



# Carleton College Design and Construction Standards

Revised June 2019



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# **1. INTRODUCTION**

## **Introduction**

Carleton College Design Standards have been developed to assist and guide the design and construction professionals in the design of quality building projects throughout campus. The objective is to create successful partnerships that will result in new and remodeled facilities incorporating a high degree of aesthetic appeal, while still realizing the more practical goals of reduced maintenance, lowered energy usage, and extended durability.

## **Variance Process**

**Compliance with Carleton's Construction Standards is mandatory for all projects.** However, situations will occur that allow for a variance from the Standards. In order to apply for a variance, designers must submit, in writing, a full description of the requested variance accompanied by detailed drawings. All requests are to be processed by the Facilities Office, with final written approval coming from the Project Manager. The designer is to allow 10 business days for the approval process. Any Design Standard variance that is implemented in a building without proper approval will be corrected at the expense of the responsible design professional.

## **Communication**

The Facilities Office handles all communication related to construction projects for Carleton College. Questions/concerns are to be directed to the designated Owner's Representative (OR)/Project Manager (PM) for the project.

## **College Personnel Policies**

Carleton College expects that students, faculty, staff, consultants, contractors, and others are to be treated with mutual courtesy and consideration. College policy prohibits sexual harassment and sexual assault. Disrespectful, demeaning, or harassing behavior toward any person will not be tolerated, and the offending party will be removed from the project.

## **Project Team**

All design and construction team members are subject to approval by Carleton College. The College reserves the right to at any time request substitutions to personnel within the project team, consultants and/or subcontractors.

## **Building Access**

Access to buildings on campus will be granted with the permission of the Maintenance Office. They can be reached at: (507) 222-4133. Campus keys and pass cards can be checked out from 8:00 am –4:30 pm Monday through Friday. Keys and pass cards are to be returned every day unless the Maintenance Office has granted permission to keep them overnight. Lost or damaged keys will be charged to the responsible party. Lost keys carry a minimum charge of \$200.00 plus any additional labor and material required to rekey the associated locks and distribute new keys to Carleton staff. Keys will only be checked out to the prime contractor's supervisory personnel. Keys and lock box access may not be given to subcontractors or suppliers without written approval from the Carleton Project Manager.

**Mileage Reimbursement**

If mileage is part of the contract, it will be paid at the IRS mileage rate.

## **2. CONTRACTOR REQUIREMENTS**

### **Project Startup**

All construction, remodeling, or contracted maintenance projects will begin with a pre-construction meeting. The purposes of the meeting will be to review the scope of work, schedules, including daily start time, site safety, storage, access, site logistics, and special conditions. At or before this meeting, the Contractor is required to provide for review and approval by the Carleton Project Manager a master project schedule, a project team roster with emergency contact information, a safety plan, an indoor air quality plan<sup>1</sup>, an erosion and sedimentation control plan<sup>2</sup> (if applicable), a waste / recycling plan and a written logistics plan showing parking, staging areas, building access, crane or other large equipment locations, etc. Attendance at the pre-construction meeting is required for primary contractor(s) and subcontractor(s), architect(s), engineer(s), and Carleton College Representative(s). The meeting is to be scheduled with the Carleton Representative.

Note: Work will not be permitted to begin until the Facilities Office receives a current Certificate of Insurance. In some cases, a Performance Bond may be required.

### **Construction Meetings**

For projects greater than \$100,000 – and as needed on smaller projects - the Contractor shall lead a weekly Owner/Architect/Contractor (OAC) meeting including updated copies of the following materials: meeting minutes, action / open items, master schedule, two-week look-ahead schedule, RFI log, change order log.

### **Scheduling**

The project schedule is subject to adjustment by College personnel if the activities interfere with the academic calendar. The contractor is to coordinate with the Facilities Office to ensure that the critical functions of the campus are not interrupted. The contractor must work with the PM/OR to **eliminate** all disruptions to the campus.

### **Pre-Installation Meetings**

Carleton College encourages pre-installation meetings for all major constructions activities and building systems as follows. Contractors are to submit a schedule of all preconstruction meetings to the Carleton Project Manager prior to start of construction:

- Cast in Place Concrete
- Unit Masonry Assemblies
- Fluid Applied Waterproofing
- Vapor Retarder
- Roofing
- Sheet Metal Flashing
- Windows

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<sup>1</sup> Indoor air quality management plan must meet or exceed all applicable recommended control measures of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAC Guidelines for Occupied Buildings Under construction, 2<sup>nd</sup> edition, 2007, ANSI/SMACNA 008-2008, Chapter 3)

<sup>2</sup> Erosion and sedimentation control plan must conform to the requirements of the 2012 U.S. Environmental Protection Agency (EPA) Construction General Permit (CGP) or local equivalent, whichever is more stringent.

- Joint Sealants
- Elevator and Elevator Door Smoke Containment System (if applicable)
- Door Hardware
- Access Control Hardware/ Security Systems
- Painting and Flooring
- Fire Sprinkler
- Ductwork
- Temperature Controls
- IT/ Telecom

#### **Use of Carleton Equipment Prohibited**

Contractors are strictly prohibited from using Carleton equipment, lifts, and ladders. Contractors and their subcontractors / suppliers must make their own arrangements for all loading and unloading of materials and equipment.

#### **Material Storage and Staging**

Carleton College has limited space for storage/staging of construction materials. The contractor should plan to store and stage all materials within the designated work area. This includes all material, job trailers, storage trailers, dumpsters, equipment/machinery, etc. Every project requires that a complete staging plan be provided by the contractor, and approved by the College's PM/OR. There will be situations where alternate storage/staging on campus is necessary. These specific cases must be approved by the Facilities Office. Landscape disturbed by outdoor staging areas must be restored per Section 10 of this document.

#### **Changes**

The Contractor must provide a written request for any changes in the project schedule, scope, cost, or variances to requirements of this document. Written approval must be received from the Carleton Project Manager before commencing any work related to the change.

The maximum total allowable markup on change orders is 10% profit and over-head to the contractor on self-performed work. The general contractor may not add more than 5% to subcontractors' proposals. No markups are allowed on the cost of bonds and permits.

#### **Parking**

Parking on campus is limited and by permit only. At the same time, parking on city streets can also be undesirable depending on the duration of the project. Contractors must provide a parking plan in advance of project start for review and approval by the Carleton Project Manager. Anyone violating the agreed upon parking policy will be ticketed and towed at the owner's expense, and/or removed from the project.

#### **Site Requirements**

The contractor shall procure and post all necessary permits and licenses required for performance of the work. The contractor is responsible for scheduling all inspections.

In accordance with the Minnesota Clean Indoor Air Act, smoking is only allowed in designated areas on campus. Smoking is strictly prohibited within any building, at **any** point during construction, regardless if it is remodeling or new construction.

**The general contractor must have at least one qualified supervisor on site any time subcontractors are present and performing work. Any exceptions must be preapproved by the Carleton Project Manager.**

Vehicles are not to be driven or parked on sidewalks, lawns, or playing fields. Some exceptions will apply, but must be approved by the Carleton Project Manager. Similarly, the contractor will not impede normal use of traffic areas such as streets, sidewalks, corridors, fire lanes, loading docks, entrances, etc.

Trees, shrubs, landscape features, sidewalks, curbs, etc. are to be protected from damage by fencing or other approved methods. Contractors are encouraged to photo document the “before” condition to confirm whether damage was caused by construction activity. Any damage to the above areas will be repaired at the contractor’s expense per Section 11 of this document.

If the contractor causes any damage to the work, adjacent work, or to the College’s property, the contractor shall remedy the damage at no additional cost to the College.

Work areas are to be kept neat and free of trash and debris. The contractor is responsible for removing all construction materials at the end of the project. Interior spaces are to have a final construction clean. If the contractor fails to keep the site clean either during the work or at project completion, the College may do so at the cost of the contractor. The construction schedule must allow minimum one week at the end of the construction project for final cleaning by Carleton custodial personnel.

Waste and recycling material is to be properly disposed of in containers provided by the contractor. There is no disposal on Carleton property or in Carleton dumpsters or trash cans except as approved by the Facilities Office. Contractor is to comply with all College and local recycling requirements.

Whenever possible, demolition contractors should track and report to the Carleton Project Manager, total construction waste and amount of waste diverted to recycling or salvage for reuse (by weight or volume). Load receipts and recycling reports should be provided to the College for reporting purposes. Carleton strives to meet LEED targets of minimum 75% construction waste diversion.

The contractor is responsible for protecting occupied areas from construction dust. This includes, but is not limited to, the following: HVAC return air openings, electric motors, smoke alarms, etc. Use of Carleton’s HVAC equipment to vent or exhaust construction work areas is prohibited with exception of testing purposes.

Contractors will not alter College electrical utilities for the purpose of operating power equipment. Only College electrical personnel shall make necessary alterations. Contractors will not alter or modify any College utilities.

The College may perform work related to temporary utility connections. Contractor must coordinate with PM and/or Carleton staff to decide the best approach for each project.

Contractors may use College restrooms if approved by the Carleton Project Manager.

Foul language is not permitted. All contractors are responsible for the behavior of their employees, subcontractors and suppliers. Respectful decorum should be adhered to at all times.

Appropriate clothing is to be worn at all times. Specifically, shirts with sleeves must be worn at all times. Workers are not to change out of their work clothes on campus property, including parking lots. A \$500 fine will be levied for each violation.

Radios are permitted by approval from the Carleton Project Manager, and only in areas that will not cause a distraction to adjacent buildings, offices, classrooms, etc. Earplugs for personal audio devices (as opposed to safety) are not permitted.

### **Safety and Security**

The Contractor is responsible for the safety of all employees and subcontractors and will comply with all laws, rules, and regulations of duly constituted authorities having jurisdiction. The contractor will be charged \$1,000 (per day if applicable) for every safety or security violation.

Safety fencing, barricades, project signage, and other necessary safety devices will be supplied and maintained by the contractor.

Prior to the commencement of a project, the contractor must submit a copy of their ongoing safety program to the Carleton Project Manager.

Carleton College assumes no liability for material or equipment that is stored on site. The contractor is responsible for securing their own equipment.

The contractor is responsible for compliance with the Minnesota Employee Right-To-Know Act.

On all projects where scaffold is being erected, the contractor is responsible to ensure that all scaffold set-ups over one section high are **tagged and certified** by a trained, certified professional. Scaffold is to be erected only by a reputable and experienced scaffold erection company.

No welding, cutting, or soldering is to be performed in or on any building until they have received approval from the Facilities Office. The contractor will coordinate with College personnel to properly deactivate and reactivate any fire alarms, devices, sprinklers, etc. and maintain a fire watch during such activities.

If any suspected asbestos-containing materials are identified, the contractor is to notify the Carleton Project Manager, and the College will perform the necessary testing.

The contractor must provide a list of emergency phone numbers for all primary contractors and subcontractors.

Compliance with Carleton's Confined Space Entry Program, Lockout/Tagout Program, and all College safety programs is required.

Carleton College prohibits anyone from carrying or possessing any firearms on campus. Violation of this policy will result in immediate termination of all related contracts.

Personal protective equipment (PPE) including safety glasses, hardhats and high visibility vests are required on all projects.

Use of Carleton aerial lift equipment and ladders is strictly prohibited. The contractor is responsible for renting lift equipment and demarking work zones when in use.



### **Project Clean-up**

The contractor is responsible to broom-clean any areas affected by the project, including area in/around/adjacent to the work. This includes removal of all excess materials, waste materials, dust, debris, etc. that is a result of the completed work.

### **Project Close-out**

- Regardless of the project size, the contractor is responsible to inform the project manager or owner's representative when the work is complete and organize a walk-through of the completed work. A punch list will be produced with the contractor being responsible for the repair of all noted deficiencies.
- Warranties will all be a minimum of one year from the date of Substantial Completion, unless otherwise noted in the specifications.
- Attic stock – 5% overage, unless otherwise indicated, will be required for finish materials such as carpet, ceramic tile, vinyl tile, specialty trim, shingles, clay tiles, ceiling tiles, etc.
- Operation and Maintenance Manuals – Carleton requires one (1) digital copy and one (1) bound (three ring binder) copy that includes, but is not limited to, the following: all necessary repair and/or replacement information, a telephone list of appropriate personnel for contractors and subcontractors who are responsible for warranty work.
- The contractor is responsible for training College personnel on all mechanical or electrical equipment after installation is complete.
- As built drawings as described above
- Construction waste total (by weight or by volume) and amount (by weight or by volume) diverted to recycling or salvage/ reuse.

### **Record Documents**

The College requires that electronic and hard copies of **as-built drawings** be submitted at the completion of each project along with electronic and hard copies of the Operations and Maintenance manuals. "Redlined" contractor plans will not be accepted as the final as-built, but must be scanned and submitted to Carleton in a digital (.pdf) format. The designer is required to obtain redlined drawings from the contractor and incorporate them into the original drawings. Electronic drawings are to be supplied to the College in a compatible AutoCAD format. Contact Facilities Office at (507) 222-4101 for version that is currently in use. Final payment will not be issued until record documents are received.

### 3. DESIGN GUIDELINES

The design guidelines are structured in a hierarchy of three categories moving from the least restrictive guidelines for the Perimeter Zone of campus, becoming more explicit in the Collar Zone surrounding the historic core, and stipulating the highest degree of regulation in the historic Central Zone of campus. Each more restrictive zone incorporates its own requirements in addition to, and superseding those of each less restrictive zone before it. The figure on the following page indicates the outer boundary of each design zone.

**Perimeter Zone**, applicable to all buildings on campus

**Collar Zone**, applicable to all buildings within the collar and central zones

**Central Zone**, applicable to all buildings within the historic campus core



## **Siting**

### **A. Sustainability**

#### **Solar Access (Perimeter)**

The siting of new buildings should not significantly obstruct the solar access of existing buildings. Shading analysis should be conducted to verify that proposed designs will not unduly reduce existing structures' access to daylight.

#### **Storm Water Generation (Perimeter)**

New buildings should be sited so as to minimize the total storm water runoff produced on campus. Strategies include siting new buildings on areas of existing hardscape or the sites of existing buildings, rather than on green-field sites.

#### **Erosion (Perimeter)**

Sites for new buildings should be chosen with regard to the local topography, soil conditions, and existing vegetation so as to reduce the potential for increased erosion, particularly in areas of steep topography.

#### **Orientation (Perimeter)**

Where the existing campus context allows, new building sites should allow for buildings to be elongated along an east-west axis. This orientation maximizes the potential for passive solar heating, shading, daylighting, and reduces the potential for glare and overheating associated with glazing on large east and west facing facades.

### **B. Circulation**

#### **Existing Networks (Perimeter)**

New buildings should provide a direct, accessible connection to the pedestrian and bicycle circulation network of the campus. Accessible means of circulation should be created connecting existing pedestrian and bicycle paths with the main and secondary entrances of all new buildings.

#### **Obstructions (Perimeter)**

The siting of new buildings should not obstruct an existing pedestrian route on campus. If such a conflict arises, the design of the building should respond by incorporating that path within the building, and making the path's continuation readily apparent from the exterior.

### **C. Service**

#### **Pedestrian Circulation (Perimeter)**

Buildings should be sited such that access for service vehicles and deliveries does not obstruct major pedestrian circulation routes.

#### **View of Primary Façade (Perimeter)**

Buildings should be sited such that service entries and yards are not visible from major public campus spaces.

#### D. Infrastructure

##### **Proximity and Access (Perimeter)**

Sites that provide ready and efficient access to existing campus infrastructure with the required capacity to support the new facility should be prioritized over those where major infrastructure resources would need to be increased or extended.

#### E. Proximity & Relationship to Other Buildings

##### **Separation (Perimeter)**

All components of new buildings shall maintain a minimum of 30' of separation from existing structures, unless the new building is to attach directly to the existing structure. Where buildings are to be attached, efforts should be made to connect the internal circulation of the existing and new component buildings on all possible levels. Solid party walls should be avoided wherever possible.

##### **Obstruction (Perimeter)**

Placement of new buildings should not obstruct the view or direct pathway from a major outdoor public space to a primary entry of an existing building.

#### F. Exterior Spaces

##### **Public Space or Quad (Collar)**

Each new building should be sited such that it reinforces an existing exterior public space or defines a new outdoor space to be further defined by future buildings. The siting of new buildings should not deteriorate or otherwise diminish the quality of existing formal public spaces on campus.

##### **Orthogonal Siting (Collar)**

New buildings should be cited orthogonally to the cardinal directions aligning with existing neighboring buildings.

##### **View Corridors (Central)**

New buildings should not obstruct any major view corridor.

#### **Form and Massing**

##### A. Façade

##### **Articulation (Perimeter)**

Large façades of buildings should be broken up by setbacks and changes in form, depth or material to create a composition of smaller masses.

##### **Depth (Central)**

Depth or perceived thickness of the façade should be emphasized to convey the massive character of load bearing exterior walls. This is in keeping with the actual load bearing masonry wall construction of the historic buildings on campus. Materials that convey great mass, such as stone or brick, should be chosen for these locations.

### **Ground Plane Intersection (Perimeter)**

Particular attention should be paid to the way the building's exterior meets the ground plane. With historic buildings appropriate effect is often achieved through battered foundations, or a transition from brick to stone at the ground plane interface. In modern buildings, effort should be made to create a deliberate transition from building façade to ground through the use of cantilever, wall material change, flashing detail, ground material change or intentional landscape elements.

## **B. Fenestration & Glazing**

### **Glazed Area (Central)**

In general, fenestration should appear as punched windows through a massive, exterior bearing wall. Entire façades of curtain wall glazing are inappropriate to the historic context of the central campus. However, selected areas of curtain wall glazing may be used where transparency and visual connection between interior and exterior spaces is desired.

In all cases, glazing shall be designed to maximize the opportunity for bringing natural daylight into spaces.

### **Glazed Area (Perimeter)**

Punched windows and areas of curtain wall glazing may be used where appropriate to support the level of transparency and visual connection between interior and exterior desired.

In all cases, glazing shall be designed to maximize the opportunity for bringing natural daylight into spaces.

### **Operability (Perimeter)**

Wherever possible, windows or sub-components of glazing shall be operable to facilitate natural ventilation and occupant comfort.

### **Shading (Perimeter)**

Wherever possible, window shading should be designed as a permanent, exterior element incorporated with the overall design intent of the building. Possible exterior shading devices include overhangs, louvers, light shelves, deciduous and coniferous trees. Exterior shading is preferable to interior shading as it prevents both visible light and solar heat gain from entering the space.

### **Glazing (Perimeter)**

In all cases, glass should be clear and un-tinted to match the appearance of the glazing in existing campus buildings.

Low-e glass should be used in all exterior glazing applications, with the exception of south facing façades of buildings designed specifically for passive solar heating in winter. There, clear glass with no low-e coating may be specified. Such buildings require specific shading and energy analysis to confirm the effectiveness of the passive systems.

Where budget and energy analysis justify triple glazing, argon filled units, multiple low-e coatings, and other energy saving glazing strategies should be analyzed and implemented.

#### **Window Dormers (Perimeter)**

Where new or existing buildings with pitched roofs will incorporate fenestration into occupied areas above the eaves, window dormers should be designed in keeping with their use elsewhere on campus.

### **C. Entries**

#### **Building Massing (Perimeter)**

The massing of buildings should respond to and signify the main entry. Massing should create a human-scale entry to the building that feels both comfortable and inviting to occupants.

#### **Shelter (Perimeter)**

Main entries to buildings should be sheltered from the elements through the use of porticos, overhangs, vestibules, or recesses in the building form, or any combination thereof.

#### **Circulation (Perimeter)**

All main and secondary entries to buildings shall be fully accessible without the use of a lift, elevator, or other assisting device. Where ground floor entries are above grade, ramps shall be integrated into the overall design of the building and entry area.

Bicycle parking and locking areas should be provided in close proximity to the main entry of each building. Such areas should be designed to respond to the building design in material and scale.

#### **Orientation (Central)**

The main entries of buildings should face directly onto the bald spot.

#### **Orientation (Perimeter)**

The main entries of buildings should face directly onto the public space they form, onto a major route of pedestrian circulation, or onto a smaller public space or forecourt that connects to the larger network of campus spaces and pedestrian circulation.

#### **Doors (Perimeter)**

All campus buildings shall have wood doors at their primary entrance.

### **D. Roofs**

#### **Equipment (Collar)**

Rooftop building equipment—air handling units, cooling towers, exhaust stacks, and similar—shall be designed into the overall architecture of the building so as to be screened from view at ground level. Such equipment may be contained within

structures of material and design consistent with the building as a whole or screened by pitched portions of roof. Such equipment may not be screened by materials inconsistent with the overall design of the building. Stacks, which may protrude vertically and remain visible, must be arranged and designed in a way fitting with the overall architecture of the building, and should be clustered together rather than dispersed.

**Equipment (Perimeter)**

Rooftop building equipment—air handling units, cooling towers, exhaust stacks, and similar—shall be screened from view if not incorporated into the architecture of the building.

**E. Height**

**Academic Buildings (Perimeter)**

Academic buildings shall be limited in height to three occupied stories above grade.

**Residential Buildings (Perimeter)**

Residential buildings shall be limited in height to five occupied stories above grade.

**Rooftop Equipment (Perimeter)**

Structures or screens housing rooftop equipment may exceed the roof height, but should be set back from the primary building facades.

**F. Articulation**

**Scale (Perimeter)**

For large buildings—those exceeding 60 feet in depth—the overall building mass should be articulated to break up the large form into smaller masses. Sub-masses should be limited to roughly 60 feet in depth and no single façade should exceed 100 feet in length without a major scale-reducing articulation.

**Shape (Perimeter)**

Where large building footprints are necessary, alternate building shapes should be explored to minimize the mass and scale of a single building, and to maximize the surface area for daylighting and views. Possibilities include courtyards and light wells, and the use of L-shaped, U-Shaped, and H-Shaped floor plates.

**G. Architectural Expression**

**Architectural Design (Perimeter)**

Architectural design should be appropriately responsive to surrounding buildings in material, scale, and massing. Individual designs shall be reviewed by the appropriate college committee to determine their compliance with this statement.

**All-Gender Restrooms**

Carleton College is committed to meeting the accessibility needs of faculty, staff, and students. Incorporating all-gender, family accessible restrooms is desired in new

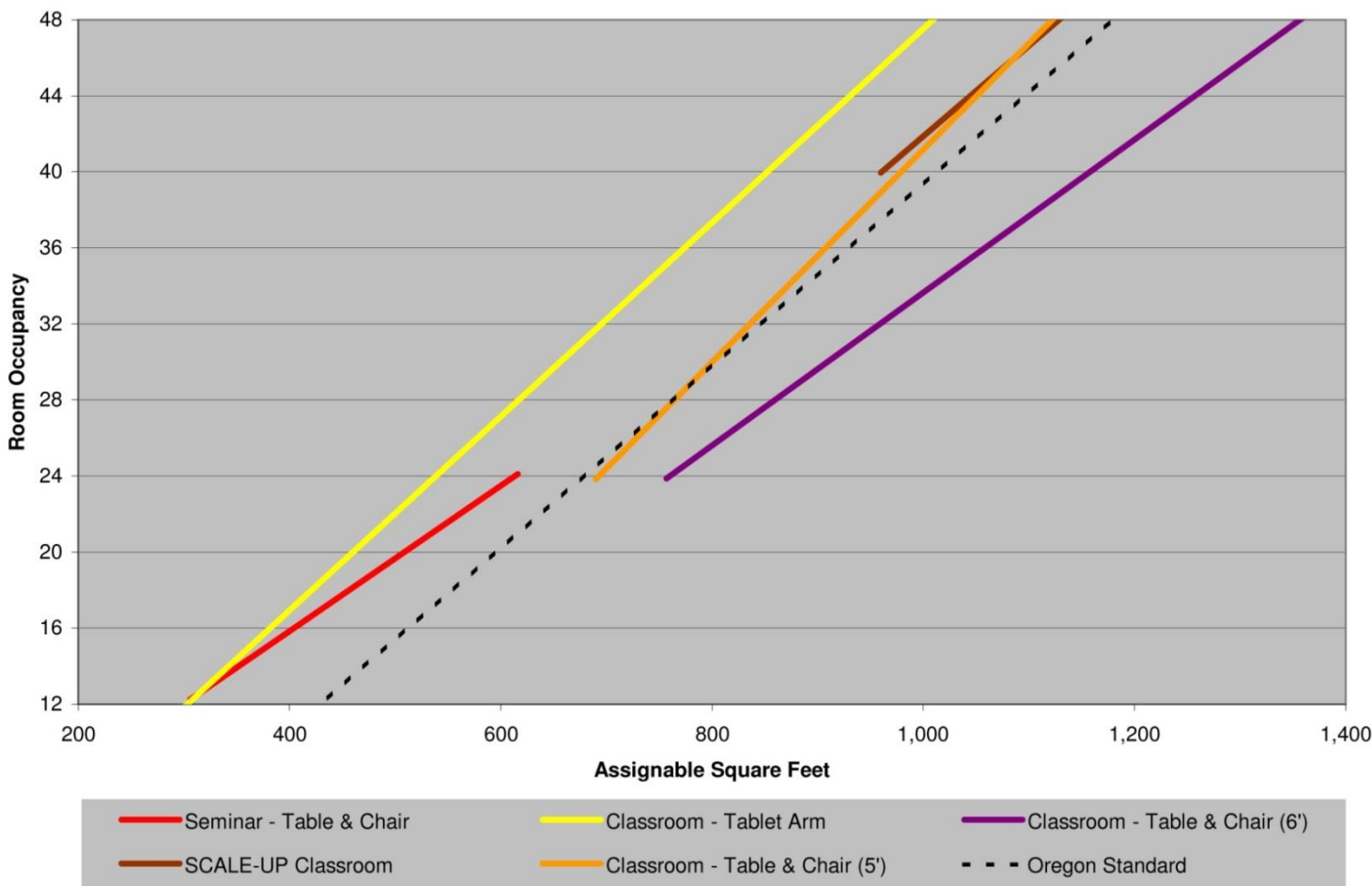
construction as allowed by building code, especially in buildings over 25,000 square feet that support frequent campus uses by many constituents. To the extent possible, consideration should be given to develop all-gender restrooms in remodel projects where space is available.

**Classroom Design**

Faculty are increasingly utilizing new teaching methods which have less lecture in front of the room and greater emphasis on interactive and group work. These teaching styles require greater flexibility within the room to rearrange furniture for small and large group discussions.

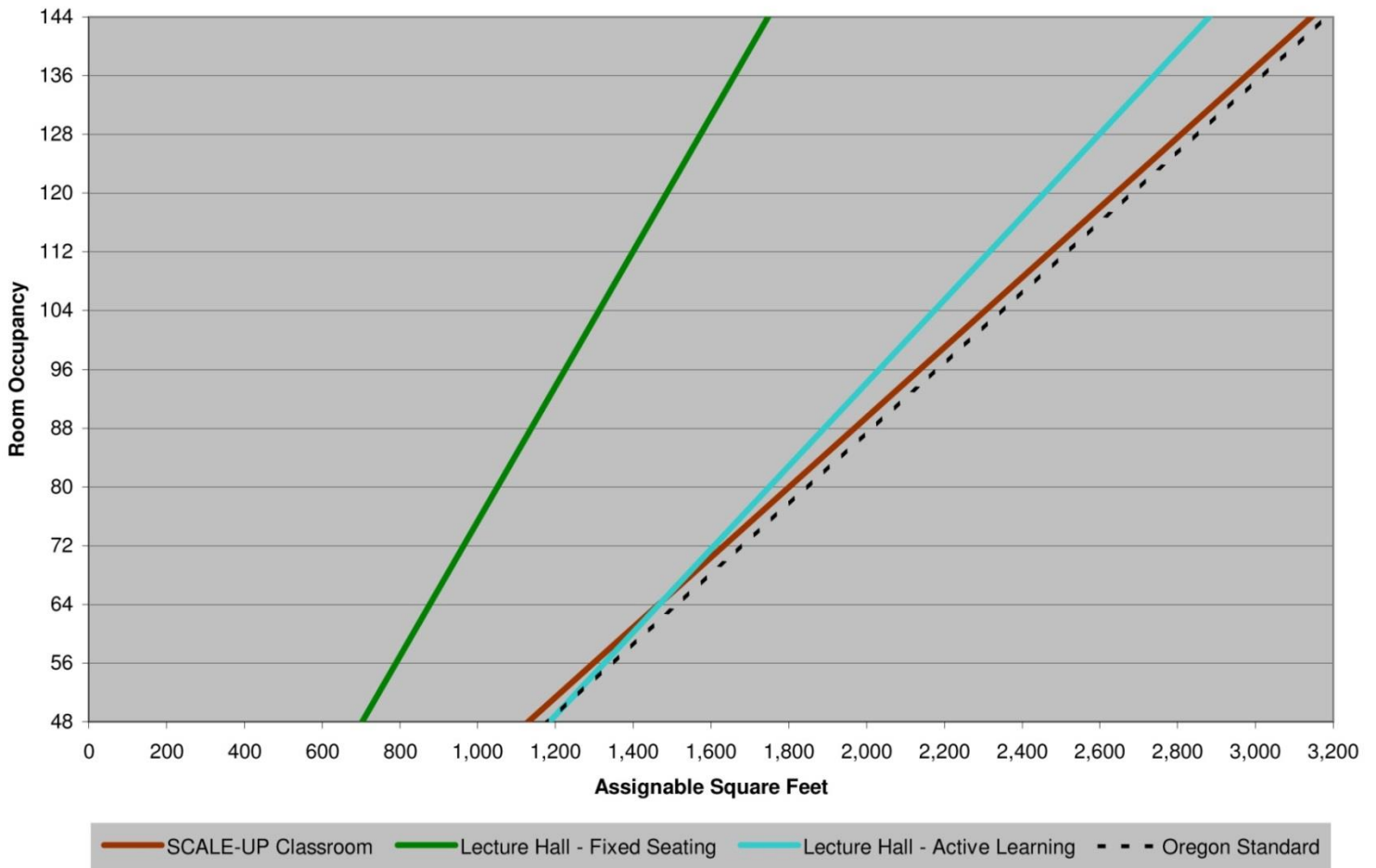
The College has adopted “Classmate” to determine the appropriate relationship between room size and seating capacity for large, medium, and small classrooms by different type of classroom use as shown in the graphs below:

**ClassMate - Small and Midsize Classroom Space Planning Standards**





































### ClassMate - Large Classroom Space Planning Standards



Acceptable sample classroom layouts sorted by classroom size and type are identified in the ideal matrix as shown in graph below:

	12 Stations	16 Stations	24 Stations	32 Stations	40 Stations	48 Stations	72 Stations	96 Stations	144 Stations
Type 1: Seminar Room									
Type 2: Tablet Arm Classroom									
Type 3: Table/Chair Classroom (5' Tables)									
Type 4: Table/Chair Classroom (6' Tables)									
Type 5: Tiered Fixed-Seat Lecture									
Type 6: Tiered Active Learning Lecture									
Type 7: SCALE-UP Active Learning									

As a best practice, the proportion of a classroom should not exceed a length to width ratio of 1.5 to 1.

## **4. SUSTAINABILITY**

### **Sustainability**

Carleton College has a strong commitment to sustainability and sustainable building practices. The design goal for new construction will be determined on a project-by-project basis. It is possible that LEED certification or prescribed energy goals may be pursued on some projects, but regardless the design should still adhere to current best practices for sustainable design and construction. In alignment with the goals of Carleton's Climate Action Plan, all new construction, major renovation and building system replacement will adhere to the following set of guiding principles:

- Utilize sustainable design and construction practices for all new construction and major renovation projects with consideration given to applicable evaluation systems (LEED, Labs 21, Living Building Challenge, etc.)
- Design to LEED silver level as a minimum and score project with appropriate paperwork
- Calculate and minimize the impact of any new construction or major renovation project on Carleton's greenhouse gas emissions (MTCDE) and energy use intensity (kbtu/sf)
- Enforce efficient space utilization principles that plan for future growth while avoiding excessive or inefficient use of space
- Maximize energy and water efficiency
- Continue to expand and improve energy and water metering and control systems
- Utilize existing, and prepare for emerging / future, state-of-the art sustainable building system and renewable energy technologies
- Maintain dense clusters of buildings to minimize sprawl and loss of open space
- Orient and mass buildings in a way that optimizes the thermal performance and day-lighting capabilities of building envelopes
- Emphasize and enhance pedestrian and bike friendly circulation paths
- Minimize waste in building demolition, construction, maintenance and occupant activities
- Maximize areas of landscape that increase plant/animal biodiversity and habitat while decreasing use of fuel, fertilizers and pesticides for maintenance
- Maximize – to a goal of 100% - the amount of campus storm water quality and quantity managed on campus
- Manage design and cost decisions with a long-term perspective using life cycle analyses
- Prioritize use of local materials to support the local economy and celebrate Carleton's sense of place

### **Sustainable Design & Construction Targets**

Furthermore, all new construction and major renovations at Carleton will strive to meet the following sustainable design and construction targets:

1. **Net zero increase** to Carleton's carbon footprint and campus energy use intensity (EUI = kbtu/sf). This goal can be accomplished by building net zero energy new space, off-setting new space with removal or renovation of existing space, installation of renewable energy resources at other locations on campus and/or purchase of renewable energy credits (RECs) and carbon offsets.
2. New construction and major renovation projects will strive to meet the **Architecture 2030 Challenge** ([architecture2030.org](http://architecture2030.org)) or **Minnesota B3 SB 2030 Energy Standard** (<http://www.b3mn.org/2030energystandard/>). The following targets can be achieved by implementing aggressive sustainable design strategies, generating on-site renewable power and/or purchasing renewable energy (maximum 20%):
  - starting now, buildings will be 60% below energy consumption standards for buildings of similar type and function
  - by 2015, 70% below standard
  - by 2020, 80% below standard
  - by 2025, 90% below standard
  - by 2030, carbon neutral

## 5. BUILDING ENVELOPE

### Design Intent

Carleton's building envelope standards have been put in place so that the design team professionals hired to provide plans and specifications are informed as to the minimum level of design required by the College. Compliance with the Carleton Construction Standards is mandatory for all designers contracted by the College. These standards are not intended to limit design expressions or material selections, but rather guide designers in ways to expedite project completion within acceptable College Standards.

### General

- Carleton College will provide a third-party consultant to perform GSA testing on the building envelope.
- A third party building envelope review is required as part of design development.
- Designer must consider product compatibility when selecting exterior envelope products.  
Example: fluid applied waterproofing and sealants.

### Maintenance of Masonry

To ensure the longevity and performance of the masonry assemblies, proper materials and procedures are critically important in maintaining existing masonry, particularly on historic buildings. Re-pointing and re-construction of damaged or deteriorated masonry often are necessary on the same wall assembly. Stone, brick, and mortar are to closely match the existing in size, shape, texture, and color. Samples of stone, brick, and mortar options are to be provided and approved by Carleton prior to ordering materials.

- A. Re-construction of damaged portions of existing walls
  1. It is preferred to utilize as much of the original materials as is practical when maintaining existing masonry assemblies.
  2. It is preferred to patch small areas of damages or deteriorated stone rather than complete replacement of the stone when practical. Use Jahn Restoration Mortars for patching stone. Prepare samples for approval that are properly aged to match the color, shape, and texture of the adjacent stone surfaces.
  3. Damaged or deteriorated masonry units that need replacement are to be cut from the masonry assembly with care in a manner to prevent damage to any adjacent remaining materials. A dust control vacuum system is required while cutting joints.
  4. The structure is to be supported as necessary in advance of removing masonry units.
  5. Loose or unsound materials in the adjoining masonry are to be removed.
  6. New masonry units are to be set in full bed of mortar, with full head joints, uniformly jointed with other work.
  7. Mortar mix is to be colored and proportioned to match existing work. The physical properties of the new mortar must match the original mortar (note that the existing mortar may not be the original mortar). When in doubt, use Type O mortar.
  8. Anchors are correctly located and built in to the existing wall.
  9. Install built in masonry work to match and align with existing, with joints and coursing true and level, faces plumb and in line. Build in all openings, accessories and fittings.

10. If an entire masonry assembly is to be re-constructed, use materials to match the original construction for the entire thickness of the masonry assembly.

**B. Re-pointing**

1. Mortar in joints is to be cut to minimum 3/4 inch depth or until sound mortar is reached.
2. Power tools can be used only after test cuts determine that no damage to masonry units will result. A dust control vacuum system is REQUIRED while cutting joints. Cutting and dust collection procedures will be approved by Carleton prior to starting work.
3. Do not damage masonry units.
4. Dust and loose material are to be removed from the joints by brushing. Joints are to be pre-moistened before applying mortar. Packed Mortar tightly in maximum 1/4 inch layers and a smooth, compact concave joint tooled to match existing.
5. Mortar should be moist cure for 72 hours.

**C. Cleaning**

1. Clean excess mortar, smears, and droppings as work proceeds and upon completion.
2. Stains, efflorescence, or other mortar excess are to be removed and washed with the gentlest means possible. High pressure water and harsh chemicals are not allowed. Submit cleaning materials and procedures to Carleton for approval prior to beginning the work.
3. Protect adjacent surfaces and landscaping when cleaning masonry.

**Waterproofing**

**A. Structures**

1. Carleton College requires the use of fluid applied reinforced waterproofing on all foundation walls, tunnels, plazas or any other sub grade structure. This product is to be used in conjunction with a protection board, composite drainage sheet and rigid insulation.
2. Fluid applied waterproofing is to extend above finish grade on foundations, and tie to above grade wall weather barrier to create a complete system.
3. This waterproofing system is to be installed per the manufacturer's instructions.
4. Prefer American Hydrotech (MM6125, 215 mils) or equivalent for the basis of design.
5. The use of drain tiles is required around all underground structures.
6. All underground slab/wall connections require a waterstop. A bentonite waterstop at the floor is preferred.
7. Required details-penetrations, cove and termination at footings, tying together of the slab waterproofing and the walls.

**B. Tunnels and Plazas**

1. The roofs to all tunnels and plazas are to be sloped to allow for drainage. Minimum pitch is  $>1/4''/\text{ft}$ .
2. Roofs are to have dual level, directional drainage.
3. Waterproofing applied to roofs is to wrap over the edge by no less than 12" and overlap with any wall waterproofing.
4. Drainage mat and protection board are required.
5. Required details-Drains showing installation of grate and cover and how access will be gained for cleaning
6. Backfill with free draining materials that would allow water to get to the drain tile.

**C. Penetrations**

1. Below grade penetrations for piping, conduit, etc. are to have individual sleeves for each pipe. Link-Seal modular seals, or equivalent, are to be used to seal these penetrations.
2. Any and all exterior penetrations shall have a seal at the weather barrier and the exterior finish. These shall be with a properly designed joint allowing installation of a backer rod and sealant.

**D. Mechanical room floors, showers and other wet spaces above occupied spaces shall be waterproofed.**

**Flashing**

- All through wall flashing at the base of the building shall exhaust water above grade.
- Copper or stainless steel are the preferred flashing materials.
- Copper composite flashing is acceptable, but must be used in conjunction with compatible metal drip edge which is exposed to allow for future maintenance.
- Self-adhering flashing is acceptable, but must be used in conjunction with metal drip edge.
- All flashing is to daylight, and form a drip.
- Any lapping of flashing material is to be bonded or caulked, as required by the manufacturer.
- End dams are to be used at all terminations of horizontal flashings. If end dams are used at the brick control joints, a secondary flashing below the two end dams shall be installed to capture and discharge water.
- All exterior wall systems at some point in their life cycle will leak. Wall designs shall incorporate a "second line of defense" against water and moisture infiltration. Redundancy in flashing details is encouraged.
- Pan flashings are required at all window and door openings, as required by the building code, as a minimum, but it is preferred that the pan flashings discharge their water to the building exterior, not just to the weather barrier, as permitted in the building code.
- Through wall flashing is required above all parapet walls and free standing walls. Any stone or brick caps at roof edges or wall construction, regardless of whether they are attached to a building or not, shall have a through wall flashing below the caps to capture and prevent water from getting into the wall cavity. Design the flashing so that water will have a path to drain from the wall either with suitable mortar beds or with rope weeps. Do not seal the flashing with caulking.
- A good source of flashing documentation is available from the Minnesota Lath and Plaster Bureau.

- Through-wall flashing shall extend at least 8-inches above all embedded metal (lintels, spandrels, etc.) within the back-up wall.
- Required details-flashings at all window heads and sills, door heads and sills, wall openings, louvers, roof, parapet, and free standing walls.

## **Windows/Doors**

### **A. Windows**

1. Installation of windows and windows systems must comply with specified performance criteria for air infiltration and water resistance.
2. The cavity wall around all window openings requires an air stop.
3. Drip caps with an upward bend on each end are to be used at all windows. Sealant is to be applied under drip cap.
4. Interior wall returns are not to cover window frame.
5. Double glazed low e glass shall be used as a minimum.
6. Minimum Condensate Resistance Factor shall be determined by the designer for each window location.
7. Metal clad wood windows and vinyl windows are to be installed as one window system. This system is to include, but not be limited to:
  - A separate auxiliary drip cap flashing at all window heads.
  - Sill flashing that is extended to inside face of wall, but not to create a thermal bridge
  - A connection of sill flashing to the weather barrier, as required by the building code.
8. The design of any large panes of exterior glass should consider strategies to reduce bird collisions.

### **B. Storefronts**

1. Storefronts are to be no higher than one story. Anything taller than one story is to be a curtain wall.
2. Any exterior storefront is to have drains, or weep holes, located at the bottom of the frame.
3. Show locations of accessible controls, including accessories such as posts and buttons.
4. Do not cover the sills or sides with interior wall finished that would reduce the amount of heat access available to the window system, to aid in reducing condensation.

## **Vapor Barrier**

- Designer is to show enlarged details at 3" = 1'- 0" for the connections on the roof and vapor barrier. Enlarged details shall also be provided clearly indicating the scope of work required at all termination points, including but not limited to: windows, louvers, doors, roofs, waterproofing, and expansion joints within the back-up wall. This detail needs to clearly show the vapor barrier being continuous, and tied to the code required air barrier system
- All vapor barriers are to be fire retardant.
- It is required that the insulation be installed outboard of the vapor barrier. It is desired that the insulation in the wall system be installed outboard of the Air and Vapor



barriers. This will leave the wall cavities available for mechanical and electrical installation without the penetration of the air or vapor barrier.

- Designer must take special care to address vapor issues under any concrete slab. Stego Wrap 10 mil minimum or equal must be used and installed per manufacturer requirements with all joints and penetrations sealed.
- Vapor barriers shall be installed over a manufacturer approved substrate. Vapor barriers typically cannot span over unsupported regions.

## **Walls**

- A. To eliminate potential problems of complexity, constructability, and excessive cost, all architectural features containing curves and non-right angles planes shall be fully evaluated by the designer and isometric drawings will be required to show functional relationship and interaction of various elements including but not limited to the following: flashings, venting, expansion, etc.
- B. Exterior wall construction detailing shall be designed to prevent condensation caused by cold surfaces in contact with conditioned interior air.
- C. Curtain Walls
  - 1. Curtain walls are to have drains located at the bottom of each panel to allow for proper drainage.
  - 2. Metal framing buried in the wall system or covered with spandrel section of the wall shall have insulation and vapor barrier covering the framing to the same level of insulation as the rest of the wall.
- D. Masonry walls
  - 1. Carleton College requires the use of a Mortar Net, or equal, product in all masonry wall cavities. The through-wall flashing shall extend vertically above the Mortar Net.
  - 2. Mortar is to be mixed using Portland cement and lime, not masonry cement.
  - 3. All lintels used in masonry openings are to be hot dipped galvanized steel, as required by the building code
  - 4. All brick ties are to be stainless steel or hot dipped galvanized steel with adjustable eye and pintle. Use of corrugated brick ties is not permitted.
  - 5. Continuously flashed cavity wall construction is required; below all windows and curtain wall sills, on walls located above adjoining roofs, and at ground level.
  - 6. Back-Up Wall: It is encouraged to utilize back-up walls consisting of masonry or concrete masonry units (CMUs) for all exterior brick walls. If metal or wood back-up walls are designed, accommodation for differential movement between the structural frame, wall in-fills and cladding should be addressed as part of the design.
  - 7. Cavity walls shall have a minimum of 2-inches of air space between insulation and back side of brick masonry.
  - 8. Consider brick growth when designing exterior walls and include location of all control/expansion joints on architectural/structural drawings.
  - 9. As a minimum, the design shall comply with recommendations of the "Brick Institute of America" (BIA).

10. The design of masonry cavity walls should incorporate weeps consisting of double back cotton ropes with a minimum spacing of 18". Rope weeps are to be installed horizontally within the cavity space on top of the installed flashing. Overlap the rope weeps a minimum of 3" within the cavity. Plastic weeps tubes are not acceptable. The use of joint vents is encouraged for ventilation of the cavity space.

**E. Metal Wall Panels**

1. Anodized metal wall panels are not permitted.
2. Any wall construction using metal wall panels must allow for product expansion.
3. It is assumed that metal wall panels will leak, so they must be designed to allow for water to exit the wall space by the installation of a weather resistive barrier and weep system.
4. Flashing assemblies around openings (windows, doors, louvers, etc.) and above parapets, roofs and grade shall be waterproofed to the weather resistant barrier and not to the exterior of the wall panel.

**F. Insulation**

- All insulation used at Carleton College is to be free of formaldehyde. In all possible locations, alternatives to fiberglass are to be used.
- Insulation is to be continuous. Gaps or shorts in insulation are not permitted.
- Designer shall specify insulation by type, manufacturer, stating performance characteristics of density, aged average R-value per inch, flame spread and fire rating, etc.

**G. Exterior Insulation Finishing Systems**

- Use of Exterior Insulation Finishing Systems (EIFS) is prohibited.

**Roofing**

The roofing material is to be determined on a project to project basis. Final roofing materials must be approved by Carleton personnel. All roofs are to be protected until completion of the project. Roof inspections are to be performed by qualified, third party, consultants during the installation process, and manufacturer representatives upon completion of the roof. Attic stock for all shingles, clay tiles, etc. to be determined by Project Manager.

**A. Steep-Sloped Roofs**

1. Steep sloped roofs are any roof with a pitch of 4/12 or greater. Steep sloped roofing material (metal, shingles, etc.) with a pitch less than 4/12 are not permitted.
2. The use of gutters and scuppers is to be minimized.
3. Any gutter system that is installed must include expansion joints.
4. Carleton College prefers the use of smooth surfaced ice and water shield. Use of mineral coated material is not permitted, as it does not seal as well as other sheet goods.
5. Composite shingles are to be fiberglass with a "lifetime" year warranty. Installation is to be consistent with manufacturer recommendations.
6. Only high wind asphalt shingles are permitted.
7. Nailing is the only accepted fastening process for asphalt shingles. Stapling will not be allowed.

8. Standing seam copper roofs are to be a 20 oz. minimum. Design for movement joints and all lower-sloped accessories and flashings joints shall be locked and soldered. Indicate procedures and minimum qualifications for all soldering within the specifications.
9. Copper roofing is to be installed per CDA regulations.
10. Any other metal roof should be installed according to the standard SMACNA details if there are no other specific details available from the material manufacturer.
11. Clay tile roofs are to be interlocking style Grade 1 with less than 1% moisture absorption. Copper annular threaded nails are to be used when fastening tile to roof sheathing.
12. Scale roofing details a minimum of 3"=1'-0". Details shall accurately show all system components and different flashing conditions. Critical details include but are not limited to the following:
  - a. Raked roof edge intersection with side wall.
  - b. Showing separation of finish from roof and how the wall structure is supported and flashed.
  - c. Fascia soffit edge details
  - d. Penetration details-show each different type
  - e. Spot locations of roof overflow discharge so it does not impact pedestrian walkway. Do not discharge any roof water onto the public sidewalk (per building code).
13. Pitched Roof Material (Perimeter)
  - a. Where pitched roofs will be incorporated in the design of a new structure, such roofs shall use either tile or slate as the primary roofing material. In keeping with the existing pitched-roof buildings on campus, pitched roofs should not have a significant overhang at the eaves.

## B. Low-Sloped Roofs

1. General
  - a. Carleton College overwhelmingly supports the use of petroleum-based built-up roofing systems on low-sloped roofs. Single-Ply roofs are only to be used on a limited basis with approval from the College.
  - b. A 3-5 year contractor's labor and material warranty for roofing and sheet metal along with 20-year manufacturer's total system warranty package is to be provided for all applicable roofs.
  - c. Installation of equipment on a flat roof is to be avoided. Minimize placement of roof penetrations, conduits, gas lines, and etc. which travel on the roof.
  - d. Roof access should be incorporated into the design to allow roof maintenance.
  - e. Base flashing and perimeter flashings shall have a minimum of 12-inches base flashing height. In all areas a minimum of 12" of "freeboard" shall be provided between the top of the roof membrane and edges of roof, equipment, pitch pockets etc. to allow for working room during initial installation and repairs.
  - f. Pitch pans are not permitted; pourable sealer pockets with rain collars can be used, if necessary.

- g. Utilize non-treated plywood and wood blocking in the design when in contact with the membrane or base flashing. The use of fire-treated wood blocking/plywood is typically not an acceptable substrate for most roofing systems.
  - h. Optimize roof drainage and placement of roof penetrations to allow water to flow in valley lines without obstructions.
  - i. As a minimum, roof design shall at least meet all requirements of the energy/building codes, roof system manufacturer and National Roofing Contractors Association's requirements and recommendations.
  - j. Roof safety anchors meeting OSHA requirements for fall protection are to be included on all roof designs.
  - k. Roof plan shall include, but not be limited to the following:
    - i. Accurately show the taper layout for drainage areas. Show all valley lines, ridges, crickets, and slopes on the roof plan.
    - ii. Roof plan shall indicate starting thickness of insulation at drains/scuppers and at high points. The tapered insulation layout shall be designed so that the averaged-aged R-Value meets the minimum thermal resistance requirements of the building code.
    - iii. Roof plan shall show all roof penetrations including location of all expansion and control joints.
2. Scale roofing details a minimum of 3"=1'-0". Details shall accurately show all system components and different flashing conditions. Critical details include but are not limited to the following:
    - a. Coping intersection sidewall
    - b. Kick out flashing areas on steep roofs
    - c. Typical Coping
    - d. Sidewall to roof intersection showing overlap of weather barrier and roof and ability to reroof in the future.
  3. Roof edge design shall incorporate details on how the membrane will be reroofed in the future without the removal of exterior finish.
  4. Majority of roof leaks occur at intersections between the roof, wall flashings, penetrations and parapets which typically are not covered by the roof system manufacturer in their warranty. Accurately detail, provide isometric drawings as required, to show connection between materials installed by different trades.
  5. It is recommended that window, door, and louvers be designed to be a minimum of 24-inches above the finished roof system.
  6. Roof Slope/Drainage
    - a. All roofs shall be sloped to provide positive drainage; any ponding on low-sloped roofs is not permitted. Low-Sloped roofs shall have a maximum slope of 2" per foot sloping to drains/scuppers. Low-Sloped roofs shall have a minimum of ¼" per foot on new construction and minimum of 1/8" per foot on existing roofs.
    - b. Roof slope design utilizing 45 degree insulation valley lines are preferred. (4-Way Slope). In instances where 2-way slopes are approved by the college, a general rule of thumb for designing sufficiently sloping saddles and crickets is

that they be twice the slope of the adjacent field of the roof. NRCA suggest length-to-width ratio for saddles and crickets is 2.5:1 up to 3.5:1.

- c. All roof drains shall have a minimum drain sump: 4-feet by 4-feet.
- d. Internal roof drains are the preferred method to shed water from a flat roof. The use of scuppers should be minimized if possible.
- e. A secondary roof (overflow) drainage system is required by building code. Internal roof drains are preferred method to accommodate secondary (overflow) drainage. The use of overflow scuppers should be minimized if possible. Secondary drains/scuppers are to purge over non-pedestrian areas.
- f. Interior roof drains should be sized to accommodate half of the vertical wall that is adjacent to the drain.
- g. Crickets/saddles shall be installed behind all roof top equipment.

#### 7. Roof Related Sheet Metal

- a. Roof related sheet metal is typically not covered under roof system warranty, therefore, detail and specify sheet metal joints to overlap in a shingle fashion in the direction of water flow/drainage. Do not rely on sealant as primary mean of waterproofing.
- b. Detail and specify sheet metal in accordance with all building codes (ANSI/SPRI ES-1 standards), insurance requirements (example: Factory Mutual), and industry standards (SMACNA, CDA, NRCA, etc.). It is not acceptable to only indicate that the contractor install sheet metal in accordance with SMACNA or FM. Designer shall specifically detail and/or specify gauge, profile, lapping, joinery, type of metal, anchoring system, etc. of all sheet metal components.
- c. All flashings that are embedded in the roof membrane (example: pipe flashings) shall be either copper, stainless steel, galvanized (painted) with all seams and joints soldered.
- d. Sheet metal cap flashings (copings) are encouraged to be used for waterproofing on top of parapet walls to minimize maintenance. If cap flashings other than sheet metal are designed, a redundant through wall flashing system must be installed below the coping. Detail drawings that no fasteners penetrate the top horizontal surfaces.
- e. Sealant shall not be used as primary waterproofing for any sheet metal joinery.
- f. Specify and detail the isolation of dissimilar metals.
- g. Self-adhering membrane or EPDM shall be installed below all cap flashings. Self-adhering membrane or EPDM under cap flashing is to extend over the top of the parapet and extend down a minimum of 2" on the exterior finish to positively seal out water that might get behind the cap flashing.
- h. The use of gravel stops is not permitted.

#### 8. Built-Up Bituminous Roofing

- a. A hot applied system is preferred, but may not be suitable at some locations due to the fumes that are emitted during application. In these select cases, cold applied systems are accepted. Consult with College personnel to determine the proper roof system for each project. All built-up systems are to be no less than 4 plies of fiberglass felts installed in a continuous shingle sequence. Specify that no phase construction is allowed.

- b. SBS Modified Bitumen systems are to be used on buildings where low sloped roofs drain over slate or tile roof areas into gutters.

9. Single Ply Roofing

- a. If a single-ply roof system is approved for use, it is to be a fully adhered system over a manufacturer approved cover board over (typically high density polyisocyanurate or Dense Deck) and polyisocyanurate insulation board, 20 psi minimum. Mechanically fastened or ballasted systems are not allowed.
- b. The insulation is part of the roofing system and is to be covered by the roofing warranty.
- c. The minimum acceptable warranty for a single-ply roof system is a 20-year total system warranty.
- d. Carlisle, Firestone, GAF, Johns Manville, and Sika Sarnafil are the preferred manufacturers.
- e. Membrane flashings are to be used where horizontal roof surfaces intersect with vertical surfaces (parapets, curbs, etc.).
- f. Service pads and walkways shall be provided from the roof access to all equipment.

C. Roof Fall Protection

- 1. The preferred supplier and method for Fall Protection Safety systems is Super Anchor Safety, model CRA Commercial Roof Anchor <http://www.superanchor.com/index.php>. All installation should will be per manufacturer's recommendations with the cable attachments as supplied by Super Anchor Safety. All system components must be of the same manufacturer and tested per manufacturer's specifications when completed. Required testing reports should be submitted to Carleton College upon their completion.

**Fire and Smoke Protection**

A. Fire and Smoke Protection

- 1. Carleton College requires the use of single component silicon fire-stop sealant or putty in the following locations:
  - All penetrations subject to movement.
  - Control joints of fire rated assemblies.
  - The top of fire rated walls.
  - Voids between slab edges and curtain wall construction.
  - Larger openings at areas such as cable trays or space for future penetrations shall use the intumescent pillows or UL approved assembly for sealing penetrations.
- 2. Carleton College requires the use of cementitious fire-stopping mortars in the following locations:
  - Non-moving penetrations
  - Flute spaces of metal deck above beam flanges, masonry wall tops, partition tracks, etc.

B. Sealants

- 1. Sealant joints shall be sized appropriately as part of the design phase. It shall not be the contractor's responsibility to calculate range of expected movements.

2. Carleton requires that exterior joints be sealed with a two-part polyurethane sealant, and interior joints be sealed by a paintable one-part acrylic latex sealant.
3. Silicone materials may be used in the fabrication and installation of the aluminum storefront and curtain walls. The window system shall incorporate a flange or added edge surface on the throat of aluminum window sections to allow the installation and retention of backer rod and sealants.
4. Horizontal joint for both interior and exterior surfaces are to be one-part, pouring grade, polyurethane sealant.
5. Sealants are never to be used as the only waterproofing method. Redundancy in the systems shall be designed to prevent the unwanted entry of water WHEN the exterior sealants fail.
6. Minimize the use of fillet joints
7. Backer rod needs to be compatible with caulk (i.e. closed cell, open cell, hybrid).
8. At the completion of the project a testing lab shall conduct probe testing, or hand pull tab testing of the caulked joints to verify proper adhesive and cohesive bond and cross section.
9. Critical details:
  - expansion joints
  - joints around windows
  - floor level expansion joints
  - joints in plaza surfaces where there are occupied areas below

## **6. MECHANICAL SYSTEMS**

### **Design Intent**

Carleton's Mechanical standards have been put in place so that the design team professionals hired to provide plans and specifications are informed as to the level of design required by the College. Compliance with the Carleton Construction Standards is mandatory for all designers contracted by the College. These standards are not intended to limit design expressions or material selections, but rather guide designers in ways to expedite project completion within acceptable College standards.

### **Mechanical**

#### **A. Energy Management and Temperature Control Design Standards**

##### **1. General**

- Carleton's College Facilities Department maintains a single control center for the monitoring and control of the majority of campus building mechanical heating and cooling systems.
- The Energy Management System (EMS) must be Automated Logic or Siemens back net/IP, and it must include the most recent software available at project completion.
- Carleton College has a standard naming convention for BAS points that must be used on all projects. The policy will be provided on necessary projects.
- All new systems will operate on the campus network.
- All freeze stats will be hard-wired to motor control devices for automatic shut-down.
- Proper flushing of utilities is required before any final utility tie-in is coordinated with College personnel.
- Please reference associated document for information of Carleton's Standard for sequence of operation.

##### **2. Thermostats/ Temperature Sensors**

- Student residences will be supplied with a room sensor that allows a 5° differential from the global set point.
- Each residential, office and classroom will have a separate sensor and VAV installed for independent control. No averaging of temperature across rooms will be allowed.
- Temperature adjustment is to be controlled at the central plant.
- Labs and offices are to be equipped with a system override that allows the system to be turned on for a pre-determined amount of time. The override will be activated by an occupancy sensor or an override button on the room sensor. Carleton College will choose the option based on the project. The College will determine the allowable time for the override. Sensors to be chosen by the Facilities department specific to the project.

##### **3. Sensors**

- Flush mounted sensors need to include a label indicating what they are, and that they are to remain free of any obstructions.
- Sensors are to be electronic.
- Thermistors are permitted for use in select locations, but they must be commissioned. They are not permitted as space sensors.



- All sensors are to be commissioned.
- A CT or differential pressure is to be used for notification that a pump is running.

#### B. Mechanical Room Requirements

1. Penthouses and other mechanical spaces are to be accessible by a 4' wide stair or elevator. Ladders or hatchways are not acceptable.
2. Doors to mechanical spaces will be a minimum of 3'- 6" wide, but a 6'-0" opening is preferred.
3. Room must be sized to allow a minimum of 2'-6" working space all the way around the equipment.
4. The working space on the front of the air handlers is to be determined by the size of the coil. Must allow 1.5 times the coil length for coil removal.
5. Carleton requires safe and workable access for all mechanical units.
6. Mechanical spaces are to have a minimum of 6'-0" clear headroom throughout.
7. Floors in mechanical penthouses are to be sealed and waterproofed.
8. Floors shall be pitched to towards floor drains and drains shall be adequate in number to eliminate the need for cooling condensate and other such piping to cross the floor.
9. Rooftop equipment will require prior approval during the design process. If possible, enclose equipment in penthouse.
10. All fresh air intakes shall be located at a minimum of 10' above the ground.

#### C. Standards for Campus Central System

##### 1. Campus Chilled Water System

###### a. General

- The chilled water system utilizes a central pump distribution system with no building level pumps.
- The campus chilled water plants contains all chillers, distribution pumps, expansion tanks, and chemical treatment equipment.
- The chilled water system is to be used for all cooling systems installed on campus.
- Facilities must approve any other use of chilled water for the winter months
- The  $\Delta T$  for the system is 44°F - 52°F.

###### b. Design Pressure

- Differential pressures will vary throughout campus ranging from 8-14 psi.
- The head pressure varies from 45-60 psi.
- Control valves must be capable of tight shutoff against 14 psi differential and 80 psi head pressure.
- Control valve body ratings to be 125 psi class where used on plant-chilled water.
- Use 125 psi class butterfly valves at building entrance for over 3" pipe and ball valves for less than 3" pipe.
- All other CHW isolation valves must be 125 psi rated.

###### c. Design Temperatures

- Coils are to be designed to accommodate a  $\Delta T$  of 12°F.

- d. Distribution System
  - Branch connections to mains shall be made at or above horizontal midline of piping.
  - Flushing of the chilled water system is to be determined by the project engineer.
  - The tie-in to the campus chilled water system is to be made by the contractor with supervision by Carleton staff.
  - Distribution system is to be supplied by pumps located in the chiller plant.
  - No pumps are to be located in the building.
- 2. Campus Steam and Condensate System . . . **NOTE: This section will be obsolete in any new design starting summer 2018. All systems will be 120 degree hot water design.**
  - a. General
    - Steam is distributed through campus using 80 psi of pressure.
    - Steam is to be used for all heating systems hot water generation on campus.
    - Condensate is collected and returned to the campus central plant.
    - The tie-in to the campus steam system is to be performed by the contractor with supervision by Carleton staff.
  - b. Pressure Regulating Valve Stations
    - Steam pressure from the main is to be reduced from 80 psi to a low pressure of 8 - 12 psi steam for distribution within the building.
    - A single stage PRV is to be used for this process, with limited exceptions for special requirements (check with Carleton staff).
    - There is to be no manual bypass installed around PRVs.
    - Acceptable PRV station control valves include: Spence.
  - c. Building Steam and Condensate Distribution Systems
    - Design pressure for heat transfer devices is to be 10 psig.
    - Steam traps and the equipment that they serve shall both be located in the same room.
    - Connections to steam mains must be made at or above horizontal midline of main piping.
    - Humidification of campus utilizes soft water from the campus water system.
    - Condensate pumps shall be duplex type if installed below finished floor.
    - Starters for the pump motors are to be provided by the condensate pump manufacturer through the mechanical contractor.
    - Steam vacuum breaker air vent references: Armstrong, B&G, or Spirax/Sarco
- 3. Hot water systems
  - The hot water distribution system utilizes central pumps with no building level pumps. All systems should be designed with no building pumps for distribution.
  - Hot water systems must use a 120°F design temperature.
  - Hot water systems to be cleaned with all valves open. Strainers to be removed and cleaned and threads to be anti-seized when reinstalled.
  - All hot water systems to have 75 pound pop offs installed on them.
  - Air bleeders, square shank 5126 loose key by Moon, Inc.

- Hot water systems to have a bladder tank and Spirotherm air and dirt eliminator installed.

#### D. Piping and Piping Accessories

##### 1. Piping Materials

<b>System</b>	<b>2" and Down</b>	<b>2-½" and Up</b>
HWS&R EES	Sweat Copper	Welded STD CS
CHWS&R EES	Sweat Copper	Welded STD CS
GWS&R EES	Sweat Copper	Welded STD CS
HWS&R College	Sweat Copper	Welded STD CS
CHWS&R College	Sweat Copper	Welded STD CS
PCR College	Sweat Copper	N/A
HWS&R Penthouse	Sweat Copper	Welded STD CS
CHWS&R Penthouse	Sweat Copper	Welded STD CS
Heat Recovery Penthouse	Sweat Copper	Welded STD CS

- Propress is allowed in pre-approved applications only.
- Only Viega fittings are allowed.
- Victaulic can be used when pre-approved for coil connections at equipment locations.
- Victaulic can be used in pre-approved areas only.

<b>System</b>	<b>Piping Material</b>	<b>Fitting Material</b>
High Pressure Steam	Schedule 80 Steel	Socket or butt weld
Medium & Low Pressure Steam	Schedule 80 Steel	Butt weld
Steam Condensate	Schedule 80 Steel	Cast Iron - threaded
Refrigeration	Type L copper	Wrought copper with silver solder (45% min. & cadmium free)

Anything larger than 12" must be approved by the College.

##### 2. Strainers

- Use (Y) type strainers.
- Install strainers in front of all steam traps and control valves (when they are in a control valve to steam trap configuration).
- Steam strainers need to withstand 300 psi.
- Chilled water strainers need withstand 125 psi.

- Steam strainers are to be installed horizontally and positioned to allow the strainer to be removed.
  - Strainers are to be located ahead of all water meters by a minimum of 2".
  - Strainer is to have a blow down valve.
  - After clean-up of heating systems, the clean-up strainers are to be removed and hung on the pump.
3. Traps **(Steam traps will be obsolete in design starting summer 2018. Any use of steam will have to be approved by College personnel.)**
    - A test valve must be installed between the trap and check valve.
    - Steam drip leg pockets to be 18" deep on steam coils, and full sized on any pipe up to 4".
    - Drip leg pockets can be 2 sizes smaller for anything over 4".
    - Nothing larger than ½" steam traps on high pressure drip legs.
    - Thermodynamic traps to be used on all steam main drip legs over 30 psi.
    - Preferences – Armstrong; without internal valves – Sarco.
  4. Hydronic Piping System
    - Where required, glycol systems will be 50% glycol solution.
    - Hydronic piping system is to use bladder type expansion tanks.
  5. Fittings
    - Use factory fabricated fittings.
    - Reducers are to be used no bushings.
  6. Flange Gaskets **(Steam traps will be obsolete in design starting summer 2018. Any use of steam will have to be approved by College personnel.)**
    - Flange gaskets on steam lines to be steam metal bestos.
  7. Valves
    - Provide isolation valves to permit service of equipment without drain down of system.
    - Main line distribution valves will be flanged connection.
    - Isolation valves shall be installed at the bottom of all hot, cold, and recirculating water risers.
    - Use of balancing valves on the discharge of pumps is prohibited. On all hot water heating systems with VFD's, all balancing valves to be left open and to be used for trouble shooting only.
    - Triple duty valves and three way valves are not permitted.
    - All modulated valves are to be full port valves.
    - Steam generated hot water heaters and heat exchangers to have Siemens control valves and they are to be controlled by the campus Energy Management System.
    - Control valves must have isolation valves on each side.
    - An updated or new valve schedule will be located in the mechanical room and provided as part of the close-out documents.
  8. Air Vents/Drains
    - Provide manual ball valve vents and drains at all local high/low points, and pitch piping towards drains so that system may be completely drained and purged of air.

9. Pressure Gages and Thermometers
  - Preferred manufacturers – Ashcroft, Marshalltown, Taylor, Trerice, or Weiss
10. Balancing Valves
  - Preferred manufacturers – Armstrong, Bell & Gosset, Gerand, or Tour & Anderson
  - If no VFD is installed when balancing is complete, the tag should be installed giving the exact gpm at that location.
11. Control Valves
  - Siemens or Belimo control valves are to be used for all AHUs, radiation control, water, and air.
  - All control valves on chilled water coils are to be located on the returns.
  - Valves that are smaller than ¾" can be electronic.
  - Electronic and pneumatic valves are never to be used in conjunction with each other.
  - All modulating valves are to be 0-10 volt with 0 volts being open and 10 volts closed.
  - Control valves will hold space temperature within 1° of set-point up and down.
12. Pressure Transmitters – Rosemount, Setra, or Siemens
13. Meter Sensors – Daniel Industries (flow straightener), Siemens (RTD's only).
14. Temperature Sensors – Siemens/Automated Logic
15. Flow Meters - See metering section.
16. Expansion Joints
  - Expansion joints to be flanged connection with a flanged valve within 10' of each end.
  - Carleton prefers the use of expansion loops.
  - Use of expansion joints is permitted, but they must be accessible to maintenance staff.
17. Water Treatment
  - The project engineer will specify the flushing and filling process as part of the specifications.
  - Flush new piping until water runs clean, remove and clean strainers.
  - It is mandatory that Carleton's water treatment company verify the results.
  - Water treatment chemicals will be provided by the College.

#### E. Mechanical Equipment

1. General
  - Carleton will only approve cogged belts for use on equipment.
  - Fixed pitch pulleys or non-adjustable shivs are to be used on all equipment.
2. Equipment Mounting
  - Floor mounted pumps, shall be installed on 1" shim to allow for grout to flow under base rails.
  - Steel supports located in areas with moisture are to be prepped with rust resistant paint.
  - All equipment is to be mounted on a 3" housekeeping pad.

### 3. Pumps

- All hot water pumps and condensate pumps are to be hooked up to emergency power.
- Lead-lag pumps must be set to change their status to Lag-lead on the 15<sup>th</sup> of each month in the Building Automation System (BAS).
- All pumps to be specified as non-overloading.
- All condensate pumps to be equipped with alarm contacts.
- All pumps must be laser aligned.
- Hot water pumps to have suction diffusers.
- EPDM coupler inserts to be supplied on all pumps to run on VFDs.
- Insulation of chilled water pumps is not permitted.
- Preferred manufacturers: Bell & Gosset.
- Steam Condensate Pumps – Dunham-Bush, ITT, or Skidmore
- End Suction Hot and Cold Water Pumps – Bell & Gosset
- Horizontal Split Case Hot and Cold Water Pumps – Bell & Gosset (preferred), Gould.
- In-line circulators smaller than ¾ hp is to be Grundfos.

### 4. Heat Exchangers

- a. Plate and Frame
  - Plates need to be expandable to 100% of their capacity.
  - The College has no manufacturer preference.
- b. Shell and Tube – B&G preferred.

### 5. Electric Heat

- The use of electric heat is discouraged.

### 6. Fin Tube Convection – Preferences: Standard, Sterling, Vulcan, Myson, or Runtal

### 7. DX Systems

- The use of DX systems must be approved by the Carleton Facilities Staff.

### 8. Motors

- All motors need to be eligible for Xcel Energy utility rebates.
- All motors are to be premium efficiency rating (90%).
- Preferences: US Motor, Lincoln, Baldor or Marathon.

### 9. Motor Controls and Disconnects

- Preferred manufacturers – Square D and Siemens.
- Both are to have copper busses.
- Local disconnects are to be provided for each motor. Disconnect must be within sight of the motor and no more than 50' away.

### 10. Variable Frequency Drives (VFD)

- VFDs are required on all hot water heating system pumps. Must be ABB
- No bypass is allowed, but standard disconnects are acceptable.
- Any VFD used on fan is to be ABB.

### 11. Fan Coils

- All fan coils used for heating and cooling are to be 4-pipe configuration.
- Preferences: Carrier, Daiken, Trane, or York.

## F. Ventilation System

### 1. Indoor Air Quality

- Reference ASHRAE requirements. Demand ventilation should be used whenever possible.
2. Humidification must utilize soft water from the campus water system.
    - Air Handling Units
      - For any air handling unit large enough to walk into, a light fixture is to be installed and connected.
      - Air handling units to be built with insulation in between sheet metal or on outside.
      - Interior perforated metal is prohibited.
      - Carleton prefers that mixing boxes not be used as part of the air blender.
      - Preferences for this equipment: Carrier, Daikin, York or Trane.
  3. Dampers
    - Install access panels for all dampers.
    - Damper motors are to be installed on the outside of the ductwork.
    - Prefer damper motors to have digital controls.
    - Preferred manufacturers: Greenheck or SMP
  4. Filters
    - Minimum of 30-40% efficiency is required for all air pre-filters. Minimum of 2" pre-filter.
    - Final filters are to have an efficiency of MERV 13 or higher.
    - Installation as indicated by LEED standards.
    - Accepted manufacturers are: Camfil-Farr, AAF International, Air Guard or Cambridge
  5. Coils
    - Steam coils to be installed with vacuum breakers, and float and thermostat traps.
    - Vacuum breakers or air vent to come off the top of the coils.
    - Traps on AHU coils to be sized for ½" Delta P and locate them 18" below bottom of coil.
    - All air handler chilled water coils to have Parker ¾" quick coupler installed on top and bottom of each section (BH6-61).
    - It is required that coils are able to be pulled out without disrupting the rest of the AHU.
    - Unions will be provided between the isolation valves and the coil.
    - If a face and bypass coil is used, bypass is to be external.
    - Coils are to be located in dedicated coil sections.
    - Coils are to have a drain and isolation valves on both sides
    - All coils to be connected to the campus Energy Management System.
    - Preferences: Carrier, Daikin, York or Trane.
  6. Air Conditioning Condensate
    - Condensate shall be piped to sanitary sewer system.
  7. Fans
    - a. Axial – Buffalo, New Philadelphia Fan Co., or Woods
    - b. Centrifugal – Barry, Buffalo, Greenheck, Trane, or Twin City
    - c. Roof Exhaust – Carrier, Greenheck, or Loren Cook
  8. Ductwork
    - All ductwork to be sealed to no more than 1% leakage.

- A duct leakage test is to be performed by a 3<sup>rd</sup> party testing agent.
- Ductwork is to be insulated on the outside only.
- Ductwork is to be delivered, handled, and installed according to ASHRAE standards.

9. Duct VAV Boxes

- All variable air volume (VAV) boxes are to be controlled by the campus Energy Management System.
- Fan powered VAV boxes are prohibited.
- Any VAV box not installed in the return air plenum must be insulated.
- VAV boxes must be insulated on the exterior.
- The entire VAV box is to be insulated with the exception of the control box.
- Volume control on VAV systems shall be accomplished by using variable frequency drives (VFD's).
- All dampers are to include VAV boxes with access panels located at damper.

G. Insulation

1. Air handling units are to be built with insulation in between sheet metal or on the outside.
  - Interior perforated metal is prohibited.
  - Use fiberglass insulation and interior duct liner are prohibited.

System	Pipe Size	Insulation Requirement
Steam Heating System and Condensate	2" and smaller 2 ½" and larger	1 ½" Fiberglass 2" Fiberglass
Hydronic Heating System	2" and smaller Over 2"	1" Fiberglass 1 ½" Fiberglass
High Pressure Steam above 250°F	2" and smaller 2 ½" – 4" 6" and larger	1 ½" Fiberglass 2" Fiberglass 3 ½" Fiberglass
Steam Condensate Hot Water Heating	Buried	Dri-therm for direct bury
Chilled Water	1 ½" and smaller 2" - 4" 5" and larger	1" Fiberglass 1 ½" Fiberglass 2" Fiberglass
Emergency Generator Exhaust		4" Calcium silicate

H. System Testing and Commissioning

1. Testing, Adjusting, Balancing
  - Test and balance services are to be included in the specifications as part of the contractor's responsibilities.
  - A College approved, independent, third party must be used to perform the testing, adjusting, and balancing.
  - The final test and balance (TAB) report shall include all set points of air handling systems, static pressure, and hydronic flow control pressure differential.
  - The test and balance equipment is to be factory calibrated in the last 6 months.
  - The person assigned to do the work is to be certified by ICBO, BOCA, or NEBB. Company certification is not sufficient.



- After TAB is complete, the test and balance person shall demonstrate readings on 20% of all work to a representative of the College. If all 20% do not pass, a new sample group is to be selected. This process will be repeated until the 20% sample group has passed.
- The final test and balance report is to be signed off by the owner, not the contractor.

## 2. Commissioning

### Construction Administration Phase

Tasks	Comments
Design Review of 100% Construction Documents and Specifications for Systems to be Commissioned	Identify items that may affect commissioning activities. Provide comments to the Owner and Design Team that could improve building operations and energy efficiency (if applicable).
Develop and Implement Commissioning Plan (including testing plan and checklist)	Write and implement the Commissioning Plan. Prepare and submit detailed testing plan and checklist for systems to be commissioned.
Commissioning Issues Log (also known as the Deficiency List)	Document all issues for systems to be commissioned so contractors can resolve them promptly and the systems can function correctly; once corrected, the Commissioning Provider will retest.
Commissioning and Construction Meetings	Communicate the commissioning progress to all involved parties/team members and attend necessary construction meetings.
Construction Observation	Visit the site periodically to test for access and installation issues.
Review Construction Meeting Minutes, RFIs, and Change Directives	Track progress on these changes for systems to be commissioned. Add any revisions and/or substitutions into the commissioning plan and testing.
Submittals and Operations & Maintenance (O&M) Manuals	Review and comment on contractor submittals and O&M manuals for systems to be commissioned.

### Verification/Acceptance Page

Tasks	Comments
Commissioning Functional Testing	Verify the equipment is functioning correctly.
Commissioning Integrated Systems Testing	Verify that all systems interact with each other correctly.
Commissioning Meetings	Lead the Commissioning meetings during Verification/Acceptance Phase.
Review TAB Report	Review Test and Balance Report.

Training of Operating Personnel	Review contractor training plan. Observe training sessions conducted by the Contractor and equipment suppliers, and verify all required information has been provided to the Owner.
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### Occupancy Phase

Tasks	Comments
Building Start-up Assistance	Commissioning Provider will be on-site during opening day to assist in troubleshooting if necessary and witness how the occupied building performs.
Commissioning Meeting	Lead the Commissioning meetings during Occupancy Phase.
Commissioning Report	Supply building Owner with the preliminary Commissioning Report prior to Seasonal/Deferred Testing. Supply the final Commissioning Report post-Seasonal/Deferred Testing.
Seasonal/Deferred Testing	Revisit and retest systems after the project ends (e.g. visit in winter if project was completed in summer) to make sure all building systems are functioning correctly.
10-Month Warranty Review	Meet with the building Owner to review installed systems and document outstanding issues.

### Systems to be Commissioned

Unit/System	Sampling (if applicable)/Description
Air Handling Unit (AHU)	100% based on testing the full sequence of operation and (+/-) 30 control points per AHU.
Piping, Cleaning and Flushing / Chemical Treatment	Review Mechanical Contractor cleaning and flushing procedure and chemical treatment, and witness selected parts of the Test Review Final Report.
Ductwork	Visit the site periodically to test for access and installation issues on systems to be commissioned.
Heat Exchangers	100%
Fan Coil Units	20%
Exhaust Fan	100%
Reheats	100%
Cabinet Unit Heaters	100%
Unit Heaters	100%

Building Automation System/Graphics	100% of main mechanical systems: AHUs, heat exchangers, exhaust fans, etc. <b>20%</b> of room level control graphics (FCUs and other similar units).
Finned Tubed Radiation (HW riser loops)	100%
Electric Water Heater	100%
Domestic Water Booster Pumps	100%
Critical Life Safety Alarms	100%
Chilled Water Building System Connection	100%
BTU Meter	100%
Testing, Adjusting and Balancing (TAB)	Random sampling 10% of systems to be balanced (air side and hydronics systems). TAB contractor to take the measurements with the same equipment used for balancing.

#### I. Submittals and O & M Manuals

- Submittals are to be reviewed by the owner, but approved by the engineer.
- Submittals are to be submitted in electronic format.
- List model and serial numbers for all equipment in O&M Manuals.
- Fan curves and pump curves to be supplied with O&M Manuals.
- Provide detailed electrical power and control diagrams for all mechanical equipment.
- Provide drawings showing how electrical is hooked up to all equipment.
- Provide as-built drawings for all mechanical systems. This includes actual equipment schedules from the submittals. Red Line drawings.

### Fire Sprinkler Systems

#### A. Piping

- Sprinkler pipe is to be Schedule 40 steel with rolled Victaulic connections.
- CPVC is acceptable for use.

#### B. Heads

- The style of sprinkler heads used in a building will be determined by the location.
- Concealed pendant heads are to be used in finished ceilings, and concealed sidewall heads are to be used in finished walls and soffits.

#### C. Valves

- Control valves shall be equipped with a port to monitor street side of system.
- Milwaukee valves are not permitted for use at Carleton.

#### D. Fire Pumps

- Peerless or Aurora
- Fire pumps must report to the Fire Alarm Control Panel as a supervisory alarm.

#### E. Flow Indicators and Supervisory Devices

- All flow and supervisory devices shall initiate a building alarm, and report the condition to Carleton Campus Security through the Fire Alarm Control Panel.

#### F. Standpipes

- A locking device is to be installed on standpipe exterior valves.
- G. Backflow Preventer and RPZ
  - Febco for 1"-2" or Watts for 2"
- H. Inspector's Drain Test
  - Drain lines, inspector's test valves, and fire pump test headers for sprinkler systems are to be piped to the exterior at a location approved by the College. All drain valves, control valves and inspector's test valves are to be easily accessible for maintenance purposes.

## **Plumbing**

### **A. All-Gender Restrooms**

Carleton College is committed to meeting the accessibility needs of faculty, staff, and students. Incorporating all-gender, family accessible restrooms is desired in new construction as allowed by building code, especially in buildings over 25,000 square feet that support frequent campus uses by many constituents. To the extent possible, consideration should be given to develop all-gender restrooms in remodel projects where space is available.

### **B. Plumbing Fixtures**

- All items included on the list below are the preference of the College. Any variation from this list must be approved by College personnel prior to installation. All fixtures and shower heads are to be low flow.
  - Copper pipe is not permitted for refrigerator water line connections. Use plastic tubing that is long enough to allow for the refrigerator to be fully removed for cleaning.
  - Each bathroom is to include a dedicated faucet to allow for connection of custodial equipment.
  - Low flow as defined by LEED must be used.
- Ball Valves – Apollo, Watts – all to be full port
  - Bathtubs – American Standard, Americast, or Kohler - All to be porcelain coated.
  - Fire Hydrant – Mueller 5-1/4" shoe for a 6" pipe connection
  - Flush Valves – Sloan with Zurn ZRK-U-1.0, ZRK-C-1.6
  - Gate Valves – Not to be used.
  - Mixing Valves – Not to be used.
  - Hose Bibs – Watts, Woodford, and Woodruff – All must be frost-free, tamper proof, and equipped with vacuum breakers.
  - Kitchen Faucet– Delta or Kohler
  - Kitchen Sinks – Elkay, stainless steel with sound deadening coating
  - Laundry Faucet – Chicago – 4" width set with vacuum breaker spouts
  - Lavatory Faucets – Delta or Symmons. Public restrooms shall have automatic on/off faucets.
  - Lavatory Trim – Delta, Symmons, or Chicago
  - Meters – See metering section for meter types and sizes

- Plumbing Drains and Supports – Josam, Wade, Zurn
- Plumbing Fixtures – Crane or Kohler
- Showerheads – Sloan #AC-11-B-3, all showerheads to be water saving
- Shower Valves – Symmons S-861X
- Tub/Shower Faucets – Delta or Symmons
- Tub/Shower Surrounds – Corian (or equivalent) with end wings
- Tub/Shower Valves – Symmons S-821X or Delta. **These products are not compatible with a Chicago water saver.**
- Urinals – American Standard, Crane, Kohler, or Toto. Public restrooms shall have automatic flushers activated by motion (not timers) on all urinals.
- Water Closets – American Standard, Crane, Kohler, or Toto. A dual flush handle for water conservation will be used. Preferably down using less water. Wall mounted water closets and carrier frame should meet 800 pound weight load capacity, 500 pound is the minimum. Toto brand is preferred.
- Water Closet Seats – Beneke, Church, or Olsonite
- Water Fountains/Coolers – Elkay Hydration Station with Chiller and Filter, Halsey Taylor
- Water Heaters – A.O. Smith, State Turbo, Bradford White
- Water Valves, Underground – Mueller or Waterous AWWA C509

C. Piping Materials

System	Piping Material	Piping Connection
Domestic Hot & Cold Water	Type L hard copper with a 3" maximum size	Wrought copper with solder
Sanitary Waste & Storm (Above Ground)	Service weight cast iron	Bell and spigot with neoprene gasket or no-hub neoprene gasket and stainless steel clamp assembly
Sanitary Vent (Above Ground)	Service weight cast iron	Bell and spigot with neoprene gasket or no-hub neoprene gasket and stainless steel clamp assembly
Domestic Water (Below Grade)	Class 52 ductile iron with a maximum size of 12" – Larger sizes must be approved by College	Standard restraint mega-lug locking joints.
A/C Condensate	Type L copper	Wrought copper with silver solder (45% min. & cadmium free)
Natural Gas – Inside	Black Iron	Threaded 2" and below, welded over 2"

Natural Gas – Outside	See engineer's specifications	
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#### D. Insulation

The following manufacturers are to be used for pipe insulation:  
Armstrong, Armaflex, Johns-Manville, and Owens-Corning:

Domestic Water (hot/cold)	Run-outs to 2" 1" and smaller 1 ¼" to 6"	½" Fiberglass ¾" Fiberglass 1" Fiberglass
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#### E. Commissioning

- Commissioning is to be performed on all plumbing systems by a commissioning agent.

### Kitchen

#### A. Kitchen Equipment Standards

1. Dish Washers – Stero Flight Type,
  - Smaller types – Hobart
2. Tray Conveyors – No Autec
3. Slicers/Mixers – Hobart
4. Food Processors – Robot Coupe
5. Steamers, Ovens, Flat Tops, Fryers, Ranges – Vulcan
6. Steam Kettles – Groen
7. Ice Machines – Scotsman
8. Coolers/Freezers – Traulsen
9. Food Warmers –
  - Portable – Metro
  - Stationary/counter top – Hatco
10. Ice Cream Machines – Taylor
11. Hot Wells/Cold Wells – Delfield or Wells
12. Under Counter Coolers/Prep Coolers – Delfield

## **7. ELECTRICAL SYSTEMS**

### **Design Intent**

Carleton's Electrical Standards have been put in place so that the design team professionals hired to provide plans and specifications are informed as to the level of design required by the College. Compliance with the Carleton Construction Standards is mandatory for all designers contracted by the College. These standards are not intended to limit design expressions or material selections, but rather guide designers in ways to expedite project completion within acceptable College standards.

### **General**

#### **A. Codes and Standards**

The following Codes and Standards apply to the design and installation of the electrical systems. Additional State and Local codes may apply.

#### **B. Operation and Maintenance Manuals**

The following information should be assembled and bound in durable hard covered binder and provided in searchable, editable electronic format.

- Manufacturers Installation, Operation and Maintenance data.
- Provide as-built drawings for all electrical systems. Red Lines.
- Provide detailed electrical power and control diagrams for all mechanical equipment.
- Provide drawings showing how electrical is hooked up to all equipment.
- Catalog product data.
- Shop drawings.
- Test reports.

#### **C. Training**

- For any product that is new to Carleton's campus and has associated software, training on the software is required.

#### **D. Spare Parts**

- A full brace of fuses is to be provided for any 15 kv G & W switch.
- To be coordinated with the campus distribution system by a qualified engineer.
- When fuses are used for disconnects on the distribution system, a full set of spares is to be provided.

### **Design Standards**

#### **A. Electrical Rooms**

- At the minimum, equipment and rooms must be designed to comply with NEC requirements. Carleton may require more space around equipment depending on the location. Designer to verify room size with Carleton personnel.
- All equipment is to be mounted on a minimum 3" concrete housekeeping slab.
- Installation of electrical equipment must be coordinated with mechanical system installations.
- Equipment Supports
  - o Tie wire of any type is not acceptable.
  - o Only approved U.L. conduit support fasteners are to be installed.
- Panels to be spaced a minimum of ¾" air gap.

## B. Medium Voltage

### 1. General

- Xcel Energy feeders supply the College electrical distribution system at 15 kV fused at 200 amps at the utility. This system is 3 phase, 4 wire.
- All 15 kV switches are to be G&W SF6.
- High voltage conductors are to be soft-drawn stranded copper ASTM B8 with semiconducting strand shield.
- Construction is to be a single conductor with copper tape shielding.
- Proposed installations are to be approved by Carleton personnel.

### 2. Insulation

- Insulation is to be ethylene-propylene-rubber (EPR)
- Insulation jacket is to be PVC with no less than 80 mil thickness
- Insulation level is to be 133% or 220 mils.
- Must follow ICEA S-68-516/WC 8 requirements.
- HiPOT testing in accordance with NETA standards is required and shall be performed by a neutral 3<sup>rd</sup> party testing agency firm and shall be witnessed by Carleton personnel. Written test results are required and must be submitted to the College.

### 3. Energizing

- Energizing of the distribution system needs to be coordinated with College personnel.
- The following items need to be tested prior to energizing the system:
  - o Proper tap connections
  - o No phase to phase faults
  - o No phase to ground faults
  - o Phase rotation is to be checked if applicable
  - o All equipment is to be labeled with arc fault calculations and the results are to be posted at each panel.
  - o Short Circuit and Overcurrent coordination studies are to be provided.

### 4. Medium Voltage Distribution Manufacturers

- Kerite, Pirelli, Rome, Southwire

## C. Low Voltage Distribution

### 1. Service and Distribution Manufacturers

- Square D and Siemens.
- Both to have copper busses. Aluminum busses will not be accepted.
- A grounding conductor is to be installed for each circuit.

### 2. Power Distribution Boards

- Factory assembled, dead front, metal enclosed and self-supported.
- Individually mounted Main over current device.
- Panel mounted devices in distribution sections.
- Circuit Breakers 400 amp and above to be provided with (5) five function solid state trip module.

### 3. Wiring

- Electrical wire is to be THHN 600 volt unless otherwise approved by the College.
- All wire #12 and larger shall be copper stranded, type THHN.



- The grounding conductor shall be installed from main distribution equipment to all distribution panels and branch circuits. The raceway is not to be used as a grounding conductor.
- The smallest gauge copper conductor is to be #12.
- All wire connections are to be made using wire nuts. WAGO Wall-Nuts are only allowed to be used as connectors in a light fixture.
- No multi-wire branch circuits – all circuits to have dedicated single pole breaker neutral.

#### D. Panel Boards

- All panel boards are to use copper busses and bolt in circuit breakers.
- Use of aluminum busses is not permitted.
- Panel board trim shall be a lockable door-in-door with full length hinges.
- 42 space bolt in breaker without main breakers (main lugs only).
- Preferred manufacturers: Square D, Siemens.
- Each panel shall have a minimum of 20% unused spaces.

#### E. Conduits Systems

##### 1. Conduit

- All electrical circuits shall have grounding conductors installed.
- Conduit shall be (RGS) Rigid Galvanized Steel, (IMC) Intermediate Metal Conduit and (EMT) Electric Metallic Tubing. (PVC) Rigid Polyvinyl Chloride shall only be used indirect burial installations.
- Using the conduit as a grounding system is not acceptable.
- In hot locations, plastic anchors will not be allowed.

##### 2. Raceways

- Wiring needs to have physical protection and will be in conduit, secured bundle, or in a tray. Loose laid wires will not be accepted.
- Metal Clad cable will not be used in any areas except for fixture whip connections. Use of MC Cable needs to be approved by the College.
- Surface mounted raceways such as wire mold shall have a separate, continuous ground wire.
- Use of flexible conduit is only permitted for use with vibrating equipment.

#### F. Starters, Motors, and Pumps

##### 1. Starters

- Use motor circuit protectors with all starters. Use thermal overload as opposed to fuses.
- Starters are to be included in the Electrical Contractors scope of work.
- Preferred – Square D or Siemens

##### 2. Pumps

- One hot water pump and one condensate pump are to be hooked up to emergency power.
- All pumps to be specified as non-overloading.
- All condensate pumps to be equipped with alarm contacts.
- All pumps with VFD control must be laser aligned, or aligned using a dial indicator.
- Hot water pumps to have suction diffusers.
- EPDM coupler inserts to be supplied on all pumps to run on VFDs.

- Insulation of chilled water pumps is not permitted.
  - Preferred manufacturers: Bell & Gosset.
  - Steam Condensate Pumps – Dunham-Bush, ITT, or Skidmore
  - End Suction Hot and Cold Water Pumps – Bell & Gosset
  - Horizontal Split Case Hot and Cold Water Pumps – Bell & Gosset (preferred), Gould.
  - In line circulators smaller than ¾ hp is to be Grundfos.
3. Motors
- All motors need to be eligible for Xcel Energy utility rebates.
  - All motors are to have a premium efficiency rating (90%).
  - Preferences: US Motor, Lincoln, or Marathon.
4. Motor Controls and Disconnects
- Preferred manufacturers – Square D and Siemens.
  - Both are to have copper busses.
  - Local disconnects are to be provided for each motor. Disconnect must be within sight of the motor and no more than 25' away and lockable.
- G. Transformers
- Transformers are to be K-rated to withstand harmonic, switching, and non-linear loads with Energy Star rating.
- H. Metering – See Section 8
- I. Devices
- Wiring devices are to be Hubbell, Leviton, or GE.
  - Receptacles and switches to be specification grade 20 amp unless directed otherwise.
  - Device color to be ivory.
  - Over current protection devices are to be Buss or Shawmut.
- J. Lighting
1. General
- All exit and emergency lights are to be powered from emergency panel boards (where available).
  - All lighting layouts are to be submitted and approved by the College during project design.
  - Administrative, athletic and educational lighting to be 4000K.
  - Student housing and lounge spaces to be 3500K.
2. Interior Fixtures
- All interior lighting should be LED if possible.
  - All offices should have low voltage dimmable lighting installed.
  - Custom fixtures are not to be used without special permission.
  - No use of incandescent fixtures.
  - No use of low voltage halogen short service life lamps. Use LED MR 16.
  - Induction lighting will be considered.
3. Exterior Fixtures
- The standard exterior light fixture at Carleton College is LED.
  - Exterior light poles are to be 15' with an LED dark skies approved fixture and to be approved by the College.
  - All exterior lights are to be tied in to the campus photocell for control.

#### 4. Lighting Controls

- The style of lighting control will vary depending on the type of building, and the uses of the rooms within the building.
- Lighting control selection must be approved by the College, Wattstopper is preferred.
- Lighting will be controlled locally for offices and classrooms. Occupancy sensors should be used with extra contacts for the BAS system.

#### Sequence of Operation for Lighting Controls:

Sequence of Operation for lighting controls																																		
	Auto On at 50%				Manual On at 100%		Auto Off at 20 mins		Partial Off at 15 Mins		Auto Off @ Target FC		Auto Dim at Target FC		Set Level to 40 FC		Continuous		Step		Multizone		Wall Switch		Dimmer Switch		Scene Control		Integration with A/V		Bridge to Lighting Control		Provide Contact for HVAC	
	OCC SENSOR				PHOTOCELL				DIMMING				SWITCHES / INTERFACE						REMARKS / Questions?															
Stair																																ON 24/7 at 10%, increase to 100% for several minutes if motion sensor is activated. Sensor is integral with fixture with no interface to Lighting Control System		
Circulation/Corridor	X				X						X																	X				Fixtures Designated "Emergency" always ON. Others activated by motion sensors, dim to 10% after 10 minutes of no motion sensing.		
Vestibule					X						X																					Auto on to 100%		
Atrium											X			X																		Part of Lighting Control System		
Mechanical and Electrical Spaces																X																		
Telecom Rooms																X																		
Student Study Rooms		X	X							X												X										X		
Classroom		X	X								X			X								X		X		X						X		
Science Research Labs		X	X							X			X									X										X		
Teaching Labs		X	X								X			X								X		X		X						X		
Office		X	X								X											X										X		
Computer Lab		X	X								X			X								X		X								X		
Storage		X																				X												
Restrooms		X	X																													X		
Custodial																						X												

## Recommended Lighting Levels

<u>Area Type</u>	<u>Foot-candle</u>	<u>lux</u>
Sidewalks and Outdoor Areas	2-5	20-50
Parking Areas	2-5	20-50
Warehouses, Homes, Theatres, Archives	20	200
Library Shelves, Cafeteria, Leisure Zones	20	200
Staff Room, Break Room	30	300
Office Space – Dimmable	50	500
Classroom, Study Hall	50	500
Conference Room – Dimmable	50	500
Theatre, Auditorium – Dimmable	50	500
Art Room, Creative Work Space	75	750
Mechanical Spaces	20	200
Physical Fitness Space	50	500

### K. Emergency Power

- During the design phase of the project, it is necessary to determine the impact or propose additional emergency load on the existing campus emergency system.
- Install a 120/208 or 277/480 volt, 3-phase shore plug on the building exterior with appropriate “Kirk Key” interlock scenario at an accessible location. Use a 5-wire shore plug to match existing. Provide portable emergency generator to shore plug equipment.
- The Automatic Transfer Switch shall be ASCO and is required to interface with the Carleton Energy Management System (EMS).
- The College currently uses both four pole and three pole Automatic Transfer Switches. Designer is to confer with College personnel to determine the best style for each individual project.
- The following items are to be powered by emergency power:
  - o One (1) sewage ejector per building.
  - o One (1) heating pump per building.
  - o For each project, there will be special requirements for equipment that is to be powered by emergency power. These requirements are to be discussed with Carleton personnel.

### L. Fire Alarm Systems

#### 1. General

Carleton College buildings are protected by fire alarm systems that include automatic smoke and heat detectors, manual pull stations, and audible and visual alarm devices. Specialty devices, such as duct detectors, suppression system tamper and flow alarms, door hold-opens, and systems warning devices are also incorporated into the alarm system. Each system is currently monitored at an offsite central station with two dedicated phone lines.

#### 2. Reporting

All alarms are to be reported to Carleton College’s designated monitoring service via telephone line connection. The contractor is to provide the interface for point identification at the panel. An addressable digital system is required for all fire alarm systems. The following is a list of alarm types that are required for each location:

- Common areas – general alarm
  - Student rooms and dorm rooms – local alarms
  - Flow switches – supervisory alarm
  - Tamper switches – supervisory trouble alarm
  - CO detectors to be installed where applicable – central station
3. Fire Alarm Control Panel
- FACP is to be connected to campus system using a serial dialer with a two phone line, Digital Alarm Communication Transmitter (DACT).
  - Alarm is to be configured so that the point of alarm is called out. Identification by zone is not permitted.
  - C form alarm contact is to be connected to energy monitoring.
  - The FACP enunciator is to be located behind locked doors.
  - The FACP is to be connected to the campus emergency generator whenever possible.
  - Manufacturers – Simplex, Notifier and Gamewell to be digital/ addressable.
  - Residential systems are to have two contacts available for boiler monitoring and a low temp sensor.
4. Cabling
- All cabling associated with the fire alarm system is to be installed in a campus approved raceway.
5. Smoke Detectors and Alarms
- Carleton requires full smoke detector coverage in all buildings.
  - Every room needs to have a heat or smoke detector. The location will determine which is to be used.
  - When alarm is triggered within a residence room, only the sounder base in that room is to signal a trouble alarm.
  - In suites and townhomes, if one smoke alarm is set off, all smoke alarms in the suite/townhome are to sound.
  - All duct detectors must use a sampling tube.
  - Smoke detectors in residence rooms are to sound immediately following the triggering of the general building alarm.
  -
6. Door Hold Opens
- Will be connected to the fire alarm system and not have an independent power source.

## 8. METERING

1. Campus chilled water, electricity, condensate, and domestic water flows are to be metered at building utility entrances and connected to the campus Building Automation System (BAS).
2. All inline meters are to have isolation valves.
3. Meter bypass is not required.
4. Meter manufacturer preferences: Niagra MTX-421 or WPX-210 Condensate, Shark 200 Electric, Badger Water, Onicon Chilled Water
5. Electric metering shall have a pulse output (4-20 ma) capability and shall be capable of displaying voltage, amperes, kWh, demand, and power factors.
6. Meter display/faceplate shall be positioned such that it is easily read from floor level. If necessary, install remote display.
7. Meters shall be commissioned as part of project close-out requirements. BAS contractor is required to confirm BAS points have correct gain values per pulse and BAS output matches faceplate readings exactly.
8. BAS contractor to work with Lucid Design Group to integrate BAS meter readings with Carleton Lucid Building OS System. Contact: [support@luciddg.com](mailto:support@luciddg.com)

## **9. TELECOMMUNICATIONS & INFORMATION TECHNOLOGIES**

### **Design Intent**

Carleton's Telecommunications and Information Technologies Standards have been put in place so design team professionals hired to provide plans and specifications are informed as to the level of design required by the College. Compliance with the Carleton Construction Standards is mandatory for all designers contracted by the College. These standards are not intended to limit design solutions or material selections, but rather guide designers in ways to expedite project completion within acceptable College standards.

### **Telecommunications Standards**

#### **A. Main Distribution Facilities (MDFs)**

1. Main Distribution Facilities (MDFs) require year round cooling. Cooling equipment is to use Carleton's campus chilled water system. Climate control for these areas is to be managed by Carleton's Controls Supervisor. Use of auto controls is prohibited. Maximum temperature for each room is to be 80°F. Designer to check with ITS and Telecommunications for each project to make sure that the proper cooling is supplied based on the heat generating load of the equipment in each room.
2. The low voltage voice and data electrical drawings shall be drawn with the assistance and advice of ITS and Telecommunications. Drawings must be reviewed and approved by ITS, Telecommunications, and ultimately Facilities prior to being released for bidding.
3. Plumbing and mechanical piping is not allowed in any MDF. Sprinkler piping is allowed, but should be installed as high as possible to avoid interference with data/telephone hardware. A dry sprinkler system is to be used if it is available to the building.
4. Flooring is to be white, non-static VCT. Acceptable – Armstrong Cool White
5. Walls of MDFs are to have 4' x 8' sheets of AC plywood mounted at 12" AFF and going up 8'. The top of the plywood is to be 9' AFF anywhere that telecom equipment is scheduled to be installed. Designer to verify exact equipment being installed because it will vary depending on the building and rooms within the building.
6. Plywood is to be painted with no less than two (2) coats of high gloss white enamel. Prefer – Ace Royal 102A310 Ultra White or equivalent.
7. Any wall surface not covered by plywood is to be painted with any type of white gloss paint.
8. Install a minimum of one quad 20 amp power outlet with a separate ground and circuit breaker on each wall at 6" AFF. In limited areas, it may be necessary to include a 30 amp, 208v, twist lock receptacle – L630R. Designer to verify exact location with ITS and Telecommunications.
9. Lighting for the room shall include a minimum of (2) 4' – two tube fluorescent lights. Reflectors are to be installed on either side of the equipment racks at 10' AFF. Designer to verify exact location of racks.

10. If the building structure allows, the MDF should have a finished ceiling height of 11' AFF. This is to allow for relay racks and other equipment.
11. The preferred size for MDFs is 6' x 8'. Room layout to be verified by Telecommunications.
12. During construction, MDFs are to be completed, through finishes, on an accelerated schedule as compared to the rest of the building. This allows equipment to be installed simultaneously to cabling in hallways that are still at rough-in status. The process ensures that cabling will not interfere with hallway finishes, and is beneficial to the overall project schedule.
13. Fire alarm control systems, energy management, telecommunications, data network electronics, surveillance control, and door access control systems may be collocated in MDFs. Any other systems may be done with the permission of ITS and Telecommunications.

#### B. Wiring and Terminations

1. 4" conduit is to be installed to the main Telecommunication room in the building. Multiple conduits may be required depending on the building needs.
2. In buildings where there are Distribution Facilities on multiple floors or locations throughout the building, a minimum of three (3) – 4" conduits are to be installed or access to cable trays for pulling wire between floors or rooms. Designer to consult with ITS and Telecommunications for exact quantity and locations of conduits.
3. All cable installed in Carleton buildings is to be a minimum of Cat 5E.
4. All cables are to be run in dual support cable trays (Wire mold L Series) if possible. Wire baskets are NOT permitted. Wire mold L Series is permitted. Aluminum or steel J hooks will only be accepted in locations that do not allow room for cable trays. Carleton will decide if J hooks are to be used. Contractor will not install any J hooks. Carleton Telecommunications will install any necessary J hooks.
5. No other low voltage cabling (fire alarm, energy management, etc.) is allowed in Telecommunications cable trays. Divided cable trays may be allowed with Carleton's permission and proper shielding of wire.
6. Contractors are to supply one (1) ¾" conduit with pull strings and Arlington insulation bushings (EMT75) for each box. Conduit is to be run to the hall or nearest accessible space. Looping of boxes with conduit is prohibited.
7. A 4"x 4" deep box (4"x 4"x 2 ¾") equipped with a double mud ring is to be installed for all locations with the exception of wall mounted phones. Wall mounted phones require a single gang mud ring with a deep box, with the center of the box mounted no higher than 52" AFF.
8. All offices or occupied space are to have at least two (2) data/telephone locations. These locations are to be installed on opposing walls to allow for future remodeling. Designer to verify final locations with ITS and Telecommunications.
9. Coaxial cable for video will not be installed in any building unless agreed upon in advance and included in design and construction documents.
10. Coaxial cable for Distributed Antenna System (DAS) is permitted.
11. Contractor is to provide the required fire rating around all telecom conduits. Carleton will provide the required fire rating within the conduit.



12. Telecommunications, with the approval of the Facilities director, will install all voice, data, and video cabling.
13. Ground cabling is to be provided by the electrician and shall be a 4/O covered cable that originates at the XO. Telecommunications will provide the ground bar and it shall be mounted at 8' AFF. Electricians shall check with Telecommunications before installing the ground cable. All connections shall be a 2-hole irreversible crimp or a 2-hole exothermic welded connector. Screw connectors are prohibited.

#### **Information Technology Standards**

- All buildings at Carleton are to be equipped with wireless internet service and Carleton ITS department will be consulted within the design phase to determine equipment and fixture locations.
- ITS will work with Telecommunications on cabling locations for wireless antennas. ITS will install wireless antennas.
- Wireless internet antennas are run by Power Over Ethernet (POE).
- Neither junction boxes nor power boxes are required to be installed on the drop ceiling grid for any wireless antenna installed on Acoustic Ceiling Tile (ACT). Electrical boxes are required above the ceiling grid on the deck.
- Some buildings may require the use of a Distributed Antenna System (DAS) to enhance the cellular phone signal and Carleton ITS department will be consulted with to determine the need for DAS and the placement of necessary equipment. ITS will install DAS electronics and antennas.

## **10. AUTOMATED DOOR LOCKS, HARDWARE, AND BUILDING SECURITY**

### **Design Intent**

Carleton's Door Locks and Building Security Standards have been put in place so design team professionals hired to provide plans and specifications are informed of the level of design required by the College. Compliance with the Carleton Construction Standards is mandatory for all designers contracted by the College. These standards are not intended to limit design solutions or material selections, but rather guide designers in ways to expedite project completion within acceptable College standards.

### **Design Standards**

#### **A. Access Control Systems**

##### **1. General**

- All buildings are to be connected to the campus online access control systems.
- The Carleton One Card will act as the building access card for all students, faculty and staff.
- All access devices must be compatible with I Class SE cards.
- Lockable interior doors to be accessed by students, faculty, or staff shall be equipped with card access. The College generally prefers to no longer issue keys. Storage rooms, mechanical rooms, and other specialty rooms with limited access may be exempt from requiring card access.

##### **2. Online Doors**

- Exterior doors in all buildings are to have card readers located at all entrances and all exit only doors are to be monitored for door position status. The card readers should be either a HID RP15 Multicalsss SE or HID RP40 Multicalsss SE to be determined at the project level.
- All exterior doors are required to include transfer hinges and request to exit devices should be installed at all doors. Entrances/exit doors with more than one door leaf should have all leaves electrically connected to the door access system. Doors with electric latch retraction should be equipped with the Von Duprin (98/99) quiet electric latch retraction devices.
- All exterior doors in residence halls are to be equipped with annunciator alarms which will be activated when doors are propped open. The preferred device is the DSI ES-4200. Academic and administrative buildings should not have annunciator alarms installed at exterior doors.
- Online entrances that include a double door shall be equipped with electrification for bolt retraction on both leaves. Entrances that have more than two doors should be wired in series so that a single card swipe at the card reader by a person with "unlocking" privileges (i.e. Security Officers) will lock all doors at that entrance.
- The College prefers that the locks are to be electrified, rather than electrified strikes, whenever possible. To be determined by both Campus Services and Facilities. Von Duprin (6000 series) electric strikes are preferred.
- For any door with electrified locks, DO NOT include dogging option for any online door. Key cylinders on doors with electrified locks should have

storeroom function so that they may not be mechanically left in an unlocked state.

- Any door not using electrified locks is permitted to use key cylinder dogging, unless it is a door on the exterior of the building. No type of dogging is allowed on exterior building doors.
- All interior wireless electrified doors should be a Schlage AD400 series lock.
- All new construction electrified interior doors should be a Schlage AD300 series lock.
- All power supplies are to be Altronix devices. Size and style to be determined at the time of the project by Campus Services.
- Doors leading to mechanical tunnels are to be online and hardwired.
- Roof hatches are to be part of online system and hardwired.

### 3. Offline Doors

- "Offline door" refers to doors that require card access, but are not connected to the campus network.
- Doors to student rooms, classrooms, and faculty offices may have offline card access with manual key back up as a less expensive option.
- Faculty offices are to be equipped with "classroom" function which allows for the user to leave the door unlocked if desired.
- Offline locks are to be determined by Campus Services at the time of the project.

### 4. System Compatibility

- All card access systems are to be CBORD compatible equipment.

## B. Security

### 1. Cameras

- Where security cameras are used, the camera is to be positioned to record the identity of the person as they enter and exit the building.
- All new construction should have a camera located in the elevator and/or aimed at elevator exterior doors.
- Final camera locations are to be determined by the Director of Campus Services with input from the Director of Security Services.
- Installation of the cameras, camera type and associated wires are to be determined by Campus Services.
- Conduit is to be installed by electrical contractor to the network closet determined by Campus Services and ITS.
- Cameras are to be compatible with NICE VISION equipment.
- Cameras are to be powered by power over ethernet (POE).

## C. Hardware

1. All locksets are to have 7 pin, Stanley Best lock system, Small Format Interchangeable Cores (SFIC).
2. Carleton will furnish and install all temporary and permanent cores.
3. Contractor is to furnish and install cylinders.
4. Cylinders to be "Figure 8" configuration. Must be able to accommodate Best (SFIC) core.
5. Hardware color is to be determined at the time of the project.
6. Carleton strongly prefers mortise locks as opposed to cylindrical locks.
7. Hardware preferences – Schlage or Stanley Best.

D. Doors

1. Entry doors must have a bottom clearance of no less than 3/8" to allow for depth of walk-off mats.
2. Please see Door and Hardware section for more information on doors.

**DOOR HARDWARE: SECTION 08 71 00**  
**HOLLOW METAL DOORS AND FRAMES: SECTION 08 11 00**  
**WOOD DOORS: SECTION 08 21 00**

**SPECIFICATION GUIDELINE**

The purpose of this booklet is to support the College's standardization of door hardware, hollow metal doors and frames. The College maintains the following hardware and is currently stocking replacement parts. **The products listed in this booklet are to be used** on new construction and modernization projects unless products are listed in this package as an alternate.

It is the intent of this booklet to provide guidelines for the architect's specification sections 08100, 08200, 08710, for product groups and the hardware schedule. It remains the architect's responsibility to coordinate these products to meet the applicable building codes, life safety codes, and ADA requirements. Hardware, doors and frames must comply, where applicable with UL10C or other approved testing agency stating material has passed UBC standard 7-2.

The door hardware section 08710 preamble must include the following:

**Before hardware installation, general contractor/construction manager shall coordinate a hardware installation seminar to be conducted on the installation of hardware, specifically of locksets, closers, exit devices and overhead stops.** Manufacturer's representative of the above products to present seminar. Seminar to be held at the job site and attended by installers of hardware (including low voltage hardware) for aluminum, hollow metal and wood doors. Training to include use of installation manuals, hardware schedule, templates and physical products samples.

**The Exit device and door closer manufacturer's Representative shall complete a post installation review for proper adjustment and installment of exit and closers prior to building turnover to the College. A report shall be submitted to the Architect for his/her review and information.**

## SPECIFICATION GUIDELINE

### SECTION 08 10 00 HOLLOW METAL DOORS & FRAMES

#### HOLLOW METAL FRAMES

1. Approved manufacturers: ***Ceco, Curries, and Steelcraft***. All hollow metal doors and frames shall be from a single source (manufacturer).
2. Manufacturers shall provide documentation for UL10C or other approved testing agency stating that hollow metal applications have passed UBC 7-2. All necessary instructions and documentation shall be supplied to job site as required for code official's approval of application.
3. ***All frames shall be set up and arch welded. Knock down frames will not be accepted.***
4. Frames in Interior locations shall be 16 gauge cold rolled, pickled and annealed steel free from scale, pits of other defects.
5. **Frames in exterior and vestibule locations shall be 14 gauge hot dipped galvanized steel having A60 zinc** – iron alloy coating per ASTM924.
6. Frame reinforcements
  - a. Spreader bars – 16 gauge channel (2 min per door opening) Spreader bars shall be removed prior to plumbing and securing frame in wall.
  - b. Hinge reinforcements shall be 7 gauge.
  - c. Provide high frequency hinge reinforcements at **top & bottom hinge of all exterior frames and high traffic applications** such as auditoriums, cafeteria, stair wells, and loading dock areas.
  - d. Surface mounted closers and overhead stops, holders reinforcement shall be 14 gauge steel plate welded inside jamb.
  - e. Reinforce for rim mounted strikes with 14 gauge steel sheet welded on inside of jamb.
  - f. Drill and tap for surface mounted hardware at job site.
  - g. Strikes for mortise locks and cylindrical locks shall be 4-7/8" and conform to ANSI A115.1 and A115.2
7. Fully enclosed mortar boxes over all mortise hardware preparations.
8. Frames shall be tennon and butt type construction with face corners mitered. Fully back weld inner jamb including stops.
9. A sample section of welded frame corner shall be submitted for review at Architects request.
10. All mortised Hardware shall be prepared by manufacturer or supplier prior to delivery using hardware manufacturers templates. Surface hardware shall be drilled and tapped in the field.
11. Provide a minimum of 3 anchors per standard height or 2'6" on center. Provide additional anchors per manufacturers recommendations for frames 7'6" and higher and fire rated frames.
12. Provide all necessary sleeves or clips at frame splices and weld all field splices to match frame. Splices must be welded and ground smooth and puttied if necessary to conceal splice.
13. Frames shall have three rubber silencers per strike jamb and two per double door head applied by manufacturer.

## SPECIFICATION GUIDELINE

### SECTION 08 10 00 HOLLOW METAL FRAMES AND DOORS

#### HOLLOW METAL DOORS

1. Approved manufacturers: **Ceco, Curries, and Steelcraft**. All hollow metal doors and frames shall be from a single source (manufacturer).
2. Manufacturers shall provide documentation for UL10C or other approved testing agency stating that hollow metal applications have passed UBC 97. All necessary instructions and documentation shall be supplied to job site as required for code official's approval of application.
3. Doors in Interior locations shall be 18 gauge cold rolled.
4. ***Doors in exterior and vestibule locations shall be 16 gauge hot dipped galvanized steel having A60 zinc – iron alloy coating per ASTM 924***
5. Door Hardware reinforcements
  - a. Reinforce for rim exit devices with 14 gauge steel channels projection welded or bonded to the door edge at lock and hinge side of door. Reinforce at top and bottom of doors for surface mounted vertical latches.
  - b. Reinforcement for Mortise locks shall be 14 gauge steel projection welded to edge of door with stabilizing tabs to keep lock body centered in mortise.
  - c. Reinforcement for cylindrical latch/locksets with 16 gauge steel projection welded to edge of door. The reinforcement to include tabs to center the latch bolt horizontally and vertically.
  - d. Reinforcement for flush bolts shall be 16 gauge steel angle projection welded to edge of door or 14 gauge steel astragal with tabs drilled and tapped to receive flush bolt.
  - e. Reinforcement for surface mounted door closers and overhead stops and holders shall be 14 gauge steel channel 14" deep x 20" long.
  - f. Provide high frequency hinge reinforcements at **top & bottom hinge of all exterior Doors and in high traffic applications** such as stair wells, cafeterias and loading dock areas.
6. Mortised Hardware preps including function holes shall be prepared by manufacturer or supplier prior to delivery to job site using hardware manufacturer's templates. Trim holes and mounting holes shall be field drilled and tapped.
7. Surface mounted hardware shall be drilled and tapped in the field.
8. Doors shall have 1/8" in 2" bevel both hinge and strike edge of door.
9. Reinforce top and bottom of door with 18 gauge steel channel welded to face skins.
10. Light kits shall be one piece 24 gage formed steel with reinforced and welded corners. Kits shall be flush with face of door and have no exposed fasteners.
11. Finish tops of exterior doors with flush top cap welded or applied with screws to secure top cap into top channel of door. All seams and exposed fasteners shall be completely sealed & watertight.
12. Honey comb core is standard specified construction. Polystyrene core doors in locations as dictated by insulation value requirements for that location are acceptable. **Vertical stiffened doors will not be accepted.**

### HOLLOW METAL DOORS-continued

13. **Avoid dark color finish paints on Poly doors at exterior applications.** *Poly doors painted in dark colors may absorb heat from the sun and swell to causing binding in the frame.*
14. Manufacturers shall provide documentation illustrating test results of ANSI a250.4 and ANSI A250.5.
15. Tubular seamless hollow metal doors based upon Steelcraft "S" series door shall be considered in lieu of Aluminum stile and rail doors based on specific needs of openings.
16. STC rated doors shall be considered for Music practice rooms, band and chorus rooms and all other music instruction rooms.



## SPECIFICATION GUIDELINE SECTION 08 20 00 WOOD DOORS

### WOOD DOORS

1. Approved manufacturer: Oshkosh or equivalent doors by Marshfield, Algoma and Eggers that meet this guide. All wood doors shall be from a single source (manufacturer).
2. Manufacturers shall provide documentation for UL10C or other approved testing agency stating that wood applications have passed UBC 7-2. All necessary instructions and documentation shall be supplied to job site as required for code officials approval of application.
3. Face veneer standard shall be Premium "Grade A" in all applications receiving stain and / or clear finish.
4. Core construction
  - a. Doors shall be Hot Pressed, 5 ply construction.
  - b. PC-5 standard solid core doors at non rated applications
  - c. PC-5 particle core door (FD 1/3)
  - d. Mineral core door (FD ¾)
  - e. Mineral core door (FD 1)
  - f. Mineral Core door (FD 1-1/2)
5. Stile and rail construction
  - a. "Superstile" on mineral core doors
  - b. Stiles shall be structural composite lumber rails and inner
6. Door Hardware Reinforcement for fire rated mineral core doors.
  - a. Reinforce Rim exit devices on mineral core doors with lock blocks on strike and hinge side of door. Include 6" top rail and corner block for surface vertical rod devices
  - b. Reinforce surface mounted door closers, overhead stops and holders with 6" top rails on mineral core doors.
  - c. Lock blocks are not required at cylindrical or mortise lock / locksets.
7. Door Hardware Reinforcement for non-rated and 20 minute Particle core doors.
8. Manufacturer's standard stiles and rails.
9. Mortised Hardware preps including function holes shall be prepared by manufacturer or supplier prior to delivery to job site using hardware manufacturer's templates. Trim holes and mounting holes shall be field drilled by the contractor.
10. Surface mounted hardware shall be drilled in the field by the contractor.
11. Doors shall have 1/8" in 2" bevel both hinge and strike edge of door.
12. Light kits shall be flush to face of door in species of wood to match face of door or veneer wrapped mineral core for fire rated doors. Flush Metal vision frames by Air Louver type "Slim Line" or approved equal are approved as alternate to wood kits.
13. Manufacturer shall provide a written life time warranty against warping and delamination of door. Supplier shall turn warranty over to Carleton College at conclusion of project.
14. Handling, Job site storage, and field finishing by contractor shall be performed per manufacturers published recommendations.

## SPECIFICATION GUIDELINE

### SECTION 08 70 00 HARDWARE

**Substitutions or Alternates not permitted unless noted below**

#### 1. HINGES

**Acceptable manufacturers and respective catalog numbers:**

	<u>Ives</u>	<u>Stanley</u>	<u>Hager</u>
Standard Weight, Ball Bearing	5BB1	BB179	BB1279
Standard Weight, Ball Bearing, Non-Ferrous	5BB1	FBB191	BB1191
Heavy Weight, Ball Bearing	5BB1HW	FBB168	BB1168
Heavy Weight, Ball Bearing, Non-Ferrous	5BB1HW	FBB199	BB1199

*Note: All exterior hinges to be NRP.*

#### 2. CONTINUOUS HINGES

**Acceptable manufacturers and respective catalog numbers:**

	<u>Ives</u>	<u>Markar</u>
Edge Mount Pin & Barrel Stainless Steel Continuous Hinge	700	FM-300
Edge Mount Hinge/Guard Pin & Barrel Stainless Steel Continuous Hinge	705	FM-305

*Note: Use continuous hinges for all exterior doors. Use continuous hinges on all interior doors over 36".*

#### 3. FLUSH BOLTS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Ives</u>	<u>Door Controls</u>
Dust Proof Strike	DP1/DP2	80
Auto Flush Bolt (Metal Door)	FB31P	842
Auto Flush Bolt (Wood Door)	FB41P	942
Manual Flush Bolt (Metal Door)	FB458	780
Manual Flush Bolt (Wood Door)	FB358	790
Constant Flush Bolt (Metal Door)	FB51P	845
Constant Flush Bolt (Wood Door)	FB61P	945

*Note: All flush-bolt applications must be UL listed to be installed with top flush-bolt only. Auxiliary Fire Bolt required for fire rated openings when less bottom bolt.*

#### 4. REMOVABLE MULLIONS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Von Duprin</u>	<u>NO SUBSTITUTION</u>
Non Fire Rated	KR4954	
Fire Rated	KF9954	

*Note: Keyed removable mullions required at all shipping / receiving areas and all exterior pairs of doors with panic exit hardware where possible. Keyed removable mullions also preferred on interior pairs where appropriate.*

## 5. EXIT DEVICES

**Acceptable manufacturers and respective catalog numbers:**

	<u>Von Duprin</u>	<u>NO SUBSTITUTION</u>
Wide Stile, Push Pad	98 / 99 Series	
Narrow Stile, Push Pad	33 / 35 Series	
Wide Stile, Cross Bar	88 Series	
Recessed Push Pad	94 / 95 Series	
Lever Trim	996 Series	
Pull Trim	990 Series	

*Note:*

- 1) 99 Rim Device preferred (Rim x Keyed Mullion on pairs when possible)
- 2) QEL 99 preferred on perimeter electronic access doors.
- 3) Von Duprin-Inpact Door System preferred on Fire-rated cross corridor applications.
- 4) Cylinder dogging required on all non-rated exit devices. Less electronic controlled openings.
- 5) No vertical rod devices allowed on exterior doors.
- 6) One night latch cylinder required at each exterior entrance area.
- 7) 06 Preferred lever design.
- 8) Supply 1 ea. Von Duprin Parts kit in a hardware group for new construction and large renovations.
- 9) Use Von Duprin EPT-10 power transfer when using EL device.

### EXAMPLES OF SPECIFIC REQUIREMENTS

	<u>Von Duprin</u>
Rim Panic	99 Series
Surface Vertical Rod Device preferred	9927 LBR
Concealed Vertical Rod Device (hollow metal doors only)	9947 (secure)
Concealed Vertical Rod Device (hollow metal doors only)	9947 LBR (non-secure area)
Impact Devices (hollow metal doors only)	9547 (secure)
Impact Devices (hollow metal doors only)	9547 LBR (non-secure area)
Exterior Trim	990 Series
Lever Trim	996L-06
Cylinder Dogging (CD)	All non-rated locked doors
Latch retraction	QEL
Power transfer (required on doors with electrified devices or locks)	EPT
Delayed egress (exit only)	CX99EO
Delayed egress (mechanical entry from pull side)	CX9975L
Power Supply (Electric latch retraction devices)	PS873-2
Power Supply (Delayed egress devices)	PS873

## 6. LOCKS AND LATCHES

### MORTISE LOCK FUNCTION APPLICATIONS

<u>Application</u>	<u>Schlage Function</u>	<u>Best Function</u>
Classroom	L9071 - Classroom Security	INL - Intruder
Office	L9050 - Office	AT - Office
Storeroom / Custodial Coop / Trash	L9080 - Office Storeroom	–D - Storeroom
Mechanical / Electrical	L9080 - Storeroom	D - Storeroom
RES: Study / Lounge / Gaming / Kitchen	L9071 - Classroom Security	INL - Intruder
Non egress door between rooms	L9082 - Institution	W - Storeroom
Multi-person restroom	L9071 - Classroom Security	INL - Intruder
Single restroom	L9456 - Corridor	T - Dormitory
Dormitory Room	AD250 Series -	None

### CYLINDRICAL LOCK FUNCTION APPLICATIONS

<u>Application</u>	<u>Schlage Function</u>	<u>Best Function</u>
Classroom	ND95 - Classroom Security	INL - Intruder
Office	ND92 - Office	AB - Office
Storeroom / Custodial Coop / Trash	ND96 – Storeroom	–D - Storeroom
Mechanical / Electrical	ND96 - Storeroom	D - Storeroom
RES: Study / Lounge / Gaming / Kitchen	ND95 - Classroom Security	INL - Intruder
Non egress door between rooms	ND82 - Institution	W - Storeroom
Multi-person restroom	ND95 - Classroom Security	INL - Intruder
Single restroom	ND73 - Corridor	H – Hotel / I - Privacy
Dormitory Apartment Room	AD 250 Series -	None

*Note:*

*Mortise lock is preferred lock type.*

*For renovation projects, contact College Locksmith for type and series of lock.*

## 7. ELECTRONIC LOCKS

***Acceptable manufacturers and respective catalog numbers:***

	<u>Schlage Electronics</u>	<u>NO SUBSTITUTIONS</u>
Cylindrical Lockset	AD 250 / 300 / 400 Series	
Mortise Lockset	AD 250 / 300 / 400 Series	
Exit Device Trim	AD 250 / 300 / 400 Series	

## 8. KEYING

**Acceptable manufacturers and respective catalog numbers:**

Best                      No Substitution

SFIC 7 pin

*Note:*

*Keying/Cores Supplied by Owner*

*Contact: College Locksmith for construction and/or permanent keying instructions.*

## 9. PULLS, PUSH PLATES, PUSH BARS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Burns</u>	<u>Hiawatha</u>	<u>Ives</u>
Offset Pull (1 ¼" dia., x 12")	*****	HG111	*****
Push Bar (1 ¼" dia.)	*****	HG100 Series	*****
Straight Pull (1" dia., 10" ctc)	26C	536B	8103EZ-0
Offset Door Pull (1" dia., 10" ctc)	39C	658A	8190-0
Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 26C	1081LBPx 536B	9103EZ-0
Offset Pull / Push-Bar (1" dia., 10" ctc Pull)	422 x 39C	1081LBPx658A	9190-0
Push Plate (.050 4"X 16")	54	200F	8200 4 x 16
Pull Plate (1" dia., 10" ctc - .050" X 6" X 16")	5626C	536Bx200F	8303EZ-0 6" X 16"

## 10. COORDINATORS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Ives</u>	<u>Door Controls</u>
Bar Coordinator	COR x FL	600 x Filler
Mounting Bracket	MB Series	AB, C Series

## 11. DOOR CLOSERS

**Acceptable manufacturers and respective catalog numbers:**

<u>LCN</u>	<u>NO SUBSTITUTION</u>
4041 EDA / H-Cush / HEDA	
4041 H	
4040 SE	Sentronic
4310 / 4410 ME	Sentronic

*Note:*

- 1) *Use auxiliary overhead stop where sentronics are used.*
- 2) *All units to be "SE" to wire into existing fire alarm system. A special model number is required for the overhead stop when used in conjunction with a Sentronic unit. Glynn Johnson overhead stop suffix is "SE"*
- 3) *Install top jamb gasket prior to installing closer on perimeter doors.*

## 12. LOW ENERGY AUTOMATIC OPERATORS

*Acceptable manufacturers and respective catalog numbers:*

### LCN

### NO SUBSTITUTION

4642 Low Energy Operator

4631 Low Energy Operator

## ACCESSORIES

### LCN

### NO SUBSTITUTION

Mullion Activator 8310-918

Bollard Activator 8310-952

Wall Activator 8310-956

RF Wall Activator 8310-967

RF Bollard Activator 8310-952RF

RF Receiver 8310-931

Bollard 8310-966

Schlage Electronics

Key Switch shut off 653-04

*Note: Provide keyed shut off (key switch) to turn system off using Schlage Electronics 600 series key switch. Key switch must be keyed to College's key system.*

## 13. ELECTRIC STRIKES

*Acceptable manufacturers and respective catalog numbers:*

### Von Duprin

### No Substitution

Type 1 6000 Series

## 14. MAGNETIC LOCKS

*Must be pre-approved before use.*

## 15. KICK PLATES AND MOP PLATES

*Acceptable manufacturers and respective catalog numbers:*

### Hiawatha

### Ives

### Hager

Where specified, provide 10" kick plates, 36" armor plates, and 4" mop plates. Unless other-wise specified, metal protective plates shall be .050" thick; plastic plates shall be 1/8" thick.

Protective plates shall be 2" less door width, or 1" less door width at pairs. **All protective plates shall be beveled 4 sides and counter sunk.** Protection plates over 16" shall not be provided for labeled doors unless specifically approved by door manufacturers listing.

Where required by adjacent hardware, protection plates shall be factory drilled for cylinders or other mortised hardware.

Armor plates should be specified for use on doors in service areas such as kitchens, and receiving areas, etc.

*Note: All kick plates to be beveled on all four (4) edges.*

## 16. OVERHEAD STOPS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Glynn-Johnson</u>	<u>Rixson</u>
Heavy Duty Surface Mount	GJ90 Series	9 Series
Heavy Duty Concealed Mount	GJ100 Series	1 Series
Medium Duty Surface Mount	GJ450 Series	10 Series

*Note:*

- 1) *Special application is required when using an auxiliary overhead stop in conjunction with a sentronic closer or hold open. Glynn Johnson suffix is "SE".*
- 2) *Medium duty OHS acceptable in non-student office areas only.*

## 17. WALL STOPS, HOLDERS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Ives</u>	<u>Hager</u>	<u>Burns</u>
Wrought Concave Wall Bumper	WS406CCV	236W	575
Extended Wall Stop	WS11/WS11X	255W	530
Automatic Wall Holder	WS40	254W	533

*Note: Floor stops will not be accepted*

## 18. MAGNETIC HOLD OPENS

**Acceptable manufacturers and respective catalog numbers:**

	<u>LCN</u>	<u>Edwards Signaling</u>
Wall Holder	SEM 7800	1500 Series
Closer Holder	4040 SE	**
Closer Holder	4310ME / 4410 ME	**
Track Holder	S E H	**

*Note:*

- 1) *Magnetic Wall Holder must have die cast metal housing*
- 2) *Wherever possible, use wall magnetic holders.*
- 3) *With each sentronic closer, apply GJ90 x SE overhead stop. (Special templating required) Stop in closer arm to coincide with engagement of SEH holder.*
- 4) *Must be powered by the fire alarm system.*

## 19. WEATHER-STRIP, THRESHOLD, GASKETING

**Acceptable manufacturers and respective catalog numbers:**

	<u>Pemko</u>	<u>Zero</u>	<u>Reese</u>
Weather-strip	35041	8305	961
Adhesive Gasket	S88	188S	797
Automatic Door Bottom	4131	360 Series	320
Sweeps	18061_NB	8192	964
Drip Cap	346	142	R201
Top Jamb Gasket	290PK	429	855
Astragal	309P-PG	98	804
Threshold	1710	8655	S425

*Note: Coordinate finish to match doors i.e. bronze or aluminum. In aluminum door/frame section.*

## 20. KEY CABINETS

**Acceptable manufacturers and respective catalog numbers:**

	<u>Lund</u>	<u>Key Control</u>	<u>Telkey</u>
Wall Mount Cabinet	1200-1205 AA	M228-2480	RWC-AWC
*Furnish 1 each model 1200 series key cabinet with a capacity 1.5 times the number of key sets.			
Provide one key cabinet with at least one hook for each key set, plus additional hooks for 50% expansion.			
Furnish key cabinet complete with cam lock, permanent key tags, and change key cards.			

**Notes:**

- 1) *All existing hardware to be removed and turned over to College Maintenance Staff.*
- 2) *Install all hardware with manufacturer's provided fasteners.*
- 3) *The hardware supplier must supply opening specific electrical diagrams covering the application specified. These must be submitted with the shop drawings to the Architect as well as to the General Contractor for installation and a copy retained for Carleton College's file.*
- 4) *All hardware must comply with current fire, safety listings, and codes and must bear label from UL, WH or other recognized testing agency.*
- 5) *All Architectural hardware shall be manufactured no earlier than 6 months prior to shipping to job site for installation.*



## FINISHES AND BASE MATERIALS

A. Except where indicated otherwise, hardware finishes shall be applied over base metals as specified in the finish schedule that follows.

B. Finish Schedule:

<u>HARDWARE ITEM</u>	<u>FINISH AND BASE MATERIAL</u>
1. Butt Hinges	
Exterior	US32D (BHMA#630)
Interior	US26D (626 or 652)
2. Continuous Hinges	US32D
3. Flush Bolts	US26D
4. Exit Devices	US26D with US32D touch pad
5. Locks and Latches	US26D
6. Pulls and Push Plates/Bars	US32D
7. Coordinators	Prime painted or mill alum.
8. Closers	Powder coat aluminum
9. Protective Plates	US32D
10. Overhead Stops	US32D
11. Wall Stops and Holders	US26D or US32D
12. Thresholds	Mill Aluminum
13. Weather-strip, Sweeps Drip Caps	Aluminum Anodized
14. Magnetic Holders	US2CD (603)
15. Miscellaneous	US26D on brass or bronze

**NOTE: ALL HARDWARE INCLUDING ALUMINUM DOOR HARDWARE  
TO BE SPECIFIED IN DIVISION 87 10 00. COORDINATE HARDWARE FINISHES WITH  
ALUMINUM DOOR & FRAME SECTION TO MATCH**

**PLEASE CONTACT CARLETON FACILITIES OFFICE FOR INFORMATION REGARDING CURRENT  
MANUFACTURER'S REPRESENTATIVES. (507) 222-4101**

## **11. INTERIOR COMPONENTS**

### **Introduction**

Carleton's Interiors Standards have been put in place so that the design team professionals and contractors hired to provide plans and specifications are informed as to the level of design required by the College. Compliance with the Carleton Construction Standards is mandatory for all designers and contractors hired by the College. These standards are not intended to limit design expressions or material selections, but rather guide designers and contractors in ways to expedite project completion within acceptable College standards. Substitute materials will be considered by College staff upon submission of qualifying documents.

### **Flooring**

#### **A. Ceramic Tile**

1. Tile should comply with the ANSI Ceramic Tile Standard.
2. Ceramic tile should be a minimum ¼" thick, square or cushion edges, matte finish with opaque glaze. Size and color to be chosen by the Project Manager.
3. Tile installation should be in compliance with ANSI A108 "Specifications for Installation of Ceramic Tile."
4. Grout sealer to be of a high quality, commercial grade.

#### **B. Sheet Vinyl (commercial grade)**

1. Vinyl sheet flooring is to have 20 mil wear layer, 80 mil thickness.
2. Traffic rating of moderate to heavy is preferred.
3. Sheet vinyl products to carry 10-year commercial warranty and lifelong fade warranty.
4. Sheet vinyl products to be installed with no VOC adhesive.
5. VCT is to be a minimum 1/8" thickness, 12"x12". Prefer Armstrong or equivalent.
6. VCT is to be stripped and waxed by contractor prior to completion of the project. The College will provide floor stripper and wax.

#### **C. Carpet Tile and Broadloom Carpet**

1. Carpet tile to be 100% solution-dyed nylon (Eco Solution Q, preferred), 1/10 minimum thickness, .160 pile height (minimum), 90 oz./sq. yard total weight and carry a lifetime commercial limited stain warranty. 100% recyclable carpet tiles are preferred.
2. Carpet is to be glued down directly to substrate. Alternate methods to be considered on a case by case basis.
3. Carpet tile installation method (monolithic, ¼ turn, ashlar, etc.) to be approved by the Project Manager.
4. All carpet pile to run in the same direction.
5. Broadloom carpet (12' & 15' widths) to be 100% solution-dyed nylon (Eco Solution Q, preferred), 1/10 gauge, minimum 24 oz. pile weight, minimum 60 oz. total weight and carry a 10-year quality assurance and lifetime stain warranty. 100% recyclable broadloom carpet is preferred.
6. Remove loose threads and clean thoroughly prior to completion of project.
7. Carpet is to be protected until project completion.
8. Carpet attic stock is to be from same dye lot and run as installed product.

9. Attic Stock: stock only one 8x8 roll of broadloom, one box of carpet tile, no more than a 5'x5' piece of sheet goods, and/or one case of LVT plank, etc. from a project in the Goodhue carpet storage area. Mark flooring stock with date and location before storing.

**D. Resilient Base**

1. Vinyl base is to be smooth surface with cove profile. Prefer Armstrong, Johnsonite, Roppe, or approved equivalent.
2. Vinyl base should be 100% recyclable, 1/8" thick, SCS floorscore certified and meet the ASTM-F 137 flexibility requirements.
3. 4" is the standard on campus, but some areas (locker rooms) may require 6" base.
4. The College accepts vinyl base, carpet base, and wood base. Project Manager will approve final selection.

**E. VCT (Vinyl Composition Tile) Flooring**

1. VCT is to be minimum 1/8" thickness, 12"x12" size. Prefer Armstrong or approved equivalent.
2. Rating: commercial traffic—extra heavy rating.
3. VCT to carry 5-year commercial warranty.
4. Installation should be with no VOC adhesive.

**F. Rubber Flooring**

1. Rubber flooring is to be Nora, Norament 925 Grano or approved equivalent.
2. Rubber flooring to be a minimum of .14" (3.5mm) thick, be rated "extra heavy," slip-resistant, and offer a 10-year limited wear warranty.
3. Installation should be with no VOC adhesive.

**Acoustical Ceiling Grid and Tiles**

1. Preferred ceiling tiles are USG #414, frost, ClimaPlus, 2'x2' tegular tiles. Tiles are to be no-VOC and offer anti-mold and mildew protection. USG white vinyl coated gyp panels are standard in bathrooms, kitchens and other high-humidity, damp or wet locations. Verify proper tile with Project Manager if there is a question.
2. Grid is to be exposed white aluminum. USG DONN DX or equivalent. Galvanized steel may be required in some locations.
3. Provide appropriate grid and tile systems for high moisture areas, food prep areas, or areas that require frequent cleaning.
4. Concealed spline systems should not be used under any circumstances.
5. Attic stock for ceiling grid and tile to be determined by Project Manager.

**Paint**

1. Interior Paint: Sherwin-Williams, ProMar 200, zero-VOC latex.
  - Residential Halls, academic and office buildings: rooms—eggshell finish; halls, baths, kitchens and common areas—semi-gloss finish.
  - Ceilings: Sherwin-Williams, ProMar 400 flat white in all areas except kitchens, baths and shower areas.
2. Exterior Paint: Sherwin-Williams, Superpaint, Duration, or Emerald Exterior, satin or eggshell finish.
  - Steps and decks: Sherwin-Williams Porch and Floor paint.
3. Metal Interior/Exterior: Sherwin-Williams, Protective and Marine Coatings DTM Acrylic, semi-gloss or gloss finish. Use rust-inhibitive primer.

4. Interior Wood Stain and Finish: consult with project manager before proceeding.

#### **Bathrooms, Bathroom Accessories and Toilet Partitions**

1. Campus buildings serving the general student or public population must include at least one all-gender restroom.
2. Prefer shower floors, surrounds, etc. to be solid surface material. Ceramic tile is acceptable. Use of fiberglass surrounds is not permitted.
3. Bathroom countertops are to be solid surface material.
4. Toilet partitions are to be 1" thick solid plastic, floor/wall mounted (no ceiling mounted partitions are allowed). Comtec or equivalent. All connections must be bolt-through.
5. Handicap grab bars are to be stainless steel, peened finished and meet all ADA requirements—installed by contractor.
6. The following bathroom accessories will be supplied by the College and installed by the contractor: toilet paper holders, sanitary napkin dispenser and disposal, and soap and paper towel dispensers. Specifications are available from the Project Manager upon request.
7. Shower curtains will be supplied by the College and installed by the contractor. Standard shower curtain length is 72".
8. Coat hooks shall be provided in the restroom and within each divided stall.
9. A book shelf shall be provided in each restroom that is visible from within the restroom (not in entryway).

#### **Office Furniture**

1. Office desks, tables, file cabinets, etc. shall be from the Steelcase "Answer" collection in the following finishes: paint-7239 Midnight, laminate-2850 Vanadium Fiber, edge detail-6654 Sand, panel trim-7225 Sand, panel fabric-New Boccie P200 Rice, pulls-9211 Nickel.
  - Office chairs shall be Steelcase "Leap" or "Amia." Fabric: Buzz2 5F17 Black, plastic: 6205 Black
  - Guest seating shall be Steelcase "Move" chairs in fabric: Crosswalk 5F55 Midnight, plastic: 6205 Black.

#### **Classroom Furniture**

1. Classroom furniture shall be supplied by Krueger International (KI) Furniture, Green Bay, WI
  - Tablet arm chairs to be KI "Torsion-on-the-Go" style, frame/seat back/tablet arm to be in "black," upholstered backs and seats in fabric: Pallas/Spun/Ink or approved equal, with carpet casters where applicable.
  - KI "Node" chairs are acceptable in classroom settings as well. Please consult with Project Manager when considering what specific furniture selections are to be made.
  - Other classroom furniture (podiums, tables, desks, etc.) are to be supplied by either KI or Steelcase in campus-standard colors.

#### **Custodial Closets**

1. Custodial closets are to be located in corridors. Closets within bathrooms are not permitted.

2. There is to be a minimum of one custodial closet per floor for all buildings.
3. All custodial closets are to have a floor mounted sink — 24"x 24"x 10".
4. Closets must allow for 3' of wall space for chemical rack that will be supplied and installed by the College.
5. Room must accommodate a wall mounted mop/broom holder that is 34" in length. The College will supply and install the equipment.
6. Floor in custodial closets is to be sealed concrete.
7. Must provide adequate shelving that will allow for bottles of cleaning products.
8. Each custodial closet must allow floor space for a mop bucket.
9. Each building must have one custodial closet that is large enough to store the following: Taski Floor Scrubber, vacuum, mop bucket, and a trash/linen cart.
10. At least two electrical outlets must be provided that are on a dedicated circuit.

### **Interior Signage**

1. Any questions regarding signage should be directed to the Carleton Facilities Office: (507) 222-4167.
2. Interior signage is to be installed according to ADAAG Section 4.30.6.
3. Archetype and ASI Signage are the preferred suppliers for all interior signage.
4. The following color designations are to be used in all buildings on campus:
  - Academic and administrative buildings – Light Brown SC-803
  - Student residences, athletic facilities, and Chapel – Wine SC-224
  - Sayles-Hill – Emerald SC-513
  - White lettering is to be used on all signage.
  - Buildings that have not used this color designation are: Center for Mathematics and Computing, Language and Dining Center, Cassat Hall, and James Hall.
5. Verify final signage selections with Carleton Facilities Office.
6. The following tables provide information to determine the correct sign for each location:

### **Tactile ADA Signs**

<b>Location Used</b>	<b>Size</b>	<b>Sign Identification</b>
Room number for offices, classrooms, and other rooms.	2" x 4"	ADA Room ID Number
Room number for large office or suites	2" x 10"	ADA Header
Locations where non-numbered tactile info is considered important	6" x 10"	ADA Header
"Emergency Exit Only" Signs, Floor Identification, Stairs	4" x 4"	ADA Floor/Exit ID
Restrooms signs designating gender	9" x 6"	ADA Restroom and Room ID Number

### **SPE (Subsurface Graphics) Signs**

<b>Location Used</b>	<b>Size</b>	<b>Sign Identification</b>
Addition to a 2" x 10" Header for more permanent information.	2" x 4"	SPE

Permanent spaces to give information when tactile is not necessary.	6" X 10"	SPE
Secondary directional information. Used individually or in groups.	2" x 10"	SPE Directional Pieces
Fire code signs to be installed in closed stairwells and dorms	12" x 12"	SPE Stairwell Sign
Placed near elevator.	9" x 6"	SPE "In Case of Fire"

### Window Modules

Location Used	Size	Sign Identification
Used as addition to a 2" x 4" Header in offices and classrooms.	2" x 4"	Window Unit
Used as addition to a 2" x 10" Header for large offices, departments, etc.	12" x 10"	Window Unit
Used as addition to a 2" x 10" Header for large offices, departments, etc.	6" x 10"	Window Unit
Used as name window for 2" x 10" Headers. Rarely used.	2" x 10"	Window Unit

### Other Signage

Location Used	Size	Sign Identification
Tack boards for faculty offices and classrooms.	12" x 4"	Framed tack boards
Sign is to be placed on glass so that back of sign is not seen.	N/A	Glass Backers

### Exterior Signage

1. Designer to verify city requirements for street address sign locations for emergency vehicles.
2. Carleton College will purchase and install all exterior signage.
3. The main entrance to all buildings on campus is to receive a standalone monument sign that is 24"x 24".
4. An 18"x 24" plaque style sign is commonly installed on the exterior wall at 2<sup>nd</sup> entrance locations.
5. Please verify exterior signage locations with the Carleton Facilities Office (507) 222-4167.

### Miscellaneous Specialties

1. Clocks are to be Power over Ethernet custom logo as supplied by American Signal. The logo and network configuration is on file.
2. Chalkboards – Classrooms to have slate chalkboards with finished edges and chalk tray.
3. Marker boards – Vitreous porcelain enamel on 24 or 28 gauge steel facing sheet with 3 coats fired-on marker surface. Marker boards to be installed in any lab.

## 12. ELEVATORS

1. Preferred manufacturers: Schindler and ThyssenKrupp
2. Flooring in elevator car will be determined by location. Resilient flooring is prohibited.
3. Phone connections to the elevator will be provided by Carleton Telecommunications Office.
4. Contractor to supply protective hanging pads and associated hooks.

## **13. Bituminous Pavement, Concrete and Hardscapes**

### **Campus Roads, Sidewalks and Hardscapes**

This section includes specifications and related details pertaining to campus road, sidewalk and hardscape construction. Please note campus sidewalk details include two concrete details. It will be important that you are aware of the location and intended use of the concrete construction scope.

Campus Road Details:

Click on link for specifications: <https://is-grp.sharefile.com/d-sb53135c92b74b4da>

Sidewalk Details:

Click on link for specifications: <https://is-grp.sharefile.com/d-sdc8db6602334c76b>



## **14. LANDSCAPING AND STORMWATER MANAGEMENT**

### **Stormwater**

Carleton College is working towards a Zero Discharge of Building Generated Stormwater. To meet this goal, we should consider the following into the design of new buildings and substantial exterior remodeling projects.

- A. Rooftop rainwater (stormwater) is collected through infiltration systems. Infiltrate stormwater using one or a combination of the resources listed below using the specifications and product manufacturers for each option.
  - 1. Engineered soil depressions, soils for stormwater BMP's.
    - a. Reference: Inspection & Contract Administration Manual for MnDOT Landscape Projects 2013 Edition
  - 2. Subsurface stormwater reuse infiltration piping manufacturer: Prinsco Ecoflow 100 or equal.
- B. Design using the latest design standards and plan approval by College.

### **Landscaping**

- A. Campus Trees
  - 1. Species and location plan to be approved or provided by the College. Special attention will be given to maintain and complement the existing campus landscaping plan which has a park-like random feel that becomes more formal and maintained as one approaches the main buildings on the campus core.
  - 2. The College prefers the use of Minnesota native plants or zone 4b hardiness minimum. Reference the USDA Plant Hardiness Zone Map for additional information as needed for varietal suitability.
  - 3. Only improved varieties for disease and pest resistance will be considered for installation.
  - 4. Only trees that are suited for the intended planting location or urban pressures will be considered.
  - 5. Root girdled plant material will not be accepted.
    - a. Reference: Inspection & Contract Administration Manual for MnDOT Landscape Projects 2013 Edition; root health, plant health and plant rejection standards
  - 6. Structural soils to be used underneath impervious surfaces where trees are planted in or around high stressed areas.
  - 7. Structural soils to be used for tree plantings around boulevards using oversized planting holes and engineered soils. References:
    - a. <http://www.deeprooot.com/products/silva-cell/overviewot.com>
    - b. [www.hort.cornell.edu/uhi/outreach/csc/graphics.html](http://www.hort.cornell.edu/uhi/outreach/csc/graphics.html)
    - c. <http://www.hort.cornell.edu/uhi/outreach/index.htm>
    - d. City of Minneapolis Urban Forest Policy section 3.6 complete and 3.7 complete
  - 8. Tree protection
    - a. Protection during construction and related activities.

- Reference: City of Minneapolis Urban Forest Policy section 3.5.3-3.5.4 complete where MPRB is mentioned, insert Carleton College and replace City Staff with Carleton's Representatives
  - b. Contractor will be assessed \$1,000 per caliper inch of trees damaged due to construction activities.
  - c. Existing trees will be protected and warranted from soil compaction damage throughout construction.
  - d. Barriers will be installed around canopy drip line for trees in the direct path of construction activities.
- B. Planting and Planting Materials
1. New construction, create and maintain positive drainage away from the building foundation. A minimum of a 10:1 slope a minimum of ten feet away from the foundation.
  2. Install a 22" stone maintenance strip around entire perimeter complete with steel landscape edger, black polyethylene 6 mil heavy duty weed barrier and ¾" decorative landscape stone.
    - a. Reference: Metal edging type Permaloc or equal  
<http://www.permaloc.com/products/permastrip.html>
  3. Carleton College is committed to installing low maintenance plantings. In order to comply with that obligation, we are also committed to providing a planting environment that will aid in the performance of the plantings.
  4. Engineered soils for planting beds shall be 50% select topsoil blended with 50% compost from an approved source.
    - a. Reference: Soils for planting beds will comply with the Inspection & Contract Administration Manual for MnDOT Landscape Projects 2013 Edition, specifically planting soils, sources and quality standards.
  5. Building foundation and other planting beds:
    - a. Excavate and remove soils to a depth of 18" throughout planting zone.
    - b. Backfill excavation with engineered planting soils to full depth.
    - c. Place markers at transition zones for future planting operations.
  6. Preconstruction meetings will determine the risk, tie-back and pruning requirements for work around existing landscape areas. Pruning and tie backs will be performed by the owner.
  7. Extreme care will be taken while working in these zones. All landscape damage will be assessed at the end of the project.
  8. Dust and debris on, in or around existing landscapes will either be washed off or cleaned up in an acceptable manner.
  9. Seed and sod use for site restoration will be approved by the College.
- C. Soils and Work Zones
1. Soils
    - a. New construction:
      - Remove contaminated soils from the site
      - Rototill, disk to a depth of 8" general site
      - Rototill, disk haul routes, staging areas to a depth of 12"
      - Import high quality, friable, free draining topsoil as needed to re-establish grades

- Remove and dispose of all stone, fabric, and debris used for construction
    - b. Existing site:
      - Remove contaminated soils from the site
      - Rototill, disk to a depth of 8" where soils have been disturbed
      - Rototill, disk haul routes, staging areas to a depth of 12"
      - Import high quality, friable, free draining topsoil as needed to re-establish grades
      - Remove and dispose of all stone, fabric, and debris used for construction
  - 2. Work zones:
    - a. Shall be fenced or maintained with temporary materials to maintain the minimum size of the required work zone
    - b. No staging of equipment or materials out of established work zone
  - 3. Contractor clean-up:
    - a. Site to be left in as good or better condition than original
    - b. Damage caused by equipment, rutting, scuffing and other damages to turf or hard surfaces will be corrected to original or better condition
  - 4. Jobsite waste management:
    - a. At times during the day, the contractor needs to inspect the site and surrounding areas to pick up windblown materials and waste
- D. Green Roof Systems
1. Green Roof Systems shall be as follows if utilized in the design of a project:
    - a. Follow manufacturers and growers specifications for the proper installation.
      - LiveRoof® Hybrid Green Roof Systems – Bachman's Inc. See link for more information: [http://www.bachmans.com/store-locator.ep?currentNodeBean=Bachmans&pageIndex=\\_pageIndexToKen\\_LiveRoof](http://www.bachmans.com/store-locator.ep?currentNodeBean=Bachmans&pageIndex=_pageIndexToKen_LiveRoof)

## References

Inspection & Contract Administration Manual for MnDOT Landscape Projects 2013 Edition  
<http://www.dot.state.mn.us/roadsides/vegetation/pdf/landscapeinspectionmanual.pdf>

City of Minneapolis Urban Forest Policy  
[http://www.minneapolismn.gov/www/groups/public/@cped/documents/webcontent/convert\\_282934.pdf](http://www.minneapolismn.gov/www/groups/public/@cped/documents/webcontent/convert_282934.pdf)

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DeepRoot Green Infrastructure, LLC  
<http://www.deeproot.com/products/silva-cell>

Cornell University, Department of Horticulture  
[www.hort.cornell.edu/uhi/outreach/csc/graphics.html](http://www.hort.cornell.edu/uhi/outreach/csc/graphics.html)  
[www.hort.cornell.edu/uhi/outreach/index.htm](http://www.hort.cornell.edu/uhi/outreach/index.htm)

Permaloc Sustainable Edging Solutions  
<http://www.permaloc.com/products/permastrip.html>

Prinsco  
[www.prinsco.com/ProductsDetail.cfm?ProdID=2157&PID=125&siteID=1](http://www.prinsco.com/ProductsDetail.cfm?ProdID=2157&PID=125&siteID=1)

Darco Incorporated  
[www.rainwater-storage-tanks.com/rainwater.html](http://www.rainwater-storage-tanks.com/rainwater.html)

United States Department of Agriculture  
<http://planthardiness.ars.usda.gov/PHZMWeb/>

LiveRoof® Hybrid Green Roof Systems  
[http://www.bachmans.com/store-locator.ep?currentNodeBean=Bachmans&pageIndex=\\_pageIndexToken\\_LiveRoof](http://www.bachmans.com/store-locator.ep?currentNodeBean=Bachmans&pageIndex=_pageIndexToken_LiveRoof)