (JULIE) System exists in the State of Illinois.

1. All utility companies and municipalities having utility lines are part of this system.
2. Contractor can call JULIE number - 1-800-892-0123 (minimum 48 hours in advance), and they will notify all members utility companies involved that their respective utility should be located.

B. Other utilities which do not subscribe to the JULIE System and have utilities which are affected by the construction shall also be contacted for assistance in locating their facilities.

PART 2. - PRODUCTS

2.01 Disposal

- A. Recycling of material is encouraged
- B. Dispose of all surplus, unstable and unsuitable materials in a legal manner.

PART 3. - EXECUTION

3.01 Preparation

- A. Verify that existing plant life and features designed to remain are tagged or identified.

3.02 Protection

- A. Protect utilities that remain from damage.
- B. Protect trees, plants, shrubs, and features designated to remain as final landscaping.
- C. Protect bench marks and existing structures from damage or displacement.

3.03 Clearing

A. General

- 1. Clear areas required for access to site and execution of Work.
- 2. Remove concrete sidewalks, curbs, and stairs indicated
- 3. Remove trees and shrubs indicated. Remove stumps, main root ball, and root system to a depth of 120”.
- 4. Remove trees, shrubs, grass and other vegetation, improvements, or obstruction interfering with installation of new construction. Remove such items elsewhere on site or premises as specifically indicated. Removal includes digging out stumps and roots.
 - a. Stump must be ground to complete removal. Remaining cavity to be back filled properly with approved material.
 - b. Carefully and cleanly cut roots and branches or trees indicated to be left standing, where such roots and branches obstruct new construction.
- 5. Clear undergrowth and deadwood without disturbing subsoil.
- 6. Apply herbicide to remaining stumps to inhibit growth.

B. Topsoil: Strip topsoil 6" or in a manner to prevent intermingling with underlying subsoil or other objectionable material. Stockpile topsoil in storage piles where directed. Construct storage piles to freely drain surface water. Cover storage piles if required to prevent windblown dust.

- 1. Where trees are indicated to be left standing, stop topsoil stripping a sufficient distance to prevent damage to main root system.
- 2. Remove excess topsoil from site if not used for finish grading.

C. Clearing and Grubbing: Clear site of trees, shrubs and other vegetation, except for those indicated to be left standing.

- 1. Completely remove stumps, roots, and other debris protruding through ground surface. Use only hand methods for grubbing inside drip line of trees indicated to be left standing.

D. Removal of Improvements: Remove existing above-grade and below-grade improvements necessary to permit construction, and other work as indicated.

1. Abandonment or removal of certain underground pipe conduits may be shown on mechanical or electrical drawings, and is included under work of those sections. Removal of abandoned underground piping or conduit interfering with construction is included under this section.
 - E. Protect and maintain existing roadways and drainage structures to remain, in existing condition; repair all items damaged.
- 3.04 Disposal of Waste Materials
- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
 - B. Removal from Owner's Property: Remove waste materials and unsuitable and excess topsoil from Owner's property and dispose of off-site in legal manner.
- 3.05 Control Monuments
- A. Provide land surveyor who re-establishes control monuments disturbed by construction operations or when indicated on Drawings to be relocated.

End of Division 31 1000

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

April 2014, rev 00

31 2000 – Earthwork

PART 1. - GENERAL

1.01 Regulatory Requirements

- A. Project sizes greater than one acre, the contractor is required to submit a “Notice of Intent for General Permit to Discharge Storm Water Associated with Construction Activities” (NOI)
- B. Storm Water Pollution Prevention Plan
- C. IEMA ten day notification for demolition provisions
- D. IEPA Uncontaminated Soil Certification LPC 663 if material is to be hauled offsite.

1.02 General Considerations

- A. Visit the site and examine all conditions that may affect the scope of work.
- B. Review NIU Environmental Health & Safety (EHS), Contractor Safety Handbook,
http://www.niu.edu/ehs/constructionsafety/Contractor%20Safety%20Handbook_2013.pdf.
- C. Contacting the Illinois Historic Preservation Agency if there is a potential for disruption of historic sites or materials as necessary.
- D. Consider contacting JULIE prior to any subsurface disturbances, as necessary.
- E. Comply with all local ordinances relative to erosion control. The contractor is responsible to obtain any permit required under the National Pollution Discharge Elimination System (NPDES) from the Illinois Environmental Protection Agency, Division of Water Pollution Control.
- F. Take necessary precautions to prevent blocking of sewers, filling of ditches and washing of earth onto existing pavement during heavy rains. After heavy rains promptly cleanup any debris and sedimentations that may have occurred, or might be damaging to sewers, ditches, and pavements.
- G. Topographic and property surveys giving lot size, ground elevations, obstructions on site, locations and depths of sewers, conduits, pipes, existing structures, curbs, pavements, and tracts have been obtained from reliable sources. The accuracy of this data is not guaranteed, and is furnished solely as an accommodation to the

Contractor. Use of this data shall be at the Contractor's discretion. No additional compensation will be granted due to the Contractor's lack of knowledge of site conditions. Prior to bid submission, conduct any additional surveys and soil test you may deem necessary to verify the accuracy of the information provided. Additional surveys and tests made by the Contractor shall be made at no cost to the Owner.

1.03 Work Includes

A. Base Bid:

1. General Contractor provide:

- a. Excavation for exterior ramp and stair foundations.
- b. Preparing and grading subgrades for walks, pavements, and landscaping.
- c. Cut and fill as necessary to provide finish grading at new paved and unpaved areas shown on the drawings.
- d. Removal of excess soils.
- e. Backfilling and compaction.
- f. Subsurface drainage backfill for walls and trenches.
- g. Sub-base course for walks and pavements.
- h. Qualified independent testing agency to provide testing specified herein.

1.04 Related Work

A. Division 31 1000 – Site Clearing

1.05 References

A. American Society for Testing and Materials (ASTM):

1. ASTM D698 - Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb. Rammer and 12" Drop.
2. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
3. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
4. ASTM D2487 - Standard Test Method for Classification of Soils for Engineering Purposes.
5. ASTM D2922 - Standard Test Methods for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

B. State of Illinois Dept of Transportation (IDOT) - Standard Specification for Road and Bridge Construction, latest edition.

C. FS Q-P-166E - Peat Moss; Peat Humus; and Peat Reedsedge.

1.06 Definitions

- A. Excavation: Consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
- C. Sub-base course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.
- D. Base course: The layer placed between the sub-base and surface pavement in a paving system.
- E. Unauthorized excavation: Consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- G. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.07 Submittals

- A. Submit as requested:
 - 1. Test Reports: Submit test reports for all fill materials to be installed below the soil materials and the area of intended use. A separate submittal of test reports is required for each new source of material.
 - 2. Filter fabric: Provide product data and 12" x 12" sample.
 - 3. Test Report on Fill Material: Prior to filling operations, submit an engineering report of the material to be used for fill, which includes a Standard Proctor Compaction Test (ASTM D698) and an engineer's recommendation for proper method of compaction for the fill material to be followed by the contractor during the filling operation.
 - 4. Product Certification: Submit certificates of inspection as may be required by governing authorities to accompany shipments. For standard products submit manufacturer's certified analysis. For other materials submit analysis by a

recognized laboratory, made in accordance with methods established by the Association of Official Agricultural Chemists wherever applicable.

5. Topsoil Analysis Report: Submit soil analysis report for proposed new topsoil.
 - a. Before delivery of topsoil, furnish to the Architect a written statement giving location of properties from which topsoil is to be obtained, names and addresses of Owners, depth to be stripped, and crops grown during past two years.
 - b. Before delivery of topsoil, furnish to the Architect a soil analysis made by an acceptable soil testing laboratory, stating percentages of silt, clay, sand, and organic matter; soil pH; mineral content; and plant nutrient content of topsoil. In soil analysis report, indicate suitability of topsoil for indicated use. If not suitable, state recommended quantities for nitrogen, phosphorus, and potash; and any limestone, aluminum sulfate, or other soil amendments to be added to make topsoil suitable.
6. Testing Agency qualifications.

1.08 Quality Assurance

- A. Perform excavation work in compliance with applicable requirements of Federal and State codes and standards.
- B. IDOT Standard Specifications.
- C. Testing Agency: Contractor shall employ a qualified independent geotechnical engineering testing agency with not less than three years documented experience in performing the tests specified herein and acceptable to the Architect. Tests include the following:
 1. Classify proposed on-site and borrow soils to verify that soils comply with specified requirements
 2. Laboratory preparation of standard proctor for fill materials.
 3. Verify existing bearing capacities.
 4. Test for compaction of installed fill material.

1.09 Project Conditions

- A. Existing Utilities
 1. Locate existing underground utilities in the area of work. When utilities are to remain in place, provide adequate means of protection during earthwork operations.

2. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Architect and the Owner in writing for resolution.
- B. Bring to the attention of the Architect in writing, any unnoted structural conditions or existing conditions.
- C. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Architect, and then only after acceptable temporary utility services have been provided.
- D. Site soils are moisture sensitive and subject to significant deterioration if prematurely exposed or overworked with construction equipment.
- E. Certain soils or weather conditions may preclude or require the limitation of the use of certain types of heavy earthmoving equipment.
- F. Correction of soil deterioration caused by contractor means/methods and/or scheduling will be considered incidental to the work and will not be subject to contract cost or time adjustment by Change Order.
- G. Protection of Persons or Property: Barricade open excavations with suitable fencing to prevent entry.
- H. Protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- I. Dispose of excess and unsuitable excavated material off-site on the adjacent property as designated on the plans.
- J. Protect downstream properties from materials deposited by storm water run-off.

PART 2. - PRODUCTS

2.01 Back fill and Fill Materials at Building Site

- A. Sand: Fine aggregate materials meeting the requirements of IDOT Grade FA-6 of Section 703 of the Standard Specifications.
- B. Borrow Material: Silty clay, a native material from the project site that is free of grass, roots, and vegetation. It shall not contain topsoil or muck.
- C. Pavement Base Material: Crushed stone Coarse Aggregate Gradation IDOT CA.
- D. Structural Fill: Sub-base or base soil material with 70% maximum silt tested according to ASTM D-422 and free of all organic material or rocks.

- E. Mass backfill material: Bank run sand and gravel or uniformly graded crushed stone.
- F. Drainage fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D448, coarse aggregate grading size 57, with 100% passing a 1-1/2" sieve and not more than 5% passing a No. 8 sieve.
- G. Filter fabric: Manufacturer's standard nonwoven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination. Tensile strength: 100 lb. Apparent opening size: #100 US Standard Sieve. Permeability: 150 gpm per sq. ft.
- H. Flowable Fill: Water, Portland cement and fine aggregate mixed according to IDOT special provisions for controlled low-strength material, 28 day compressive strength is 100 min, 500 maximum verified by laboratory tests by Contractor.

2.02 Topsoil

- A. Topsoil at Site: Verify suitability and quantity of topsoil stockpiled at site. If sufficient quantities of suitable topsoil are not available at site, provide additional topsoil as required to complete landscape work.
- B. Acceptable topsoil: Includes selectively excavated material that is representative of soils in the vicinity that produce heavy growths of crop, grass or other vegetation and is reasonably free of underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or be a hindrance to grading, plant or maintenance operation. Topsoil shall not contain more than 5% by volume of stones, stumps, and other objects larger than 2" in any dimension for lawn areas. Topsoil shall be acceptable to Architect prior to beginning finish grading work.

PART 3. - EXECUTION

3.01 Inspection

- A. Examine the areas and conditions under which excavating, filling and grading are to be performed and notify the Architect in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been resolved.
- B. Protect structures, utilities, sidewalks, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

- D. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.
 - E. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- 3.02 Excavation
- A. The areas indicated for grading shall be cut to the elevations and contours shown. Useable topsoil shall be stripped and stockpiled for reuse. The final grade in unpaved areas shall have a minimum of 4" of topsoil. All areas, once stripped either for fill or for subgrade, shall be proof-rolled with loaded trucks to detect localized weak subgrades.
 - B. Classified excavation: Excavation is classified and includes excavation to required subgrade elevations. Excavation will be classified as earth excavation or rock excavation as follows:
 - 1. Earth excavation includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation.
 - 2. Rock excavation includes removal and disposal of rock material and obstructions encountered that cannot be removed by heavy-duty rock excavating equipment without systematic drilling, blasting, or ripping.
 - a. Rock material includes boulders 1/2 cubic yard or more in volume and rock in beds, ledges, un-stratified masses, and conglomerate deposits.
 - b. Rock excavation, when encountered, will be paid by unit prices included in the Contract Documents or by Change Order. Do not excavate rock until it has been classified and authorized by Architect.
 - C. Stability of excavations: Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
 - D. Excavation for structures:
 - 1. Excavate to indicated elevations and dimensions within a tolerance of + .10'. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.
 - 2. Excavations for footings and foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3. Excavation for underground tanks, basins, and mechanical or electrical appurtenances: Excavate to elevations and dimensions indicated within a tolerance of + .10'. Do not disturb bottom of excavations intended for bearing surface.
 4. Underpin adjacent structures which may be damaged by excavation work, including utilities.
 5. After completion of the excavation and prior to placement of concrete for footings, excavations may be inspected and approved by the Owner's Testing Lab or representative to insure that suitable bearing has been obtained if deemed necessary by the Owner. Twenty-four-hour notice shall be given to the Architect and Owner.
 6. Fill excess cuts under footings and foundations with concrete, and fill any excess cuts under slabs with compacted sand.
- E. Excavation for walks and pavements: Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.
- F. Excavation for utility trenches:
1. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
 2. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12" higher than top of pipe or conduit, unless otherwise indicated.
 3. Trench bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
- G. Approval of subgrade: Notify Architect when excavations have reached required subgrade. When Architect determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Architect.
- H. Unauthorized excavation: Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Architect. Fill unauthorized excavations under other construction as directed by the Architect.
- I. Unsuitable Soil Materials Removal: When dry compacted suitable bearing soil for footings is not encountered at depth indicated on drawings, immediately notify Architect; do not proceed until an acceptable solution has been determined.

- J. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is below 35° F.
 - K. Install sub-drainage systems as shown on drawings.
- 3.03 Storage of Soil Materials
- A. Stockpiling of usable topsoil on University property is acceptable but shall be under the direction of the Grounds Superintendent.
 - B. Clay soils and unusable soils shall be removed from University property unless directed otherwise by the Grounds Superintendent.
 - C. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
- 3.04 Backfill
- A. Place acceptable soil material in layers to specified subgrade elevations, for each area classification listed below.
 - 1. Use acceptable excavated or other on-site earth material as backfill material adjacent to foundations. The final 2'-0" of backfill shall be a compacted cohesive soil material.
 - 2. In excavations, outside the building, use foundation backfill material.
 - 3. Under grassed areas, use satisfactory excavated or fill material from the site and final 4" layer of topsoil.
 - 4. Under walks use trench backfill or fill material.
 - 5. Under paved areas use fill material.
 - B. Backfill excavations promptly, but not before completing the following:
 - 1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Testing, inspecting, and approval of underground utilities.
 - 4. Concrete formwork removal.
 - 5. Removal of trash and debris from excavation.
 - 6. Removal of temporary shoring and bracing, and sheeting.
 - 7. Installing permanent or temporary horizontal bracing on vertical supported walls.
 - C. Placement and Compaction:

1. Place backfill and fill material in layers not exceeding 8" in loose depth for material compacted by heavy compaction equipment, and not exceeding 4" in loose depth for material compacted by hand-operated tampers.
2. Place backfill and fill materials evenly adjacent to structures, to specified elevations; prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.

D. Moisture Control:

1. Before compaction, moisten or aerate each layer to provide optimum moisture content; compact each layer to specified percentage of maximum dry density or relative dry density for each area classification.
2. Do not place backfill material on muddy, frozen, frosted, or iced surfaces.

E. Utility trench backfill:

1. Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
2. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18" of footings. Place concrete to level of bottom of footings.
3. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1", to a height of 12" over the utility pipe or conduit. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
4. Coordinate backfilling with utilities testing. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed. Place and compact final backfill material of satisfactory soil material to final subgrade.

F. Subsurface drainage backfill:

1. Subsurface drain: Place a layer of filter fabric around perimeter of drainage trench or at footing, as indicated.
2. Drainage backfill: Place and compact drainage backfill of filtering material over subsurface drain, in width indicated, to within 12" of final subgrade. Overlay drainage backfill with one layer of filter fabric, overlapping edges at least 6".
3. Impervious fill: Place and compact impervious fill material over drainage backfill to final subgrade.

3.05 Fill

- A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
 - 1. Scarify or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
 - 2. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture condition or aerate soil and re-compact to required density.
- B. Place fill material in layers to required elevations for each location listed below.
 - 1. Under grass, use satisfactory excavated or borrow soil material with 6" of topsoil at the surface.
 - 2. Under walks and pavements, use mass backfill material to within 6" of paving material. Use 6" of pavement base material immediately beneath walks and pavements.
 - 3. Under steps and ramps, use mass backfill material.
 - 4. Under building slabs, use sand.
 - 5. For backfilling use borrow material or mass backfill material.
 - 6. Under footings and foundations, use structural fill.
- C. Flowable fill: In tight locations below foundations use flowable fill as shown on the drawings.

3.06 Moisture Control

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2% of optimum moisture content. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.

3.07 Compaction

- A. Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations. Place backfill and fill uniformly along the full length of each structure. Carry material uniformly on both sides of the wall to approximately the same elevation in each lift.

- C. Control soil compaction during construction, providing minimum percentage of dry density specified for each area classification. Dry density is determined by a Standard Proctor Test, ASTM D698.
- D. Prior to any filling or after cutting to proper subgrade elevations, the entire area outside the building area shall be disced to a depth of 8" and re-compacted using a sheepfoot roller or other appropriate equipment.
 - 1. Lawn or unpaved areas: Compact top 8" of subgrade and each 12" layer of backfill or fill material at average 95% maximum dry density.
 - 2. Paved areas: Compact top 8" of subgrade and each 8" layer of backfill or fill material at average 95% maximum dry density.
 - 3. Walkways: Compact top 6" of subgrade and each layer of backfill or fill material at average 95% maximum dry density.
 - 4. Building structure areas: Compact top 8" of subgrade and each 8" layer of fill material at average 98% maximum dry density.
 - 5. Building slabs: Compact top 8" of subgrade and each 8" layer of backfill or fill material at average 98% maximum dry density.

3.08 Grading

- A. Subsoil Preparation:
 - 1. Eliminate uneven and depressed areas. Remove any debris, roots, branches, stones, and gravel in excess of 1/2" in size. Remove subsoil contaminated with petroleum products.
 - 2. Scarify subgrade to a depth of 12" where topsoil is scheduled. Scarify all areas where equipment has compacted subsoil.
- B. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Provide a smooth transition between existing adjacent grades and new grades. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- C. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding. Finish surfaces free from irregular surface changes, within not more than 0.10' above or below the required finish elevations. Topsoil to be in minimum depth of 4". Topsoil finish grade shall be in accordance with type of surface treatment.
- D. Grading Surface of Fill: Grade smooth and even, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1".

E. Topsoil:

1. Provide acceptable topsoil level to grade and place in areas where seeding or sodding is scheduled.
2. Install topsoil during favorable weather conditions. Topsoil and installation area must be relatively dry.
3. Place topsoil over all backfill trenches, excavations and disturbed areas that are not scheduled for paving.
4. Place topsoil to a minimum depth of 4".

F. Site grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or unpaved areas: + .10'.
2. Walks: + .10'.
3. Pavements: + 1/2".
4. Grading inside building lines: Finish subgrade to a tolerance of 1/2" when tested with a 10' straightedge.

G. Finish Grading:

1. Mechanically cultivate and fine grade topsoil eliminating rough, uneven, or depressed areas. Maintain levels, profiles and contours of subgrade.
 - a. Finished grade shall provide positive drainage away from buildings at all times and shall prevent pooling or puddling of water at any/all locations.
 - b. Finished grade tolerance shall be + 1".
 - c. Finished grade to be level, firm and sufficient to prevent areas from settling when irrigation is applied.
 - d. Cultivate inaccessible areas by hand. Rake until surface is smooth.
2. Remove stones, roots, grass, weeds, debris and foreign materials while grading. Do not bury foreign materials.

3.09 Sub-base and Base Courses

- A. Proof roll building site and parking lots prior to fill operations with a loaded dump truck. The Owner's soils engineer will examine for soft areas that will need to be removed. The cost of correcting unstable soil conditions shall be adjusted by change order.
- B. Under pavements and walks, place sub-base course material on prepared subgrades. Place base course material over sub-bases to pavements.
- C. Compact sub-base and base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 100% of standard dry density. Shape sub-base and base to required crown elevations and cross-slope

grades. When thickness of compacted sub-base or base course is 6" or less, place materials in a single layer. When thickness of compacted sub-base or base course exceeds 6", place materials in equal layers, with no layer more than 6" thick or less than 3" thick when compacted.

3.10 Drainage Fill

- A. Under slabs-on-grade, place drainage fill course on prepared subgrade. Compact drainage fill to required cross sections and thickness. When compacted thickness of drainage fill is 6" or less, place materials in a single layer. When compacted thickness of drainage fill exceeds 6" thick place materials in equal layers, with no layer more than 6" thick nor less than 3" thick when compacted.

3.11 Field Quality Control

- A. Testing agency services: Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
- B. Footing subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of each subgrade with related tested strata when acceptable to the Architect.
- C. Paved and slab areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 200 sf or less of paved area, but in no case fewer than three tests.
- D. Trench backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150' or less of trench, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.

3.12 Protection

- A. Protecting grade areas: Protect newly graded areas from traffic, freezing and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
- C. Settling: Where settling occurs during the project correction period, remove finished surfacing, backfill with additional approved material, compact, and

reconstruct surfacing. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.13 Disposal of Surplus and Waste Materials

- A. Disposal: Remove surplus soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

End of Division 31 2000

This section of the NIU Design Requirements establishes minimum requirements only.

It should not be used as a complete specification.

December 2013, rev 00

32 9200 – Turfgrass Sodding

PART 1 - GENERAL

1.01 Section Includes

A. This work consists of a complete installation of sodded areas which include:

1. Soil preparation.
2. Fertilize and sodding of all specified areas.
3. Securing sod and erosion protection.
4. Sodded area protection.
5. Cleaning up work area.
6. Maintenance and watering until final acceptance.

1.02 Definitions

- A. Topsoil: Fertile, friable, natural soil of loamy character without admixture or subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sand, stones, plants, roots, sticks, and other foreign material, with acidity range of between PH 6.0 and 6.8.
- B. Pulverized Topsoil: Topsoil crushed and screened to be free of clumps, rocks and debris.
- C. Amended Topsoil: Soil produced by homogeneously blending and thoroughly incorporating 60% topsoil, 20% coarse sand and 20% mushroom compost.
- D. Finish Grade: Elevation of finished surface of planting soil.
- E. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- F. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.

- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
 - I. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoils.
- 1.03 Submittals
- A. Submit sod growers certification of grass species. Identify source location.
- 1.04 Quality Assurance
- A. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor, with a minimum of five years' experience, on Project site when work is in progress.
 - 1. Pesticide/Herbicide Applicator: State licensed, commercial.
 - B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
 - 1. The soil-testing laboratory shall oversee soil sampling.
 - 2. Report suitability of tested soil for turf growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.
 - c. Sod: comply with Turf Producers International (TPI) classes of sod materials.
- 1.05 Delivery, Storage And Handling
- A. Deliver and install sod cut within a 48-hour period.
 - B. Do not transport sod when moisture content may adversely affect sod survival. Any sod that has dried out will be rejected and shall be immediately removed from job site by the contractor.
 - C. Cover sod on pallets to prevent dehydration. Do not tear, stretch, or drop sod during handling and installation.
 - D. Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in TPI's "Guideline Specifications to Turfgrass Sodding." (www.turfgrassod.org/)

1.06 Project Conditions

- A. Work notification: Notify Owner’s representative at least two (2) working days prior to start of sodding operations.
- B. Fine grading must be approved by Owner’s representative prior to the start of sodding operations.
- C. Protect existing utilities, paving, and other facilities from damage caused by sodding operations.
- D. Perform sodding work only after planting and other work affecting ground surface has been completed.

1.07 Warranty

- A. Provide a uniform stand of grass by watering, mowing and maintaining lawn areas until Final acceptance. Re-sod areas with specified materials, which fail to provide a uniform stand of grass until all affected areas are accepted by the Owner’s representative.
- B. Special Warranty: Installer agrees to repair or replace turf that fails in materials, workmanship, or growth within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - 2. Warranty Periods from Date of Substantial Completion: 12 months

PART 2 - PRODUCTS

2.01 Materials

- A. Topsoil: Topsoil shall be defined as a friable, loamy mixture surface soil. It shall not be extremely acid or alkaline nor contain toxic substances harmful to plant growth, and shall be of uniform color and texture. Topsoil shall be free from large roots, sticks, weeds, brush, subsoil, clay lumps, or stones larger than one (1") inch in diameter, or other litter and extraneous matter undesirable to plant growth. Topsoil will be inspected by the owner at the source of supply or as delivered. Topsoil shall meet the approval of the owner prior to use. Any topsoil placed without approval may be subject to removal at the discretion of the Owner’s representative.

- B. Turfgrass Sod: Locally grown. Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
1. IDOT Class 1 Mixture:
 - a. Proportioned by weight as follows:
 - 1). 25 percent Supranova Supina Kentucky Bluegrass
 - 2). 25 percent NuBlue Kentucky Bluegrass
 - 3). 30 percent Perennial Ryegrass
 - 4). 20 percent Creeping Red Fescue
 2. IDOT Class 1A Salt Tolerant Mixture:
 - a. Proportioned by weight as follows:
 - 1). 17 percent Supranova Supina Kentucky Bluegrass
 - 2). 17 percent NuBlue Kentucky Bluegrass
 - 3). 11 percent Audubon Red Fescue
 - 4). 11 percent Perennial Ryegrass
 - 5). 11 percent Rescue 911 Hard Fescue
 - 6). 33 percent Fults Salt Grass
- C. Inorganic Soil Amendments (added as necessary to attain proper soil preparation)
1. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent, Class T or Class O.
 2. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
 3. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
 4. Aluminum Sulfate: Commercial grade, unadulterated.
 5. Perlite: Horticultural perlite, soil amendment grade.
 6. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
 7. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
 8. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

D. Organic Soil Amendments (added as necessary to attain proper soil preparation)

1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3-4-inch sieve; soluble salt content of 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.
2. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture, with a pH range of 3.4 to 4.8.
3. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

E. Fertilizers (added as necessary to attain proper soil preparation)

1. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of four (4) percent nitrogen and twenty (20) percent phosphoric acid.
2. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
3. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - a. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
4. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - a. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

F. Pesticides:

1. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

G. Herbicides:

1. General: Herbicide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3. - EXECUTION

3.01 Inspection

- A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start sodding work until unsatisfactory conditions are corrected.

3.02 Preparation

- A. Limit preparation to areas which will be immediately sodded.
- B. Loosen or till topsoil of areas to be sodded to a minimum depth of four (4) inches. Remove all clumps, clay and sod clods, stones over one (1) inch in any dimension, sticks, roots, and undesirable extraneous material and legally dispose of them off Owner's property prior to final grading.
- C. Finish Grading: Grade areas to be sodded to a smooth, uniform, free draining even surface with a loose, moderately coarse (uniformly fine) texture. Roll and rake, remove ridges, and fill depressions as required to drain and meet finish grade elevations.
 1. Reduce elevation of topsoil along edge of walks, curbs and pavements one (1) inch to allow for soil thickness of sod. Taper finish grade uniformly away from these walk, curb and pavement edges.
- D. Apply Starter fertilizer by mechanical or handheld rotary type distributor, thoroughly and evenly incorporated with soil to a depth of 3" by disking or other approved method.
- E. Thoroughly blend any amended topsoil or soil amendments.
- F. Restore prepared areas to specified condition if eroded, settled, or otherwise disturbed after fine grading and prior to sodding.
- G. Before sodding, obtain Owner's representative's acceptance of finish grading.
- H. Unchanged Subgrades: If turfgrass sod is to be placed in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:
 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.

2. Loosen surface soil to a depth of at least three (3) inches. Apply soil amendments and fertilizers according to topsoil mix proportions and mix thoroughly into top three (3) inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply fertilizer directly to surface of soil before loosening.
3. Remove stones larger than 1-1/2 inch in any dimension as well as all sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.

3.03 Installation

A. Sodding.

1. Sod immediately after preparation of finish grade.
- B. Lay sod within 24 hours of harvesting. Do not lay dormant sod or install sod on saturated or frozen soil.
- C. Lay sod to form a solid mass with tightly fitted joints. Do not stretch or overlap butt ends and edges of sod. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with finish grade, eliminate air pockets, and form a smooth surface. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
1. Lay sod across angle of slopes exceeding 1:3. Install initial row of sod in a straight line, beginning at bottom of slopes, perpendicular to direction of the sloped area.
 2. Anchor sod on slopes exceeding 1:6 with Greenscapes Bio-degradable Stakes, or equivalent, spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- D. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.
- E. Roll with light lawn roller to ensure contact with finish grade.

3.04 Maintenance

- A. Maintain all sodded lawn areas for a period of at least 60 days or until Final Acceptance by the Owner's representative.

- B. All sodded lawn areas shall be protected using four foot poly fence, or simple four foot wood stakes, string and yellow caution flags. This warning fence shall be maintained until the ENTIRE project is completed and accepted by the Owner. Maintain fence at regular intervals.
- C. Maintain and establish sodded areas by watering, fertilizing, spot weeding, mowing, trimming, application of herbicides, fungicides, insecticides, and resodding until a full, uniform stand of grass free of weed, undesirable grass species, disease, and insects is achieved and accepted by the Owner's representative.
 - 1. Water sod thoroughly as required to establish proper rooting.
 - 2. Repair, rework, and resod all areas that have washed out or are eroded. Replace undesirable or dead areas with new sod.
- D. Mowing: Mow turf as soon as top growth reaches a three (3) inch height. Cut back to two inch (2") height. Repeat mowing as required to maintain specified height.
- E. Apply pesticides and other chemical products and biological control agents in accordance with authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- F. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is laid and continue until acceptable sod is established but not prior to final acceptance of the project by the Owner's representative.

3.05 Acceptance

- A. Sodded areas will be inspected at completion of installation and accepted subject to compliance with specified materials and installation requirements.
 - 1. Sodded areas will be acceptable provided all requirements, including maintenance, have been complied with and a healthy, even colored viable lawn is established, free from weeds, undesirable grass species, disease, and insects.

3.06 Cleaning

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from sodding operations.

End of Division 32 9200

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

December 2013, rev 00

32 9219 – Turfgrass Seeding

PART 1. - GENERAL

1.01 Section Includes

A. This work consists of complete construction of lawn areas including:

1. Soil Preparation
2. Seeding and fertilizing of all specified areas
3. Erosion, seed and seedbed protection
4. Maintenance and watering until final acceptance.

1.02 Definitions

- A. Amended Topsoil: Soil produced by homogeneously blending and thoroughly incorporating 60% topsoil, 20% coarse sand and 20% mushroom compost.
- B. Finish Grade: Elevation of finished surface of topsoil.
- C. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- D. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- E. Pulverized Topsoil: Topsoil crushed and screened to be free of clumps, rocks and debris.
- F. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- G. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.
- H. Surface Soil: Whatever soil is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.
- I. Topsoil: Fertile, friable, natural soil of loamy character without admixture of subsoil material, obtained from a well-drained arable site, reasonably free from

clay, lumps, coarse sand, stones, plants, roots, sticks, and other foreign material, with acidity range of between PH 6.0 and 6.8.

1.03 Submittals

- A. Submit seed vendor's certification for required turfgrass see mixture, indicating percentage by weight, percentage of purity, germination and, and weed seed for each grass species. One seed tag for each seed type used on the site shall.
- B. The contractor shall supply maintenance instructions for proper care of the applied seed material.

1.04 Quality Assurance

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor, with a minimum of five years' experience, on Project site when work is in progress.
 - 1. Pesticide/Herbicide Applicator: State licensed, commercial.
- B. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory.
 - 1. The soil-testing laboratory shall oversee soil sampling.
 - 2. Report suitability of tested soil for turfgrass growth.
 - a. State recommendations for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.

1.05 Delivery, Storage, and Handling

- A. Seed shall be delivered to the site in the original unopened sacks as received from the producer, and each sack shall be tagged in accordance with the agricultural seed laws of the United States and the State of Illinois. Each sack shall be tagged showing the dealer's guarantee as to the year grown, percentage of pure seed, analysis of seed mixture, percentage of germination and the date of the test by which the percentages of purity and germination were determined. All seed sown shall have a date of test within six (6) months of the date of sowing.
- B. Any seed delivered prior to use shall be stored in such a manner that it will be protected from damage by heat, moisture, rodents, or other causes.
- C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.06 Project Conditions

- A. Work Notification: Notify the Owner’s representative at least two (2) working days prior to start of seeding operations.
- B. Protect existing utilities, paving and other facilities from damage caused by seeding operations.
- C. Perform seeding work only after planting and other work affecting ground surface has been completed.
- D. Install seed under favorable weather conditions unless approved by Owner’s representative. The conditions of the guarantee and maintenance provision apply regardless of the date of installation. The generally accepted times for seeding are:
 - 1. Spring – April 1 through May 30
 - 2. Fall – August 15 through September 31

1.07 Maintenance Service

- A. Initial Turfgrass Maintenance Service: Provide full maintenance by skilled employees of landscape installer. Maintain as required in Part 3. Begin maintenance immediately after each area is sown and continue until acceptable turfgrass seed is established and mown or until final acceptance of the project by the Owner’s representative.

1.08 Warranty

- A. Provide a uniform stand of grass by watering, mowing, weeding and maintaining seeded areas until final acceptance. Reseed areas with specified seed which fail to provide a uniform stand of grass until all affected areas are accepted by the Owner’s representative.
- B. Special Warranty: Installer agrees to repair or replace turf that fails in materials, workmanship, or growth within specified warranty period.
 - 1. Warranty all work in this section for 12 months following the date of Final Acceptance.

PART 2. - PRODUCTS

2.01 Materials

- A. Turfgrass Seed: Fresh, clean seed from the most recently harvested crop which complies with all local, state and federal seed and weed laws and is free of Poa

annua, Bent grass and noxious weed seeds. A seed mixture of one of the approved mixes listed below or an approved equal:

1. Field of Dreams Athletic Mixture by National Seed
 2. McNabb Tees & Fairway Mixture
 3. The preference of new turfgrasses and overseeding at NIU is a mixture minimum of 50% bluegrass species unless otherwise approved.
- B. Seed Blanket: Bio-degradable and required as a top dressing when seeding between June 1 and August 15 or when requested by the Owner, shall consist of the following or an approved equal:
1. Greenscapes Wood Fiber Seed Blanket
 2. Pennington Wood Fiber Seed Blanket
 3. Seed Blanket stakes shall be Greenscapes Bio-degradable Stakes or an approved equivalent. Metal stakes shall not be used.
- C. Straw Mulch: Clean oat or wheat straw well-seasoned before bailing, free from mature seed-bearing stalks or roots of prohibited or noxious weeds and required as a top dressing when seeding between June 1 and August 15.
- D. Water: Free of substances harmful to seed growth. Furnish hoses or other methods of transportation. Also available from University sources by rental or valve and hydrant connections or pumping from creek and pond.
- E. Fertilizer: Granular, non-burning product composed of not less than 50% organic slow acting, guaranteed analysis professional fertilizer.
1. Starter fertilizer: 10-24-18 with 30% nitrogen in slow release formula.
 2. Over-seed Areas: 22-3-11 with 50% nitrogen in slow release formula.
 3. Post emergent fertilizer: Approx. analysis 30-5-5
 4. Additional fertilizers may be specified in contract specifications.

PART 3. - EXECUTION

3.01 Inspection

- A. Examine finish surfaces, grades, topsoil quality, and depth. Do not start seeding work until unsatisfactory conditions are corrected.

3.02 Preparation

- A. Limit preparation to areas which will be immediately seeded.
- B. Loosen or till topsoil of areas to be seeded to minimum depth of 4". Remove all clumps, clay and sod clods. Stones over 1" in any dimension, sticks, roots, and

undesirable materials prior to final grading. Grading shall meet tolerances specified contract specifications.

- C. Grade areas to be seeded to a smooth, free draining even surface with a loose, moderately coarse texture. Roll and rake, remove ridges, and fill depressions as required to drain.
- D. Apply Starter fertilizer be mechanical or handheld rotary type distributor, thoroughly and evenly incorporate with soil to a depth of 3” by disking or other approved method.
- E. Restore prepared areas to specified condition if eroded, settled, or otherwise distributed after fine grading and prior to seeding.
- F. Provide temporary winter cover when the completion schedule of the work under the contract requires a delay in the seeding operation.
 - 1. Areas not yet seeded or have no vegetative cover shall be seeded immediately with a temporary winter grass.

3.03 Installation

A. Seeding

- 1. Seed immediately after preparation of seed bed.
- 2. Seed indicated areas within contract limits and areas adjoining contract limits disturbed as a result of construction operations.
- 3. Perform seeding operations when the soil is dry and when winds do not exceed 10 miles per hour velocity.
- 4. Re-seeded areas shall have no blanket applied unless the areas is bare earth or has less than 30% seed germination/plants present at time of re-seed.
- 5. Apply seed by mechanical, rotary or drop type distributor. Install seed evenly by sowing equal quantities in two directions, at right angles to each other.
- 6. After seeding, rake soil surface lightly to incorporate seed. Roll with light lawn roller.
- 7. The entire seeded area shall be covered with seed blanket or straw mulch between June 1 and August 15 or on the request of the Owner. All seeded areas must be completely and uniformly covered. Within 24 hours, place seed blanket or straw mulch. If straw mulch, place uniformly at 2¹/₂ tons per acre using manual or mechanical methods. Crimp straw into soil to secure.

Anchor straw mulch with liquid tackifier, applied uniformly at a rate of 60 gallons per acre, on slopes of 3:1 or steeper.

8. Seed shall be applied at the following rates:

Seed	Rate per 1000 square feet
Seed of new turfgrass areas	4.5 to 5 pounds
Reseeding of established areas (over seed in Spring)	2.5 to 3 pounds

B. Hydoseeding

1. Evenly apply a slurry mixture of seed, wood fiber and water to the prepared surfaces at the specified rate. On slopes of 3:1 or greater, or where specified, add tackifier per manufacturer’s recommendations, to the slurry mixture prior to application.

C. Reconditioning Existing Lawn

1. Recondition existing turf damaged by Contractor’s operations, including storage of materials or equipment and movement of construction vehicles.
2. Provide fertilizer, seed and soil amendments as specified for new lawns and as required to provide a satisfactory reconditioned lawn. Provide topsoil as required to fill low areas and meet new finish grades.
3. Cultivate bare and compacted areas thoroughly.
4. Remove diseased or unsatisfactory lawn areas. Do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor’s operations, including oil drippings, stone, gravel, and other constructions materials.
5. Where substantial but thin lawn remains, rake, aerate if compacted, and cultivate soil; fertilize and seed.
6. Water newly seeded areas. Maintain adequate soil moisture until new grass is established.

D. Protection of Seeded Areas

1. Immediately after seeding, the area shall be protected against foot and vehicular traffic or other uses by erecting snow fences or chain link fence, stakes with ropes and ribbons, and/or barricades, as required, and approved signs shall be placed at appropriate intervals until Final Acceptance.

3.04 Maintenance

- A. Maintain all seeded lawn areas for a period of at least 90 days or until Final Acceptance by the Owner's representative.
- B. Maintain seeded lawn areas, including cultivation, fertilizing, watering, mowing, application of herbicides, fungicides, insecticides and re-seeding until a full, uniform stand of grass free of weeds, undesirable grass species, disease, and insects is achieved and accepted by Owner's representative.
- C. Mow seeded lawn areas as soon as top growth reaches a three inch (3") height. Cut back to two inch (2") height. Repeat mowing as required to maintain specified height.
- D. Use of Municipal Water or operation of any fire hydrants with the municipality is strictly prohibited without prior approval of the Director of Public Works. Contractors shall obtain a hydrant meter, pay deposit for meter, and payment for water usage from the local municipality. Water tanks shall also be inspected prior to use. Use of water from a water source outside of the municipality does not require inspection.

3.05 Acceptance

- A. Acceptance of the seeded areas is based on 95% coverage over the entire new seeding area and over-seed areas. Maintenance shall continue by the Contractor until Final Acceptance has been granted by the Owner's Representative.
- B. If an irrigation system is in place, it is the responsibility of the Contractor to ensure that the system is working and is covering all new seed areas. This responsibility continues until the site is turned over to the Owner upon acceptance.
- C. Watering shall continue and be maintained by the contractor for the duration of time until final acceptance. It is the contractor's responsibility to notify the owner's representative that they are on-site performing watering. Notification by fax or email is preferred.

3.06 Cleaning

- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, debris, and equipment. Repair damage resulting from seeding operations.

End of Division 32 9219

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

January 2014, rev 00

32 9310 – Trees, Shrubs and Groundcovers

PART 1. - GENERAL

1.01 Section Includes

- A. Provide trees, shrubs, and groundcovers as shown and specified. The work includes:
 - 1. Soil preparation.
 - 2. Trees, shrubs, and groundcovers.
 - 3. Mulch and planting accessories.
 - 4. Existing tree care.
 - 5. Tree relocation.
 - 6. Tree set-backs and placement.
 - 7. Maintenance until acceptance.

1.02 Definitions

- A. Topsoil: Fertile, friable, natural soil of loamy character without admixture or subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sand, stones, plants, roots, sticks, and other foreign material, with acidity range of between PH 6.0 and 6.8.
- B. Pulverized Topsoil: Topsoil crushed and screened to be free of clumps, rocks and debris.
- C. Amended Topsoil: Soil produced by homogeneously blending and thoroughly incorporating 60% topsoil, 20% coarse sand and 20% mushroom compost.
- D. Planting Soil Mix: A thorough mixture of specified soil amendments. Specific materials for planting soil mixes are specified within the plans and specifications.
- E. Soil Amendments: Any material mixed with topsoil including but not limited to peat moss, perlite, fertilizers, vermiculite, manures, sand or mushroom compost. Specific materials for soil amendments are specified within the plans and specifications.
- F. Finish Grade: Elevation of finished surface of topsoil.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before topsoil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

- I. Backfill: The earth used to replace or the act of replacing earth in an excavation.
 - J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
 - K. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
 - L. Set-backs: Allowable distance between planting and roadways, walks, pavements, lighting fixtures and buildings to allow landscape maintenance and/or prevent damage to plantings from salt/chemical applications.
- 1.03 Submittals
- A. Product Data and Certificate: For each type of product.
 - B. Samples of each type of mulch and planting accessory.
- 1.04 Quality Assurance
- A. Plant names indicated shall comply with "Standardized Plant Names" as adopted by the latest edition of the American Joint Committee of Horticultural Nomenclature. Names of varieties not listed conform generally with names accepted by the nursery trade. Provide stock true to botanical name and legibly tagged.
 - B. Comply with sizing and grading standards of the latest edition of "American Standard for Nursery Stock" (ANSI Z60.1). A plant shall be dimensioned as it stands in its natural position.
 - C. All plants shall be nursery grown under climatic conditions similar to those in the locality of the project for a minimum of 2 years.
 - D. Stock furnished shall be at least the minimum size indicated. Larger stock is acceptable, at no additional cost, providing that the larger plants will not be cut back to size indicated.
 - E. Plants are subject to inspection by the University's Representative or Landscape Architect at the nursery or jobsite. The Owner's Representative or Landscape Architect reserves the right to personally select any or all nursery stock prior to digging.

- F. The Landscape Contractor shall maintain an experienced full-time supervisor on the project site when work is in progress.
 - 1. Pesticide Applicator: State licensed, commercial.
- 1.05 Delivery, Storage, and Handling
- A. Deliver fertilizer materials in original, unopened, and undamaged containers showing weight, analysis, and name of manufacturer. Store in manner to prevent wetting and deterioration.
 - B. Take all precautions customary in good trade practices in preparing plants for moving. Workmanship that fails to meet the highest standards will be rejected. Spray deciduous plants in foliage with an approved “Anti-Desiccant” before digging to prevent dehydration. Dig, pack, transport, and handle plants with care to ensure protection against injury. Inspection certificates required by law shall accompany each shipment invoice or order to stock and on arrival, the certificate shall be filed with the Owner’s Representative. Protect all plants from drying out. If plants cannot be planted immediately upon delivery, properly protect them with soil, wet peat moss, or in a manner acceptable to the University’s Representative or Landscape Architect. Water heeled-in plantings daily. No plant shall be bound with rope or wire in a manner that could damage or break the branches, bark or destroy the plant's natural shape.
 - C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape.
 - D. Plants transported to the site in open vehicles shall be covered with tarps or other suitable covers securely fastened to the body of the vehicles and adequately ventilated to prevent overheating and or wind burn. Do not drop plants during delivery and handling. Handle planting stock by root ball.
 - E. Deliver plants after preparations for planting have been completed, and install immediately. All plants that cannot be planted immediately on delivery shall be set on the ground or in a trench and the balls well covered with soil, mulch or other acceptable material to prevent freezing, drying or over watering conditions. All plants shall be kept moist, fresh and protected for the entire period during which the plants are being handled in transit or in temporary storage.
 - F. Provide dry, loose topsoil for planting bed mixes. Frozen or muddy topsoil is not acceptable.
- 1.06 Project Conditions

- A. Work notifications: The Contractor shall notify the University’s Representative or Landscape Architect at least two (2) working days or 48 hours in advance of the anticipated delivery and subsequent plant material installation for on-site approval.
 - B. J.U.L.I.E. notification: Landscape Contractor shall be responsible for contacting J.U.L.I.E. (Joint Utility Locating Information for Excavators) prior to digging operations.
 - C. Protect existing utilities, paving, and other facilities from damage caused by landscaping operations.
 - D. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant material list, the planting plans shall govern.
- 1.07 Maintenance Service
- A. Plant Maintenance Services: Will be performed under a separate contract. Provide full maintenance by skilled experienced employees of Landscape Maintenance Contractor. Maintenance service shall be performed as required in Part 3. Begin maintenance immediately after final acceptance on the initial project by the University’s Representative or Landscape Architect.
- 1.08 Warranty
- A. Warrant plant material to remain alive and be in a healthy, vigorous condition for a period of one (1) year after completion and final acceptance of all work.
 - 1. Inspection of plants will be made by the University’s Representative or Landscape Architect at completion of planting.
 - B. Replace, in accordance with the drawings and specifications, all plants that are dead or, as determined by the Representative or Landscape Architect, are in an unhealthy or unsightly condition, and have lost their natural shape due to dead branches, or other causes due to the Contractor’s negligence. The cost of such replacement(s) is at contractor’s expense. Warrant all replacement plants for one (1) year after installation. Replacement plants which are dead or unacceptable within one (1) year of installation may be replaced with unguaranteed plants or removed at the discretion of the University’s Representative or Landscape Architect.
 - C. Warranty shall not include damage or loss of trees, plants, or groundcovers caused by fires, floods, freezing rains, lightning storms, winds over 75 miles per hour,

winter kill caused by extreme cold and severe winter conditions not typical of planting area; or acts of vandalism.

- D. Remove and immediately replace all plants, as determined by the University's Representative or Landscape Architect to be unsatisfactory during the initial planting installation.
- E. Warranty shall not include on-site relocation of existing plants.
- F. Special Warranty: Landscape Contractor / Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified one year warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from vandalism.
 - b. Structural failures including plantings falling or blowing over.
 - c. Plants 1/3 dead or more.

PART 2. - PRODUCTS

2.01 Materials

- A. Plants: Furnish freshly dug nursery-grown plants true to genus, species, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings; with normal, densely-developed branches and vigorous, fibrous root systems developed by transplanting or root pruning. Provide only sound, well-shaped, fully branched, healthy, vigorous stock, free from defects such as disfiguring knots, sunscald injuries, frost cracks, abrasions of the bark, plant disease, insect eggs and larvae, borers, and all forms of infestation. All plants shall have a fully developed form without voids and open spaces. Plants held in storage will be rejected if they show signs of growth during storage.
- B. Balled and burlapped (BB) plants shall be dug with firm natural balls of earth, with sufficient diameter and depth to include all fibrous and feeding roots. No plants moved with a ball will be accepted if the ball is cracked, mushroomed or broken before or during planting operations.
 - 1. Provide ball sizes complying with the latest edition of the "American Standard for Nursery Stock". Tree spade transplanting is not acceptable.
 - 2. Container-grown stock: Grown in a container for sufficient length of time for the root system to have developed to hold its soil together, firm and whole.
 - a. No plant shall be loose in the container.
 - b. Container stock shall not be pot bound.

3. Provide tree species with a single main trunk unless otherwise specified on the Plant List or accepted.
 4. Provide plant matched in form when arranged in groups.
 5. Provide plants free from pruning wounds with diameters of more than one (1) inch. Acceptable wounds must show vigorous bark on all edges.
 6. Provide evergreen trees branched to the ground unless otherwise specified or accepted.
 7. Provide shrubs and groundcover meeting the requirements for spread, height and spacing indicated in the Plant List or Plant Schedule.
 - a. The measurement for height shall be taken from the ground level to the average height of the top of the plant and not the longest branch.
 - b. Single stemmed or thin plants will be rejected.
 - c. Side branches shall be generous, well-twigged, and the plant as a whole well-bushed to the ground.
 - d. Plants shall be in a moist, vigorous condition, free from dead wood, bruises, or other root or branch injuries.
- C. All plants shall have been grown in Northern Illinois under climatic conditions similar to those in the locality of the project for at least two years. Plants shall have been transplanted or root pruned at least once in the past three years. No heeled-in plants or plants from cold storage will be accepted unless approved by the University's Representative or Landscape Architect.
- D. Substitutions will only be permitted by the University's Representative or Landscape Architect. If proof is submitted that specified plants or sizes are unobtainable, a proposal will be considered for the nearest equivalent size or variety.
- E. When size substitutions are necessary, the contractor shall request approval from the University's Representative or Landscape Architect in writing. It is up to the University's Representative or Landscape Architect to approve in writing requested substitutions.

2.02 Accessories

- A. Topsoil: Fertile, friable, natural soil of loamy character without admixture or subsoil material, obtained from a well-drained arable site, reasonably free from clay, lumps, coarse sand, stones, plants, roots, sticks, and other foreign material, with acidity range of between PH 6.0 and 6.8.
- B. Amended Topsoil: Soil produced by homogeneously blending and thoroughly incorporating 60% topsoil, 20% coarse sand and 20% mushroom compost.
- C. Peat Moss: Brown to black in color, weed and seed free granulated raw peat or baled peat, containing not more than 9% mineral on a dry basis.

- D. Mulch: 6 month old well-rotted shredded native hardwood bark mulch not larger than 4” in length and ½” in width, free of woodchips and sawdust.
- E. Water: Free of substances harmful to plant growth. Hoses or other methods of transportation furnished by contractor.
- F. Slow-release Watering Bags: “Treegator” Bags or approved equal.
 - 1. Standard product manufactured for drip irrigation of plants and emptying its water contents over an extended time period; manufactured from 10 mil polyester reinforced polyethylene sheet, PVC, or HDPE plastic with 20 gallon capacity minimum.
- G. Steel Posts for Guying: Standard 7 foot, “T” shaped steel fence post, or steel screw anchors.
- H. Guying Wires: Double strand No. 12-gauge galvanized wire.
 - 1. Turnbuckles: Galvanized steel of size and gauge required to provide tensile strength equal to that of the wire. Turnbuckle openings shall be at least three (3) inches.
 - 2. Safety Ribbon: Bright yellow ribbon securely fastened to all guying wires at least thirty six (36) inches above the ground. Yellow “EMCO” plastic guy guards #70-7y, covering 75% of guying wire obtained from Electrical materials company may be used.
- I. Guying Hose: Two-ply, reinforced garden hose not less than ½” inside diameter.
- J. Tree Wrap: Standard burlap tree wrapping, four (4) inch wide or standard waterproofed tree wrapping paper 2-1/2” wide, made of 2 layers of crepe Kraft paper weighing not less than 30 lbs. per ream.
- K. Twine: Two-ply jute material.
- L. Drainage Tile: ASTM F405 corrugated polyethylene drainage tubing, perforated.
- M. Drainage Fill: AASHTO M43 #6 (3/8” to 3/4”) clean uniformly graded stone or gravel.
- N. Sand: Coarse “torpedo” sand.
- O. Fertilizers:
 - 1. Bonemeal with an approximate analysis of 4% nitrogen, and 20% phosphorous.
 - 2. Commercial 10-10-10 fertilizer.

- P. Pesticides: Herbicides and insecticides registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3. - EXECUTION

3.01 Inspection

- A. Examine proposed planting areas and conditions of installation. Do not start planting work until unsatisfactory conditions are corrected.

3.02 Preparation

A. Time of planting:

1. Evergreen material: Plant evergreen materials between September 1 and November 1 or in Spring before new growth begins. If project requirements require planting at other times, plants shall be sprayed with anti-desiccant prior to planting operations.
2. Deciduous material: Plant deciduous materials in a dormant condition. If deciduous trees are planted in-leaf, they shall be sprayed with an anti-desiccant prior to planting operations.
3. Planting times other than those indicated must receive the University Representative's or Landscape Architect's approval prior to commencing work.

B. Spade-Cut Edging:

1. Separate mulched areas from turf areas with a 90-degree, 4 to 6 inch deep, spade-cut edge.

- C. Install plants using only experienced workmen familiar with planting procedures under the supervision of a qualified supervisor.

- D. Locate plants as indicated and approved in the field by the University's Representative or Landscape Architect. If obstruction are encountered that are not shown on the drawings, do not proceed with planting operations until alternate plant locations have been selected.

- E. Excavate or auger circular plant pits with tapered sides, except for plants specifically indicated to be planted in beds. Provide shrub pits at least 12" greater than the diameter of the root system and 24" greater for trees. Depth of pit shall accommodate the root system. Scarify the bottom of the pit to a depth of 4". Remove excavated materials from the site.

- F. **Set Backs:** Plant set-backs are to be of sufficient distance from edge of walks and pavements to allow for landscape maintenance, snow storage and removal and the prevention of damage from salt or other anti-ice applications. If any proposed plant location has an insufficient set-back, contact the University's Representative or Landscape Architect for relocation.

3.03 Installation

- A. Trees and Shrubs: Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
- B. The University's Representative or Landscape Architect will stake and space trees, shrubs, and vines as indicated on Drawings. If the Contractor stakes, sets out or spaces the plant material the University's Representative or Landscape Architect will approve final plant locations.
1. Dig or auger plant holes or pits large enough to allow spreading of roots.
 2. Set plant material in center of the planting pit to proper grade and alignment. **The top of the root ball shall be at the same elevation as the surrounding finish grade.** Allow for settlement. Set plants upright, plumb, and faced to give the best appearance or relationship to each other or adjacent structure. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break. No filling will be permitted around trunk or stems. Backfill the pit with topsoil or specified planting mixture in layers to eliminate voids and air pockets. Do not use frozen or muddy mixture for backfilling. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 3. All excavated material not used in the soil mixture as backfill or watering saucer shall be removed and legally disposed of off-site.
 4. Form a shallow ring shaped basin or saucer of soil around the edge of each planting pit to retain water during future watering's.
 5. All burlap, ropes and wires shall be removed from the sides and top of balls. No wire or wire baskets shall remain at the top 1/3 of the root ball after planting.
 6. Mix bonemeal or approved commercial fertilizer at 10 lbs. per cubic yard of backfill.
 7. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.
 8. The Contractor is responsible for stripping sod from proposed planting areas and leveling soil according to drawings and specifications.

9. Potted and Container-Grown Stock: Carefully remove root ball from container without damaging root ball or plant. Loosen root system gently and thoroughly in root balls that are bound solid.
 10. Water thoroughly after planting, taking care not to cover plant crowns with wet soil. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.
 11. All rhododendron and hydrangea species shall be backfilled with amended topsoil having an acidity range between 4.5 and 5.5.
- C. Groundcovers: Where groundcovers are specified on the plans, rototill entire plant bed to 6” depth using a mixture of 60% topsoil, 20% mushroom compost, 20% torpedo or coarse sand. Incorporate commercial 10-10-10 fertilizer into prepared soil mixture at an approximate rate of 1 lb. per square yard.
1. Space plants as specified. Fill entire bed to within 6” of edge.
 2. Apply commercial pre-emergent herbicide (Preen or equal) per manufacturer’s directions to entire groundcover bed before mulch is applied.
 3. Mulch with 2” of specified mulching material using care to keep foliage exposed.
- D. Mulching: Mulch tree and shrub planting pits, beds and areas indicated on the plans with required mulching material 3” deep immediately after planting. Thoroughly water mulched areas. After watering, rake mulch to provide a uniform finished surface.
1. Individual tree mulch rings shall be a minimum of 4’ radius from the tree trunk or 8’ diameter. The tree mulch ring edge shall be a uniform circular cut the full depth of sod. Refer to Mulch Ring Guide on drawings for exact mulch ring diameters.
- E. Wrapping: Inspect trees for injury to trunks, evidence of insect infestation, and improper pruning before wrapping.
- F. Guying: Guy all trees immediately after lawn seeding or sodding operations and prior to acceptance. When high winds or other conditions which may affect tree survival or appearance occur, the University’s Representative or Landscape Architect may require immediate guying.
1. Guy deciduous trees over 2” caliper and over. Guy evergreen trees 6’ tall and over. See planting detail for method.
- G. Pruning: Prune out dead branches, suckers, and crossing branches of deciduous stock, after planting. Remove or cut back broken, damaged, and unsymmetrical growth of new wood. Cut branches flush with the branch collar, at a point beyond a lateral shoot or bud a distance of not less than ½ the diameter of the supporting branch. Make cut on and angle.

1. Multiple leader plants: Do not remove multiple leaders unless directed by University's Representative or Landscape Architect. Preserve the leader which will best promote the symmetry of the plant.
 2. Prune trees and shrubs in accordance with standard horticultural practice to preserve the natural character of the plant.
 3. Evergreens: Prune evergreens only to remove broken or damaged branches.
 4. Flowering Trees: Prune flowering trees to remove dead and broken branches or branches that rub only.
 5. Pruning shall be done with clean, sharp tools.
 6. Do not apply pruning paint to wounds.
- H. Care of Existing Trees: Selectively prune existing trees in construction limits, under University Representative's or Landscape Architect's direction. Remove sucker shoots, dead, rubbing, and damaged branching.
1. Clean up miscellaneous organic debris within construction limits.
- I. Slow-release Watering Bag: Provide a minimum of one bag for each tree and fill with water. Use watering tanks or other form of watering system where hose bibs and hydrants are inoperable or inaccessible.
- J. Tree Relocation: Dig, ball and burlap, and move designated trees for relocation to the designated plant storage area for heeling-in of materials until final planting areas are prepared.
1. Maintain plants in storage areas by bracing plants in vertical position and setting balls in an enclosed berm of topsoil or bark. Water as required to maintain adequate root moisture.
 2. Re-burlap plant balls if required before final transplanting operations.
 3. Move to final locations shown on the drawings and plant in accordance with specified tree planting requirements.
- K. Weather Conditions: Planting shall be done under favorable weather conditions or as authorized by the University's Representative or Landscape Architect.

3.04 Maintenance

- A. Maintain plant material for a period of at least 30 days after all work in this section has been installed and prior to receiving final acceptance by the University's Representative or Landscape Architect. Continue the required maintenance in this section until all work in the entire project receives final acceptance by the University's Representative or Landscape Architect. If final plant installation is not complete by September 15 and final acceptance made before October 15, continue the required maintenance beyond the prescribed period until at least April 30 of the following year or until all work in the entire

project receives **written** final acceptance by the University's Representative or Landscape Architect.

- B. Maintenance shall include pruning, cultivating, weeding, watering, fertilizing, mulching, performing other operations as required to establish healthy, viable plantings and application of appropriate insecticides and fungicides necessary to maintain plants free of insects and disease.
 - 1. Reset settled plants to proper grade and vertical position. Restore plant saucer and adjacent material and remove dead material.
 - 2. Tighten and repair guy wires and stakes as required.
 - 3. Correct defective work as soon as possible after deficiencies become apparent and weather and season permit.
 - 4. Water trees, shrubs, and groundcover beds within the first 24 hours of initial planting, and not less than twice per week until final acceptance.
- C. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
- E. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with University's operations and others in proximity to the Work. Notify University before each application is performed.
- F. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- G. Provide maintenance by skilled employees of Landscape Contractor / Installer. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established.
- H. Where hose bibs or hydrants exists, the Contractor shall utilize the systems in the manner they were intended.
- I. Contractor shall water plant material from the point of installation, 30 days after and until final acceptance for the entire project. Watering shall take place so that no less than 1" of water is applied to each plant within any seven day period.

- J. Prior to final acceptance of the project, the Contractor shall inspect the plantings throughout the growing season and take necessary steps to control insect and blight attack. The Contractor shall also inspect the plantings after severe storm and exercise all corrective measures required to maintain finished quality appearance and good plant vigor.
 - K. Care shall be taken in watering plant material so as not to over water or in any way damage the plants. The Contractor is encouraged to monitor the soil moisture condition frequently and water when necessary to improve the percentage of plant survival. The University will take over watering of plant material if necessary following final acceptance.
- 3.05 Acceptance
- A. Planted areas will be inspected during and upon completion of installation and accepted subject to compliance with specified materials and installation requirements
 - 1. Planted areas will be accepted provided all requirements, including maintenance, have been complied with and plant materials are alive and in a healthy, vigorous condition.
- 3.06 Cleaning
- A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris, and equipment. Repair damage resulting from planting operations.

End of Division 32 9310

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**

March 2014, rev 00

General Guidelines

A) General

1) Definitions

- a. The University: Northern Illinois University; NIU.
- b. Prime Professional (s): Architects and Engineers and Contractors.
- c. EHS: NIU Environmental Health and Safety department.

B) Construction Standards

- 1) The Northern Illinois University (NIU) Design and Construction Standards (hereinafter referred to as the Standards) should serve as a guide to all Prime Professionals retained by the University to plan, design and construct new campus buildings, or the major renovation of existing buildings and site work. These Standards are effective as of the date updated and noted at the upper left of each document, but are subject to change at any time.
- 2) These Standards are available on the University's website at: www.niu.edu/aes/resources/standards
- 3) These Standards are obviously not intended to be an exhaustive set of basic instructions on good practice for design and construction of University buildings. The Standards are, however, intended to be a set of instructions to those concerned, to convey the particular needs and policies of this University with regard to development and uniformity of its physical facilities.
- 4) The University, through its design review procedures, comments and recommendations, does not release or alleviate the Prime Professional from his/her responsibility and legal liability relating to equipment, materials, code compliance, serviceability of systems, capacity, Guide compliance, budget, site observation of the work in progress, system operation, shop drawing review, contract document interpretation, schedule, errors, omissions and/or all other non-delegable duties and obligations as a professional.
- 5) Because of the monumental scope of the subject of design and construction standards, these documents will be continually expanded and revised to record more detail or to document changing needs to maintain its continued relevance.
- 6) Prime Professionals are free to propose variations that meet or exceed the Standard, provided that the variations are brought to the attention of the University's Representative, **in writing**, for review prior to incorporation into the project and at the appropriate stages of design and prior to their implementation.

- 7) If you have questions about these standards please contact the University's Architectural/Engineering Services Department

C) Prime Professional's Responsibilities

- 1) The University's Architectural/Engineering Services Department will be the liaison between the University and the Prime Professional throughout the planning, design and construction.
- 2) After reviewing the architectural program, it is expected that the Prime Professional; will visit the campus along with its sub-consultants to become familiar with existing site and/or building conditions, and discuss the overall project with University officials. The University will make available existing site survey information for utilities and general topography, as well as any existing building information that is at hand. The Prime Professional shall be responsible for verifying existing site and building conditions or providing new survey information if required. Renovations or work in existing structures will require a detailed review of available contract documents, field measurements to verify the accuracy of previous as-built documents, and the review of structural constraints. The Prime Professional shall discuss with the University such items as utilities, long-range planning and information which relates to the approach toward construction on the University campus.
- 3) Relationships with the press and publicity agencies regarding progress reports and graphic representations of the building shall not be the prerogative of the Prime Professional. The University will release any and all such pertinent information.

D) Scheduling

- 1) Work on any construction project must accommodate the University's calendar of classes and special events. The Prime Professional must communicate with NIU Architectural/Engineering Services Department to identify specific requirements for timing of the construction work to be included in the construction documents. University classes and special events may limit normal working hours by the contractor. Specific requirements for time frames or staging of the construction must be reviewed in detail with the University and outlined in detail in the construction documents.

E) Documentation

- 1) Construction documents shall clearly note provisions for future needs. Expansion capabilities such as empty conduits, extra electrical capacity, oversized structural components, etc., shall be indicated on applicable drawings for future identification and implementation.

F) Model Building Code Requirements

- 1) Buildings and structures are to be designed and constructed to conform to applicable model building codes and standards as adopted and codified by the State of Illinois Capital Development Board (CDB) (Public Act 096-0704). Such codes include but may not be limited to:
 - NFPA 101, Life Safety Code and associated references;
 - International Building Code (2006 or later editions edition);
 - International Existing Building Code (2006 or later editions);
 - International Property Maintenance Code (2006 or later editions edition);
 - National Electric Code (NFPA 70) (2008 or later editions);
 - Illinois Plumbing Code;
 - Energy Conservation Code;
 - Illinois Accessibility Code.

Please note: Northern Illinois University reserves the right to that request the Prime Professional use a more current edition of the codes listed above as long as it is at least as stringent as the codified edition as it serves in the best interest of the project. Prime Professionals are directed to use the most current edition of the code especially in circumstances in which there is no specific edition listed in section F)1).

- 2) Northern Illinois University also reserves the right to require that codes not otherwise listed in section F)1) be referenced and used as necessary on campus construction and renovation projects. Other applicable codes such as the International Mechanical Code, consensus standards (e.g. NFPA, ASNI, ASME, ASHRAE, ASTM, etc.) and industry best practices may be applicable to the project being considered.
- 3) Projects involving site work shall be designed to adhere to the Illinois Environmental Protection Agency's National Pollutant Discharge Elimination System (NPDES), the Environmental Barriers Act, and other state/federal environmental rules and regulations where applicable.
- 4) Sanitary sewer and domestic water work shall conform to the standards of the Dekalb Sanitary District.
- 5) The Prime Professional should direct all model building code inquiries to Architectural and Engineering Services.
- 6) The Prime Professional should direct all fire and life safety code inquiries to the Environmental Health and Safety (EHS) Department.

G) Code Analysis and Plans Review Process

- 1) It shall be the responsibility of the Prime Professional to maintain the integrity of the codes which are in force at the time of contracting for their services. The Prime Professional shall provide information on the final drawings which will indicate the group and type of occupancy, type of construction, rated corridors, rated shaft

- enclosures, occupancy separations, area separation wall(s) fire rating and opening protection, designated exterior exits, units of egress and occupancy load. Additionally, the Prime Professional shall show the total gross square footage of each level in the facility and the occupancy of each room.
- 2) The Prime Professional shall submit drawings and project specifications to Architectural/Engineering Services Department and the EHS Department to initiate the plans review process. The Prime Professional is required to incorporate comments generated during the plans review process into the bid set. Regardless of the findings from the plans review process, the Prime Professional assumes and maintains responsibility for ensuring the bid set of drawings complies with all applicable model building codes as noted in section A of this document. Should there be a difference in code interpretation between the Prime Professional and the University; the EHS Department reserves the right to issue the final interpretation as it relates to matters pertaining to applicable fire and life safety codes. Should there be a difference in code interpretation between the Prime Professional and the University, the Architectural/Engineering Services Department reserves the right to issue the final interpretation as it relates to matters pertaining to all other model building codes.
 - 3) Should fire protection and detection systems be installed, the Prime Professional shall ensure the contractor(s) submit shop drawings to Architectural/Engineering Services Department and the EHS Department for final review and approval.

H) Construction Oversight and Acceptance Testing

- 1) The Prime Professional is responsible to perform regularly scheduled job site inspections to ensure the contractors are executing the work in accordance with provisions outlined in the drawings and project specifications. The EHS Department and Architectural/Engineering Services Department will also perform frequent inspections in a quality control capacity to support the Prime Professional. Please note code violations identified during site visits shall be promptly addressed by the Prime Professional. This may result in a temporary stoppage of the project until such violations are abated. The EHS Department and Architectural/Engineering Services Department will issue a final interpretation in accordance with provisions outlined in section G)2) of this document to resolve any discrepancies.
- 2) Once the work is complete, the Prime Professional will notify the EHS Department and Architectural/Engineering Services Department at least five (5) days in advance to initiate the acceptance test for all fire and life safety systems (e.g. sprinkler systems, standpipe systems, fire pumps, fire alarm systems, special hazard suppression systems, emergency lighting, exit signs, and area of rescue assistance systems) and other mechanical, electrical, plumbing, and heating, ventilating and air conditioning systems. Other NIU Departments involved in this process may include the Heating Plant and Electrical Shop.

- 3) According to the State of Illinois Capital Development Board (Public Act 096-0704) newly constructed commercial buildings must pass an inspection conducted by an inspector meeting the qualifications established by CDB. This may also include existing buildings which are being substantially renovated (e.g. greater than 50% of the building will be subject to renovation) Therefore, the Prime Professional is responsible for identifying and retaining qualified inspectors to perform this service.
- 4) The Prime Professional is responsible for obtaining, organizing and issuing final acceptance test documentation to Architectural/Engineering Services Department and the EHS Department.

I) Site Safety

- 1) Contractors are expected to become familiar with the Contractor's Safety Handbook, found at: www.niu.edu/aes/resources/standards.

J) Material Selections

- 1) Appropriations for state building projects are funded with a certain degree of finality. It is expected that new facilities will not have need for major repairs or modifications for a considerable period of time. This concern should be reflected in the selection of interior and exterior materials that require a minimal amount of maintenance. Maintenance shall be a prime consideration in the selection of all finishes. Buildings should include technological progress only where there is a proven performance history.
- 2) Lecture halls, classrooms, seminar rooms, and rooms requiring privacy will need special acoustical treatment.
- 3) The University maintains an inventory of repair parts which requires a certain amount of product standardization. See individual technical sections of the Design and Construction Standards for standard product requirements. The University's Architectural/Engineering Services Department will provide additional information on product standardization.
- 4) Hazardous Materials:
 - a. Special care and attention must be given to hazardous materials. The Prime Professional must contact the Office of Architectural/Engineering Services regarding identification of suspect hazardous materials such as asbestos, lead, chemical, or radioactive materials. The University's Architectural/Engineering Services Department has on-call consultants to perform hazardous materials surveys and write abatement specifications. These consultants will be assigned the project and shall be used for such work.
 - b. Abatement, containment or handling procedures will be prescribed by the qualified/certified consultant and if required, the same consultant will provide monitoring, testing and final clearance verification. These services are a part of

the project budget and are accounted for in the Total Project Budget. All projects shall include hazardous material surveys as part of the construction documents. This shall be true whether the test results are positive or negative.

K) Classroom/Lecture Room Facilities

- 1) Effective classroom design depends on attention to detail as well as to a clear understanding of overall objectives. An understanding of the design factors that affect auditory and visual performance can result in effective classrooms.
- 2) Sound Reinforcement:
 - a. Special attention should be considered in classrooms which require sound-reinforcement systems. These audio/visual systems should be coordinated with the NIU Media Services. All sound reinforcement shall comply with ADAAG Guidelines. Certain room surfaces must be hard and properly angled to provide required reflections. Other room finishes must be soft in order to prevent late reflections or delayed rear wall reflections.

L) Support Spaces

- 1) Audio Visual:
 - a. Any building with classrooms shall provide an audio-visual storage closet. . The closet shall have a 36" door that opens out into a corridor.
 - b. Large lecture rooms may have requirements for audio-visual control rooms to project and coordinate A/V systems. Careful consideration for access wiring, data connections, projection screens, lecterns, and other equipment must be reviewed with the NIU Media Services, to ensure maximum flexibility of these spaces.
- 2) Mechanical/Electrical Rooms:
 - a. Mechanical room doors should open directly to the outside of buildings where practical. The Prime Professional shall incorporate knockout panels and or louvers to facilitate replacement of large items of mechanical equipment.
 - b. Electrical distribution shall be provided within mechanical rooms or in dedicated electrical equipment closets accessible to corridors or other public space. Equipment closets should be stacked vertically where possible.
 - c. Provide adequate working clearances in accordance with the National Electric Code.
- 3) Custodial Closets:
 - a. Custodial closets shall be located on each level with no dimension less than 4 ft. The sink shall be floor-mounted and located near a door. Shelves shall accommodate supplies in case lots and allow for storage of liquids in 5-or 6-gallon containers. Include a slot for a six-foot ladder. Specify hangers for wet mops over the sink and for dry mops and brooms on other walls. Walls shall have a special coating to protect from moisture and physical abuse. Doors shall be 36" wide and open out.

- 4) I.T. Equipment Rooms:
 - a. I.T. equipment rooms should be stacked vertically where possible. The minimum dimensions should be coordinated with the University's IT department. Doors shall be a minimum of 36" wide.
 - b. I.T. equipment room design must meet NIU HVAC standards.
- 5) Toilet Rooms:
 - a. Toilet rooms should be given particular attention to ensure that sight lines are controlled. Hardware and separator panels (preferably solid composition) must be of durable construction. Soap dispensers, towel dispensers and disposers and mirrors should be specified in the contract documents. All toilet room finishes shall include ceramic floor tile and full-height ceramic wall tiles. Urinals and water closets should be wall mounted. Pipe chases serving toilets and other wet areas must be no less than 24" wide and preferably 36".

M) Standard Office Configuration

- 1) Offices 150 sq. ft. or greater shall have the following:
 - a. A light switch or occupancy sensor immediately to the inside of all exit door openings. (Required by code)
 - b. A minimum of one electrical outlet on each of the four walls where possible or as determined by the planning process.
 - c. Outlets spaced no more than 12 feet apart on any single wall or as determined by the planning process.
 - d. Two data ports on opposite walls on all new construction and renovation.
 - e. All outlets should be installed at a minimum of 15 inches AFF to be ADA compliant.
- 2) Offices less than 150 sq. ft. shall have the following:
 - a. A light switch or occupancy sensor immediately to the inside of all exit door openings. (Required by code)
 - b. One electrical outlet on each of four walls.
 - c. Two data ports on opposite walls on all new construction and renovation.

N) Standard Laboratory configuration

- 1) All laboratories where hazardous materials are used or where there is a potential for use of hazardous materials, shall have:
 - a. Emergency Showers/Eyewash stations installed. These shall be units with emergency shower, eyewash in combination. Floor drains below the shower/eyewash station shall not be installed.
 - b. Fume Hoods
 - c. Sink for hand washing near the exit door
 - d. Biosafety cabinets if appropriate
 - e. Bench tops impervious to chemicals
 - f. Flooring material that is impervious to chemicals. Rugs, carpet is not acceptable.

- g. Furniture that is covered with non-porous material that can be easily cleaned and disinfected
- h. Windows that open and are fitted with screens
- i. Self-closing doors

O) Room Numbering

- 1) A room numbering system has been established by the University to assure that the numbering of spaces in a building will facilitate management control, be consistent from building to building, and guide people to their destinations. The Prime Professional shall submit drawings to the University's Architectural/Engineering Services Department for room numbering prior to commencing with construction documents. The room and door numbers identified on the construction documents are the same as the numbers used in the building upon completion of the project.

P) Signage

- 1) All interior signage shall comply with NIU Campus Interior Signage Specifications. Contact the NIU Space Administrator.
- 2) All exterior campus signage other than temporary shall meet all requirements such as size, location and set-back of NIU. Exterior fixed signage other than directional or building identification shall be approved by the University's Architectural/Engineering Services Department.

End of General Guidelines

**This section of the NIU Design Requirements establishes minimum requirements only.
It should not be used as a complete specification.**