Standards for Commissioned Architects and Engineers

These standards and instructions are required for use by consulting architects, engineers, and other entities involved in construction and renovation projects at Clemson University. In conjunction with the Office of State Engineer's Manual, these Standards help design teams develop quality learning environments and maintain campus facilities responsibly. These Standards are organized according to the 2018 Construction Specification Institute (CSI) MasterFormat.

If unique project conditions justify deviations from these Standards, the Project Manager must submit a Deviation Request, with justification, through the A/E Standards Deviation Portal early in project design to allow adequate review time. Approval of a deviation request applies only to design standards and does not constitute approval of procurement actions, contract modifications, or scope changes under the South Carolina Consolidated Procurement Code. All procurement related matters must follow the South Carolina Procurement Code and University Procurement procedures.

Conformance to these Standards does not relieve designers of their professional responsibility to meet all applicable codes, laws, regulations, ordinances, and other project specific requirements. These Standards include guiding information relevant to design and construction but do not serve as full technical specifications.

Compliance with these Standards does not replace or override procurement requirements under South Carolina law §11353220. Architect and engineer selection is conducted exclusively by designated procurement personnel using the State's qualificationsbased selection process.

The Standards will continue to evolve, and input is always welcome. For questions or suggested improvements, contact the Building Codes Division.

Contents

DIVISION 00 – Procurement Requirements

00 20 00 Instructions for Procurement

South Carolina Procurement Code Compliance

All University advertisements, solicitations, invitations, and purchases of and for procurement of goods and services are to be made pursuant to South Carolina Code of Laws Title 11, Chapter 35, also known as the South Carolina Consolidated Procurement Code. This code establishes the following regulatory agency and policy applicable to University procurements:

- Purchasing methodologies based on procurement value. This can be found in University Procurement Policies and Procedures under Dollar Limitations.
- Authority of the South Carolina Office of the State Engineer. (OSE)
- Compliance with South Carolina Manual for Planning and Execution of State Permanent Improvements (OSE Manual)

South Carolina Joint Bond Review Committee Compliance

Clemson University is a state funded institution of higher education and as such is required to adhere to Title 2, Chapter 47 of South Carolina State Law regarding any permanent improvements. This establishes the following regulatory agency and policy applicable to any construction, renovation, or improvement to University property:

- Authority of the South Carolina Joint Bond Review Committee (JBRC)
- Compliance with South Carolina Policies and Guidance for Establishment of Permanent Improvement Projects

In addition to the above requirements, Clemson's Permanent Improvement Procedure is designed to aid in fulfilling the requirements set forth by the JBRC and the above policy and shall also apply to any permanent improvement on University property.

South Carolina Commission on Higher Education Compliance

Clemson University is a state funded institution of higher education and as such is required to adhere to Title 59, Chapter 103 of South Carolina State Law in regard to any permanent improvements. This establishes the following regulatory agency and policy applicable to any construction, renovation, or improvement to University property.

- Authority of South Carolina Commission on Higher Education. (CHE)
- Compliance with the current SCCHE Policies and Procedures Manual

Procurement of Professional Services

All agreements for Professional Services such as engineering/architectural design, contracting and construction management shall be in compliance with Clemson's Standard Procedure for Negotiating Large Professional Services and the OSE Manual. The OSE Manual includes specific

versions of common AIA agreements and these versions shall be used as specified therein for any professional services rendered to the University.

These sections serve as a list of minimum legal requirements and does not exempt any work from any section of the SC Code of Laws or and any other applicable statutes.

00 31 00 Project Management and Coordination

00 31 19 Existing Condition Information

Existing Drawings and Reports

1. The Owner has available a limited number of "as-built" drawings and surveys for many of the existing facilities on the main campus. The A/E is responsible for the review of the available documents determining their possible benefit in the design of the project.

2. All projects shall comply with South Carolina's asbestos regulations. Clemson's Office of Occupational and Environmental Safety has an active survey of asbestos containing materials (ACM) in facilities on the main campus. Any additional surveys or tests for ACM can be coordinated with the Project Manager in accordance with the A/E Agreement. Incorporate any asbestos related work in project scope and design.

3. The Owner maintains a utility and site map of the main campus that is available for use by the A/E. Critical location and type of utility or other improvement shall be confirmed by additional survey as deemed appropriate by the A/E. Coordinate with University Surveyor prior to the start of any survey.

00 62 00 Certificates and Other Forms

00 62 39 Minority Business Enterprise Certification Form

1. Specify that Clemson has established a goal of 10 percent of the value of procurement contracts and construction contracts or any portion of the awarded contract to be subcontracted to other suppliers. The Contractor is encouraged to offer such business to minority and/or women-owned businesses (MBE's).

2. Specify that the Contractor shall submit a report with each payment invoice to the Project Manager prior to payment being dispersed. This report shall include for each MBE firm contracted with, type of product/service provided, and a comparison of the total actual dollars spent and the actual total contract value. A sample form is available upon request.

DIVISION 01 - GENERAL REQUIREMENTS

01 11 00 Summary of Work

01 11 13 Work Covered by Contract Documents

Scope of Services

The contract between the Architect/Engineer and Clemson University specifies the scope of services to be provided and the procedures to be followed.

1. Adequately describe the extent and scope of the work covered by the design documents, and confirm that the descriptions are clear, consistent and agree regardless of authorship.

2. Describe any extraordinary conditions that exist.

01 11 16 Work by Owner

1. The University retains the right to self-perform or independently contract any work it deems necessary within the scope defined by the A/E Agreement.

2. Clearly describe any work that is planned to be done by the Owner's forces or by other contractors that the Owner has retained.

3. Itemize any work performed or independently contracted by the University that could affect the work of contractors or construction management firms or the completion of work detailed in the A/E Agreement.

01 11 19 Purchase Contracts by Owner

1. The University retains the right to pre-purchase any equipment it deems necessary for the contractor to install.

2. Itemize all purchases described above and specify how equipment is to be handled, including unloading and storage responsibilities.

01 14 00 Work Restrictions

01 14 13 Access to Site

Many projects at Clemson University will require restrictions that will affect construction operations. These include limited physical access to the project site; partial occupation of buildings under construction, surrounding buildings that are in use, pedestrian and vehicle traffic near the project site, and other restrictions due to the nature of construction on a university campus. To accommodate these, the following will be required:

- Clearly specify in construction documents all site access restrictions.

- No construction activity shall take place on football game days.
- If special conditions exist concerning actual routing of traffic and delivery to site, please indicate such on drawings and in specifications.
- Specify that sight distances for intersections and driveways are not impeded by fencing.
- Include wayfinding signage for both vehicular and pedestrian detours on plans.
- Specify that fencing with banners are restrained from toppling without the use of stanchions or sandbags.

01 14 19 Use of Site

1. Provide all necessary details in construction documents needed to install and maintain all site use features.

2. The A/E shall make every effort to minimize the risk of injury to students and personnel and the consequent liability to the University and their agents. The construction site is only intended for use by the contractor for the construction of the facility. It is required to be secured with an approved barrier for the entire project.

3. Specify that any use of the site will comply with the Urban Forest and Landscape Management Policy.

4. All construction operations shall be in compliance with all OSHA regulations for operations involving respirable silica dust and asbestos.

5. Specify that Clemson University is a tobacco-free institution. No smoking or other use of Tobacco Products is permitted on University Property pursuant to Clemson's Tobacco-Free Policy.

6. Minimize noise vibration and dust impacts to nearby buildings and areas. At a minimum the following shall be done:

    - Construction operations on campus during exam week are prohibited.
    - Noisy operations are defined as over 60 dbA in the adjacent interior spaces and 90 dbA at 100 feet from the building exterior and shall not be performed near occupied residence halls prior to 10:00AM.
    - The playing of radios or other such audio devices shall be strictly prohibited.

7. Entrances and exits for public use must be provided to meet code requirements for buildings occupied during construction. At least one path of travel that is accessible to individuals with disabilities must be maintained to all user occupied portions of the building. Signage must meet all applicable ADA requirements.

8. Show all necessary requirements in construction documents regarding access routes, parking, construction fences, temporary utilities, etc. in construction documents.

9. Clearly specify in construction documents any construction job signage, including the project identification signs, as well as other information that may be unique to a particular project.

10. Specify areas of the jobsite that will require dust and or noise control and indicate the methods that will be used to do so.

11. All construction barriers and entrances are required to be approved by the Fire Code Official.

01 20 00 Price and Payment Procedures

1. Price and payment procedures are covered in the requirements as itemized in the OSE Manual, including contract modification procedures

01 31 00 Project Management and Coordination

1. Project management and coordination procedures and responsibilities of the contractor are addressed in the contract documents and as prescribed by the OSE Manual.

01 31 13 Project Coordination

Communication with the Owner's Representative

1. Unless otherwise directed, the Project Manager will be the designated Owner's Representative and first Clemson University contact for all matters. The A/E shall maintain adequate communication with the Owner's Representative throughout the project.

2. Do not take direct instruction from individual user groups unless authorized by the Owner's Representative.

3. Specify that the successful contractor will be required to submit a listing of both their Project Manager and their Field Superintendent to the Owner for approval.

01 32 00 Construction Progress Documentation

01 32 16 Construction Progress Schedule

1. Every University project shall have and maintain an up-to-date construction schedule. The type and detail will be dictated by the type of project and requirements set forth in the OSE Manual and contract documents.

2. Construction schedules shall, at a minimum, properly describe the progression of work to be completed, account for all working restrictions deemed necessary, plan for any needed inspections, estimate and document unsuitable workdays due to weather conditions, and any other factors found to affect the timely prosecution of work.

01 32 33 Photographic Documentation

Photographic documentation shall be performed on all project types contained within the Scope of Work section of the University's Construction Photo Documentation Standards

01 33 00 Submittal Procedures

Drawings

1. Submit Schematic Design and Construction Documents for Review in accordance with the OSE Manual. Design drawings shall be complete, unambiguous, and readable. Legible font size and clarity of layout promotes faster review. For example, the minimum font height of 1/8" may need to be increased for reduced (11x17) paper printing. Do not colorize or texture spaces (such as occupancy type) if that feature hides details.

2. Drawing scales shall be given by both listing the scale (i.e. 1:20 or 1"=10') and providing a scale ruler on each page of plans with scaled information.

3. Provide a North Arrow on all plan sheets.

4. Show the gross and net assignable square footage of the building.

5. List the applicable Codes and Standards for the project including the edition as well as the version of this document. Vesting is based upon the date of the first submittal.

CAD Formatting and Modeling Requirements

1. All construction and record documents shall include the following:

   - A complete plan set in AutoCAD
   - A complete plan set in .pdf form with at least 400 dpi resolution.
   - BIM Models capable of completely describing the building in 2 and 3 dimensions. These models shall adhere to the following standards:

     - BIM models for new construction and renovations shall have a minimum of AIA LOD 400.
     - Existing BIM models effected by new construction or renovation shall be updated to the AIA LOD of the existing model or AIA LOD 400, whichever is greater, as part of the A/E's scope of work.
     - These minimums and any additional requirements deemed necessary will become part of the A/E Agreement with the Owner.

2. All civil designs are to be produced in Auto CAD Civil 3D (version within one edition of current). All C3D designs are to include the following models:

   - Existing Surface, Storm Sewer, and Sanitary Sewer
   - Proposed Surface, Storm Sewer, and Sanitary Sewer
   - As-Built Surface, Storm Sewer, and Sanitary Sewer

3. All Operation & Maintenance and specification manuals shall be in .pdf format.

Technical Specifications

1. The technical specifications shall be developed in a form consistent with the most recent numbering system of the Construction Specification Institute (CSI) this

document.

2. Page numbering shall be consistent throughout the specification booklet, including specifications prepared by design consultants for the lead design group.

3. Specifications shall be produced on 8-1/2" x 11" size media. Adhere to the requirements of the A/E Agreement for submission of specifications in the appropriate electronic media.

4. Provide CSI MasterFormat section number and page number in the header or footer of each page.

Project Closeout Documents

1. All Projects are required to submit all the applicable closeout documentation detailed in Project Closeout Document Checklist.

01 33 16 Design Data

Room Numbering

1. Set room numbering at design development phase and shall follow the Clemson Room and Door Numbering Standards and is subject to the approval of Campus Planning and Design.

2. Coordinate room numbering with all trades such as fire alarms and elevators so that space naming is consistent between building signage and all building systems.

Space and Access Requirements

1. Provide ample headroom at all points where people stand or walk, including over and under stairways and landings. The minimum ceiling heights must be 9'-0" for classrooms, 9'-6" for labs, 8'-0" for corridors, but in no case less than applicable code requirements.

2. All sleeping spaces shall be designed for use by a single gender.

3. Provide separate space for departmental program equipment. Do not locate program equipment in the building mechanical room.

4. Space Allocations and designs shall be in accordance with University Design Guidelines and approved by Campus Planning and Design.

5. Each floor level shall have at least one Inclusive and accessible single occupant restroom centrally located alongside gender specific restroom facilities. These facilities will conform to Clemson's Inclusive Facilities Policy. Each room shall be served by a lockable door and contain a wall-mounted baby changing station. These restrooms shall be identified as Restroom in text and braille and display the universal symbol of accessibility.

6. For projects incorporating bathing facilities and/or changing areas, construct at least

one lockable and accessible single occupant facility to be included and centrally located, so the user need not leave the area to use the changing room. These facilities will conform to Clemson's Inclusive Facilities Policy.

7. Specify that a minimum 50-sqft. Lactation Room be included that is fully accessible and complying with the University-wide Lactation Room Guidelines. These rooms shall include the following features:

    - Lockable Door Hardware with single motion egress and integral in-use indicator.
    - At least one electrical receptacle
    - Sink with manual faucet
    - Table or counterspace usable when seated
    - Comfortable chair upholstered with non-woven medical grade material that is impervious to liquid and easily cleaned.
    - Soap Dispenser
    - Mirror
    - Paper Towel Dispenser
    - Waste Receptacle
    - Small Refrigerator
    - Water resistant, non-carpeted flooring that is easily cleaned.

~~8.~~ Include a Medical Wellness room that is similarly sized and equipped to Lactation Rooms.

9. Provide at least one accessible break area with a refrigerator, sink, microwave and table and chairs that is centrally located, designed for use by all building occupants, and accessed directly from a main corridor or passageway.

10. For new construction, provide access to the roof and any roof-mounted equipment from the inside of the building via stairs or penthouse. Renovations will be considered on a case-by-case basis. Ladders mounted to the building exterior are strictly prohibited.

11. At a minimum, provide one 100sqft custodial closet per floor. Each custodial closet shall have the following:

    - A floor mounted, low curb mop basin with waterproof backsplash extending to the faucet height. Mop basin faucets shall be mounted at 4' above finished floor, be threaded for a standard ¾" garden hose, and have a 3' hose extension installed.
    - A wall hung vitreous china lavatory.
    - A handheld emergency eye wash that can also serve as an emergency drench hose.
    - A personal storage locker system with two lockers that can be secured with a common padlock.
    - Provide a floor drain connected to the building's sanitary sewer system.

12. Provide a minimum 100-sqft. recycling room with a floor drain near the loading dock or service entrance.

13. Provide a minimum 100-sqft. Maintenance Storage Room for keeping building specific attic stock and building specific maintenance equipment.

14. Provide a Fire Command Room that meets the following conditions unless greater is required by any governing code as adopted in Chapter 5 the OSE Manual.

    - Minimum 100 sqft. in size
    - Temperature controlled
    - Has card access
    - Contains any Emergency Responder Radio Equipment in the building
    - Access to any two-way communication systems within the building
    - Hardwired connection to Campus network
    - Contains everything required in Section 508.1.6 of the IFC as adopted in Chapter 5 the OSE Manual.

    The location of the Fire Command Room shall be approved by the Fire Code Official.

15. Attic spaces and penthouses containing mechanical, electrical and/or plumbing equipment shall have access via stairs or elevator and shall be considered an equipment room.

16. Design all electrical rooms such that there is at least 20% of the wall space free for the addition of new panels and/or electrical equipment.

17. All wet and chemical laboratories shall conform to the requirements in Section 428 of the IBC as adopted by Chapter 5 of the OSE Manual unless technically infeasible or the building elements requiring alterations to comply with this section are to remain unaltered and not included within the scope of work in any way. The designer shall make the Project Manager aware of any laboratory not complying with this section as early as possible in the design phase.

01 33 23 Shop Drawings, Product Data and Samples

1. All submittals and samples for furnishings and finishes must follow Clemson's Furniture and Finishes Submittal and Sample Standards.

01 33 29 Sustainable Design

1. Clemson is committed to being a leader in sustainable design and construction. Because of this sustainability is a fundamental part of building design and shall be incorporated into all projects in accordance with the following:

    1. The University's Sustainability Action Plan
    2. The International Energy Conservation Code as adopted in Chapter 5 the OSE Manual
    3. Achievement of either Silver Level of LEED v4 for BD+C: New Construction and Major Renovation or two Green Globes from the Green Building Initiative.

01 35 00 Special Procedures

01 35 03 Conservation Treatment Procedures

All work on buildings that are included in the National Register of Historic Places shall be done in accordance with Clemson University's Preservation Master Plan and all applicable National Park Service Preservation Briefs.

01 35 53 Security Procedures

1. Specify the following worksite decorum and background check policy:

   All companies, including but not limited to, design professionals, vendors, suppliers, consultants, general contractors of any trade, and their subcontractors, that bring one or more of its employees on to the Clemson University Campus or other University property in order to fulfill the terms of this agreement, must conduct a criminal background check on said employee(s) prior to bringing or sending the employee(s) to the Clemson University campus or other University property. Any contractors retained by Clemson shall agree that any employee with a criminal history that the contractor reasonably believes poses a threat to property or persons will not be brought or sent to the Clemson University campus or other University property. The Contractor agrees to impose this same criminal background check requirement on all subcontractors, vendors, suppliers, or consultants, used to fulfill its responsibilities under this agreement. The Contractor shall be responsible for all costs associated with these requirements. Clemson University reserves the right to verify compliance by contractor upon request. Information collected for verification is controlled by the federal Fair Credit Reporting Act. Individuals believed by Clemson University to pose a threat must leave the campus or University property immediately and the Contractor may be prohibited from future awards without permission of the Procurement Officer.

2. In addition to specifying the policy above, all personnel working on University property shall be required to adhere to the following rules:

   - All workers shall always wear a visible identification badge or uniform with photo ID that contains their name and the name of their employer.
   - Possession of alcohol or controlled substances, or presence onsite of personnel who are under the influence of alcohol or controlled substances, is forbidden.
   - Workers' conduct shall be controlled by the Contactor to require adherence to all relevant university policies (tobacco use, safety, etc,), prevent any unprofessional or unsafe behavior and unwanted interaction such as whistling, profanity, and initiating conversations with passersby, students, staff, or other individuals, adjacent to the Project Site.

01 40 00 Quality Requirements

01 41 13 Codes and Standards

1. In Chapter 13 of the OSE Manual, the duties and authorities of the AHJ are delegated

to University Facilities if the project value falls with University's Level of Certification. The University Building Official shall be the Authority Having Jurisdiction (AHJ) as defined by Chapter 1 of the International Building Code as adopted by Chapter 5 of the OSE Manual and will issue the required permitting, perform or request all compliance reviews, perform or oversee all construction inspections and issue necessary Certificates of Occupancy.

2. AHJ duties and authorities, as described above shall remain with the OSE for projects that exceed the University's Level of Certification. Its assigned representative shall issue the required permitting, perform or request all compliance reviews, perform or oversee all construction inspections, and issue necessary Certificates of Occupancy.

3. All construction, renovation, demolition and permanent improvement projects are subject to Clemson's policy on Alterations or Improvements to University Facilities. As such, any work that is considered a Level 2 Alteration or greater in accordance with the International Existing Building Code (IEBC) shall be required to have a construction permit and be subject to review by the appropriate AHJ.

4. All design and construction work shall be done in such a manner that the completion of project is in compliance with this document and the codes and standards found in Chapter 5 the OSE Manual. In the event there is a conflict between any of these codes and standards, the most restrictive code shall apply.

5. Accurate life safety drawings shall be provided for all projects, regardless of occupancy or project size. Mechanical, Electrical and Plumbing projects may not need architectural drawings but must still reference building Construction type, Occupancy/Use, and Sprinkler status with code listing. Special consideration for existing structures is facilitated by use of the IEBC. Use OSE Manual Table 3E on such projects.

6. Life safety drawings shall emphasize the following as applicable:

   - A legend clearly identifying life safety features
   - The code approach for mixed occupancies
   - All use groups and occupant loads
   - Location of the public way, exits from each floor, exit access and common path of travel distances, dead end length, and diagonal separation of exits.
   - Locations of all hazardous storage areas, materials, chemical Safety Data Sheets and quantities, or equipment that pose a particular safety hazard.
   - Control area (and/or laboratory unit) boundaries.
   - Locations of all rated assemblies and any required HVAC damper or firestopping methods.
   - Provide a description of any special mechanical systems such as compressed air, hydraulic, nitrogen, etc., including an explanation of the medium source.
   - Compliance with IEBC Chapter 3. Provide justification if Accessibility compliance is technically unfeasible.
   - Provide door and access hardware details early in the design process. These must meet standards for egress, accessibility, and security.
   - Show scope of demolition or renovation work including impacted areas on the floor below or above the construction site with a plan to minimize disruption and maintain functional occupancy of the effected space.

01 41 19 Rules

Campus Master Plan

All designs shall comply with the most current edition of the Long-Range Framework Plan and Site Design Guidelines as published by Campus Planning and Design. The information, instructions, and standards presented in this document shall be applied in coordination with these guidelines.

Design within the Historic District

Clemson University is committed to the preservation and protection of the historical aspects of its architecture and landscape. Information and guidelines to assist the designer in achieving this goal is available from Campus Planning and Design and specifically found in their publication Clemson University Preservation Master Plan.

01 41 26 Permitting Requirements

1. The consulting A/E, construction manager and/or contractor and shall acquire all required permits outside of the construction/renovation permit issued by the appropriate AHJ and any permits legally required to be held by the University.

2. The University personnel responsible for the project shall apply for the construction/renovation permit and shall facilitate the application for any permits required to be applied for and held directly by Clemson.

01 45 00 Quality Control

01 45 23 Testing and Inspecting Services

1. All projects shall follow the OSE Guidelines for Inspections and Material Testing.

2. Specify the appropriate instructions regarding Special Inspections and Tests that are required during the construction of the project. These instructions must be consistent with the requirements indicated in the OSE Manual, all codes adopted through Chapter 5 therein, and approved by the appropriate AHJ.

3. The A/E, Contractor, and/or Construction Manager shall be responsible for requesting, from the project manager, all inspections required to be performed by the AHJ directly and for coordinating any third-party inspections and documentation thereof within the scope of work as defined by the agreement between A/E, Contractor or CM.

01 45 29 Testing Laboratory Services

1. All projects shall follow the OSE Guidelines for Inspections and Material Testing.

2. Provide for a testing laboratory to perform any testing for individual material installation as deemed necessary.

3. Specify that copies of all subsequent test reports be provided to the Owner, the A/E,

and the Contractor in a timely manner. Specify that the scheduling of these tests shall be the responsibility of the Contractor and that any requirements for the storing of test cylinders or other applicable test samples shall be the responsibility of the Contractor.

4. Specify that the cost associated with the retesting of any material shall be borne by the Contractor.

01 50 00 New Utility Locations

1. When installing University maintained utilities, specify that the contractor be required to notify the University Surveyor at least 24 hours prior to covering or backfilling any underground utility, including PVC sprinkler lines, associated wiring and valves, so that they can record the location and other information on their mapping data base. This requirement is in addition to any other requirement for special code inspections or testing. Failure to comply with survey notification will require uncovering.

2. Specify the University Surveyor will not mark any existing utility in the field because State law requires Contractor to call PUPS (811) for all existing underground utility locates.

01 51 00 Temporary Utilities

1. Contract documents shall indicate whether temporary utilities for the project during construction are to be furnished by the University at no cost to the contractor, or to be furnished by the contractor as part of his cost.

2. If temporary utilities are to be furnished by the contractor, the project drawings shall indicate the points of delivery of these utilities to the project where the University will install the appropriate service.

3. Utilities that may be charged to the contractor include electricity, steam, chilled water, and sewer. Charge rates for these utilities at the time of the project can be obtained from the Project Manager.

01 51 36 Temporary Water

1. All temporary water connections are required to be metered. Consumption reporting to University Utilities shall be the responsibility of the contractor and Project Manager.

2. Meters for construction water from fire hydrants shall be provided by the Contractor on a hydrant approved by University Utilities.

3. Meters for temporary taps shall be supplied by the contractor and approved by the University Utilities Maintenance Shop prior to installation

4. Prior to the performance of any work requiring the use of water from the University's water distribution system, a meeting with University Utilities is required.

01 55 00 Vehicular Access and Parking

1. Project Manager must approve parking locations for Contractor's vehicles.

2. All personnel shall comply with University Parking and Transportation Services regulations, including permitting requirements.

3. Cost for A/E construction related parking is to be included in the Contract Sum.

4. Minimize impact within work areas by providing off-site parking and storage for ancillary workers and materials.

5. Fenced or barricaded on-site parking spaces must be designated on drawings when appropriate.

6. On-site parking must comply with emergency vehicle access requirements, ADA regulations and shall minimize impact on Owner operations and other projects. Any site changes necessary to accomplish this shall be indicated in the plans and specifications.

01 55 29 Staging Areas

1. Indicate exterior staging area or point of access to building on drawings.

2. Provide fencing around staging areas and dumpsters when appropriate. Indicate location of dumpster and route for debris removal through occupied buildings.

3. Review vertical access within building, including use of stairs and elevator with the Project Manager.

01 74 00 Cleaning and Waste Management

01 74 23 Final Cleaning

1. For all Housing projects, final cleaning immediately prior to turnover shall be completed to the APPA Level 2 Standards listed below.
   - The floors and base moldings shine and/or are bright and clean. There is no buildup in corners or along walls, but up to two days' worth of dust, dirt, stains, or streaks can be present.
   - All vertical and horizontal surfaces are clean, but marks, dust, smudges, and fingerprints are noticeable upon close observation. Lights all work, and fixtures are clean.
   - Washroom and shower fixtures and tile gleam and are odor-free. Supplies are adequate.
   - Trash containers and pencil sharpeners hold only daily waste and are clean and odor-free.

01 83 00 Performance Requirements

01 83 16 Exterior Enclosure Performance Requirements

1. During the Design Development phase, The A/E shall complete the following regarding bird friendly construction:

    - Determine the Threat Factor of building materials using guidance from LEED BD+C: New Construction Innovation Credit for Bird Collision Deterrence.
    - For any materials or structures that have a Threat Factor that exceeds LEED requirements above, Bird Collision Threat Factor Rating Calculations shall be completed, and the results and bird-friendly, alternative options shall be discussed with Project Manager and Campus Planning and Design.
    - For any building façades that exceed the maximum Bird Collision Threat Rating (BCTR) allowed the LEED Requirements above the results and bird-friendly, alternative options must be discussed with Project Manager and Campus Planning and Design.
    - Provide building elevations on which Façade Zones 1 & 2 are clearly identified and each façade material type, surface area and Threat Factor is indicated when required.
    - Provide project site plans on which the Threat Factor of each site structure is indicated when required.
    - Provide a completed LEED Bird Collision Threat Rating Calculation Spreadsheet when required.
    - When used, glass etching shall use selections from the Guardian Bird 1st family of patterns that meet the LEED requirements above

2. All guardrails for spaces within the building such as balconies, habitable roofs, etc., excluding stairs, shall have a minimum height of 54”.

01 90 00 Life Cycle Activities

01 91 13 General Commissioning Requirements

1. For new construction or renovation projects affecting over 50% of the building floor area, the University requires one of the following commissioning standards to be used on the total building.

    - Fundamental and Enhanced Commissioning on LEED projects
    - Building Commissioning and Training on Green Globes projects

2. Commissioning will fall under the scope of the A/E unless otherwise directed by Clemson University.

3. All Commissioning agents must have at least one of the following certifications

    - AABC Commissioning Group: CxA
    - Building Commissioning Certification Board: ACP, CCP
    - ASHRAE: BCxP

4. Refer to later Divisions for the specific requirements of individual building systems.

DIVISION 02 - EXISTING CONDITIONS

02 21 00 Surveys

02 21 13 Site Surveys

1. If the project requires a current boundary, topographic or utility survey, the A/E shall coordinate the procurement of this service with the Project Manager. Depending on the project and scope of the information needed, this service may be procured either directly by the Owner or by the A/E.

2. The survey shall be tied to a minimum of two University benchmarks and, upon completion be delivered to the University Surveyor as well as raw point file in PNEZD format (point #, northing, easting, elevation, description).

3. The design team shall geo-reference the South Carolina State Plane Coordinate System Single Zone 3900 and utilize North American Horizontal Datum (NAD83) and North American Vertical Datum 1988 (NAVD88).

02 21 13.23 Archeological and Historical Surveys

1. Any project that will disturb any soil is required to perform a Cultural Resources Survey in accordance with Section 106 of the National Historic Preservation Act. This work must be performed following the guidance of the SC Department of Archives and History.

02 26 00 Hazardous Materials Assessment

1. Before any renovation or demolition, the facility or portion of the facility being renovated or demolished must have an environmental hazard assessment on file. This shall determine the presence of asbestos, lead, PCB's or any other materials that could be deemed hazardous to workers and/or the general public.

2. These inspections must be performed by a qualified person with all required training and licenses and follow the guidance given by Clemson's Occupational and Environmental Safety Office (OES) on their Construction Sites Hazardous Materials/Wastes page and in their Asbestos Management Plan.

02 32 00 Geotechnical Investigation

1. The A/E shall be responsible for any required geotechnical surveys and subsurface drilling. This needs to be coordinated with the Project Manager and University Utilities prior to completion.

2. Any subsurface investigation must include a utility location prior to any drilling or excavation. Both the Facilities Surveyor and local commercial utility locating services PUPS (811) must be contacted prior to any subsurface investigation.

02 82 00 Asbestos Remediation

1. All items containing asbestos shall be identified on plans and shall be disposed of following the University's Asbestos Management Plan from OES.

02 83 00 Lead Remediation

1. All items containing lead shall be identified on plans and shall be disposed of following the guidance for Construction Sites Hazardous Materials/Wastes from OES.

02 84 00 Polychlorinate Biphenyl (PCB) Remediation

1. All items containing PCB's shall be identified on plans and shall be disposed of following the guidance for Construction Sites Hazardous Materials/Wastes from OES.

02 84 16 Fluorescent Lamp and Ballast Disposal

1. Removal of fluorescent lamps and ballasts containing Mercury or PCB's shall be identified on project demolition plans and coordinated with Campus Recycling for intact bulbs and follow guidance for Construction Sites Hazardous Materials/Wastes from OES for broken bulbs.

DIVISION 03 - CONCRETE

03 05 00 Common Work Results for Concrete

Design Standards

1. Specify that all applicable standards are incorporated in the project design as well as the preparation of the design documents and enforced during execution of work.

Site Use Standards

1. Clearly specify rinse-down and washout areas for concrete delivery vehicles and handling equipment.

03 20 00 Concrete Reinforcing

1. Specify that the contractor shall properly store, protect, and place reinforcing steel to minimize contamination per the American Concrete Institute (ACI) and the Concrete Reinforcing Steel Institute (CRSI) recommendations

03 30 00 Cast-in-Place Concrete

1. Provide for a testing laboratory to be engaged by either the Owner or the A/E to perform any testing deemed necessary.
2. Specify that copies of all subsequent test reports be provided to the Owner, the A/E, and the Contractor. Specify that the scheduling of these tests shall be the responsibility of the Contractor and that any requirements for the storing of test cylinders are the responsibility of the Contractor.
3. Specify that any cost associated with retesting of concrete shall be borne by the Contractor.
4. Coordinate the use of any additives of admixtures with the Project Manager.
5. Specify that all form work must comply with all applicable safety regulations.

03 35 00 Concrete Finishing

1. Clean and rub all exposed surfaces to remove stains, foreign matter, burrs, fins, and surface irregularities.
2. Exposed surfaces shall be left true to line and grade, and free from form marks and other imperfections. Cosmetic coatings used to disguise underlying defects are prohibited.
3. Provide all exterior concrete ramps, walks, loading docks, and other such surfaces

subject to wetting with a non-slip broom finish.

4. The use of any specialty finishes on exposed concrete surfaces including colored concrete, exposed aggregate concrete, stamped concrete and grooving or tooling requirements must be coordinated and approved with the Project Manager.

03 45 00 Precast Concrete

1. Specify that any precast architectural concrete shall be properly handled and stored to prevent physical damage to the precast units and to prevent staining and discoloring.

2. Clearly state that the contractor will be responsible for replacing any damage.

DIVISION 04 – MASONRY

04 05 00 Common Work Results for Masonry

Design Guidelines

The Clemson University Site Design Guidelines outline the design principles and design guidelines that must be followed regarding the exterior appearance of facilities at Clemson.

Historic Buildings and Structures

1. Pay careful attention to mortar materials, colors, and joint profiles. Both visual continuity and matching as well as structural integrity are to be accounted for.

2. Pay special attention to the selection of mortar materials, since the use of some mortars presently available may result in the strength of the mortar exceeding the strength of the brick.

04 21 00 Clay Unit Masonry

04 21 13 Brick Selection and Sample Panels

1. Sample panels of materials of all proposed exterior surfaces are required for approval of materials, change of material locations and other joinery conditions from Campus Planning and Design. Coordinate the selection of masonry with the selection of other exterior materials at the same time, i.e., roofing, metal work, other building trim.

2. Maintain sample panel until completion of the facility for comparison and standard of quality for the building.

3. Specify an allowance for the purchase of brick on Design-Bid-Build Projects and as directed by the project manager for other delivery methods. Specify that all exterior face brick is to be purchased at one time and delivered in sufficient quantity to complete the installation. This shall be done to ensure a uniform color throughout the building.

4. Indicate a brick storage area on construction documents.

5. All masonry units colored mortar shall be approved by Campus Planning and Design prior to specification or use.

6. Specify methods for cleaning the various types of masonry used in the facility and any extraordinary conditions that may affect the use of masonry cleaning materials and equipment. Prohibit the use of sandblasting as a method for cleaning masonry.

7. The widespread use of water-repellent masonry coatings is discouraged. The effective use of design detail shall be utilized to minimize and/or inhibit the entrance of water into the structure.

04 43 00 Stone Masonry

The use of stone masonry may be acceptable as a construction material on some exterior walls or other site installations.

DIVISION 06 - WOOD, PLASTIC AND COMPOSITES

06 05 00 Common Work Results for Wood, Plastics, and Composites

Design Standards

1. Use of structural fire-retardant wood is not allowed.

2. All walls of telecommunications closets shall be constructed to include the following:

   - Walls covered with three-quarter inch A-C grade plywood extending from the floor to eight (8) feet above the finished floor and mounted with the "A" side exposed.
   - Wall surfaces painted with two coats light colored, non-conductive paint.

3. Specify that the designer shall provide samples and specification sheets of all proposed exterior materials made from plastic or phenolic from which a decision to approve or deny use can be made. Coordinate delivery of these samples with the Project Manager. Ensure that the selection these materials happens concurrently with the selection of other exterior materials such as masonry, roofing, metal work, and other building trim.

4. Use pressure treated wood for blocking where moisture may be encountered, such as below grade locations and roof locations.

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 05 00 Common Work Results for Thermal and Moisture Protection

Design Standards

1. Existing roofing systems will be replaced with a like system unless approved.

2. Roof systems shall be designed and selected to best serve the building aesthetically and functionally.

3. Specifications that allow an undetermined roofing manufacturer to determine the acceptability of a condition or detail to be used is not allowed.

4. Follow general construction and detail recommendations from the following as applicable to the roof type being installed:

    - Asphalt Roofing Manufacturers Association (ARMA)
    - Single Ply Roofing Institute (SPRI)

5. All roof designs shall comply with the following:

    - Most Current Version of the NRCA Roofing Manual
    - Most Current version of SMACNA Architectural Sheet Metal Manual.

6. A minimum slope of ½" per foot is required on all new flat roofs. In the case of some large roof areas, a slope of ¼" per foot is acceptable for existing roofs.

7. Provide an existing roofing plan showing actual field dimensions, actual conditions, penetrations, roof mounted equipment, and any core sample information or summaries. Indicate any equipment or penetrations that are to be abandoned.

8. Provide a new roofing plan, identifying slopes, penetrations, equipment, and any other details necessary to provide adequate information to the contractor. The use of isometric details is preferred where applicable.

9. Roof access shall be via interior stairs or penthouse for new construction. Renovations will be considered on a case-by-case basis.

10. Ladders mounted to the exterior of buildings for any reason are strictly prohibited.

11. Any existing roof hatches or those approved for use under a Deviation Request from these Standards shall be designed such that opening, closing, locking and unlocking functions can be done from floor level prior to any climbing. Ladders associated with roof hatches shall be permanently mounted and both the ladder and hatch system shall comply with the applicable sections of the SC OSHA Standards.

12. Protective mats or pads shall be strategically placed at exit/entry points, around roof mounted equipment and anticipated heavy travel areas.

13. Fall Protection: All areas that expose workers to a fall into hazardous equipment or material or a fall of 4 feet or greater shall be protected by permanent guardrails or parapet walls When not feasible, provide horizontal lifelines and anchorages as a part of a complete OSHA complaint fall arrest system. All workers performing work requiring fall protection shall have fall protection training that satisfies the requirements from Clemson's Office of Occupational and Environmental Safety.

14. Coordinate the installation of any required lightning protection system and adequately address the need for certification or recertification of the system.

15. Specify that all lightning protection systems be made operational at the end of the workday.

16. Use crickets, saddles, and edge strips to direct waterway from penetrations and parapet walls to ensure positive drainage to scuppers, drains, and gutters.

17. A minimum distance of twelve (12) inches between roof penetrations shall be maintained to allow for proper flashing details.

18. Avoid the use of pitch pans. When existing pitch pans cannot be eliminated, specify a preformed pan with a minimum height of 4", 4" flange, and a minimum clearance of 2" on all sides of the penetration. The pitch pan shall also include the appropriate hood or umbrella.

19. Use round shapes for equipment supports. These supports shall be a minimum of 14" high, with higher supports necessary for larger pieces of equipment.

20. Locate interior roof drains at mid spans and low points of the roof deck. Do not locate drains at columns. When flashing drains, taper insulation 24" around drain. Extend membrane or any flashing under drain bowl clamping ring. Do not use exposed lead sump pans.

21. The designer shall specify that the contractor will confirm, prior to final inspection, in the presence of the appropriate Facilities personnel, that existing roof drains are open and functioning properly without any leaks.

22. Specify the method of protection of roof drains during construction.

07 32 00 Tile Roofing

1. Clemson University has a number of facilities with tile roof systems. Many of these facilities are considered to be part of the historic resources of the University. The replacement of roof systems on these facilities shall be coordinated with the design information and guidelines available from Campus Planning and Design.

07 50 00 Membrane Roofing

1. Clemson University has utilized built-up bituminous roofing, modified bituminous membrane roofing, and elastomeric membrane roofing systems on its facilities. Each facility shall be analyzed with the Project Manager to determine the type of roofing in this category to be used.

07 51 00 Built-Up Bituminous Roofing

1. Asphalt kettles are not allowed.

2. Specify that built-up modified bitumen roofing systems are of a 3-ply built-up system conforming to Clemson's Membrane Roofing Standards. Two-ply systems will be considered a Deviation from these standards and will require a formal request and approval prior to use.

07 53 00 Elastomeric Roof Membranes

1. Specify that all elastomeric roofs are either KEE and PVC conforming to Clemson's Membrane Roofing Standards. The use of TPO will be considered a Deviation from these Standards and will require a formal request and approval prior to use.

07 60 00 Flashing and Sheet Metal

1. Due to the various types of metal roofing employed on campus, Campus Planning and Design shall approve material selections.

2. Sheet metal incorporated into roof systems shall have the equivalent life expectancies of the adjoining roofing system and be compatible with the architectural intent of the facility.

07 71 00 Roof Specialties

1. Do not specify interior or built-in gutters, and/or built-in downspout systems unless their use is determined by the University Historic Preservation Officer to be of architectural importance in the historical district of Campus.

2. Material selection for gutter and downspout systems shall use the same standards as indicated for other sheet metal flashing and trim from Section 07 60 00 above.

3. When designing primary roof drain systems, a multiplier of 1.25 shall be applied to the maximum hourly rainfall indicated for the building location in the edition of the International Plumbing Code referenced in Chapter 5 of the OSE Manual.

4. All parts of gutter systems mounted to the exterior of the building shall be designed to withstand the windspeeds listed in the IBC as referenced in Chapter 5 of the OSE Manual for the location of construction and appropriate risk category.

5. Specify adequate protection for all gutter downspouts in areas such as those adjacent to pedestrian pathways, entrances, loading zones, etc. that are likely to see damage from impact.

6. Secondary/overflow drains, if present, shall be designed using the multiplier in paragraph 3 above, but ponding depths shall be reduced as much as physically possible to minimize roof loading.

07 72 00 Roof Accessories

07 72 53 Snow Guards

1. Specify snow and ice guards above all exterior doorways anytime there is the possibility of material sliding off the roof and into door or the pedestrian pathway leading to it.

07 72 73 Vegetative Roof Systems

1. All decorative vegetation placed on roofs shall be in self-contained planters that are impervious to root penetration. These planters shall also connect to the roof drainage system to prevent spillage of water and debris onto roofing system.

07 76 00 Roof Pavers

1. Clemson University has limited installations of roof deck paver systems on their facilities. Specify that all future dead and live loading is accounted for. This includes loads from construction activities, maximum occupancy, change of furnishings, green roof irrigation, etc.

07 80 00 Fire and Smoke Protection

07 81 23 Intumescent Firestopping

1. Specify that for every type and application of firestopping, a manufacturer's label shall be placed in the proximity of the work stating the type of material, when placed, and responsible contractor.

07 84 00 Firestopping

07 84 13 Penetration Firestopping

1. All though penetrations to fire rated flooring, wall and ceiling systems for passing wiring or cabling shall be protected with a manufactured permanent sleeving system containing firestopping medium that creates a reusable pathway. The sleeving systems installed in all new electrical, mechanical, and IT rooms and closets shall have capacity for 200% of the anticipated initial cabling volume.

PRODUCTS AND MATERIALS- DIVISION 07 – THERMAL AND MOISTURE PROTECTION

Fiberglass Roofing Felts

- Tamko
- Johns-Manville
- GAF

Modified Bitumen Base Flashing

- DynaFlex by Johns-Manville
- FiberTite
- Ruberoid by GAF SOPREMA

Modified Bitumen Cap Sheet

- DynaGlas by Johns-Manville
- Fibertite
- Ruberoid Mop FR by GAF SOPREMA

Roof Drains

- Smith Series 1010 –Y-R-C-G or approved equal
- Wade Series W-3000-NH-40-52-53 or approved equal

Roof Hatch Operator

- Belmont Safety Products or approved equal

Sealants

- Exposed Joints: Dow Corning 790, SikaFlex 1A, or Tremco Mono 555
- Interior Joints: Dow Corning 790, Tremco Caulking Compound, or approved equal

Fire Caulking and Putty

All must comply with ASTM E814 standards.

- 3m
- Hilti
- Tremco
- STI

Firestopping Systems for Penetrations

- Hilti: CFS and CP series or approved equal
- STI: FA and CA series or approved equal

DIVISION 08 – OPENINGS

08 05 00 Common Work Results for Openings

1. Areaways and other access to mechanical rooms, electrical vaults, and other areas containing equipment, including departmental research, and teaching equipment, shall be large enough to pass the largest piece of equipment without undue disassembly. The design shall place doors and frames in positions that discourage the entrance of water without the dependence on caulking and sealants.

2. All openings will be given unique ID numbers in accordance with Clemson Room and Door Numbering Standards.

3. All exterior doors and openings not protected by other means shall have drip caps to prevent water intrusion to the building.

08 10 00 Doors and Frames

Doors

1. Do not specify honeycomb core metal doors for any application.

2. Doors are to between 7'-0" and 8’-0” in height. The standard size for single doors, and for each leaf of pairs of doors, is 3'-0" x 7'-0". The standard door thickness is 1-3/4".

3. Plumbing chase doors shall be 2’-0” x 7’-0” minimum.

4. Mechanical room doors shall be 3’-0” x 7’-0” minimum, but access shall be configured such that the equipment housed can be removed, replaced, serviced etc.

5. All new exterior, classroom, office, hallway, stairwell, mechanical room, electrical room, and IT closet doors are to be provided with internal cabling pathways to facilitate installation of access control hardware in place from manufacturer.

6. Exit doors are to be designed to receive the appropriate panic hardware. The building plan must locate exit doors so that the stresses are minimized by the impact of hurried egress from the building by its occupants.

7. Exterior hollow metal doors shall be 14-gauge steel; others may be 16-gauge.

8. Heavy doors, fire doors, and doors wider than 3'-0" must be installed using four heavy duty ball bearing butts or continuous hinges.

9. All storefront type doors must be designed with the following minimum dimensions: 5” vertical stiles, 8” top rail, and 10” bottom rail. Those receiving panic hardware must also have at least an 8” mid rail. All rails and styles are to be constructed of aluminum.

10. Doors to receive cylindrical locksets shall be factory prepared to accept Best 9k series hardware.

Frames

1. Steel door frames for openings wider than 3'-0", and all steel frames for exterior doors shall be constructed of 14-gauge material. Interior frames for doors narrower than 3'-0" may be constructed of 16-gauge material. All frames are to be fully welded and shall have double rabbeted profiles with equal sized rabbets.

2. All frame strike plate pockets shall be designed for commercial strikes, 4 7/8" x 1 ¼" curved lip. Residential bedrooms may be excepted from this and are allowed to use a 2 ¾" x 1 ¼".

3. All new frames for exterior, classroom, office, hallway, stairwell, mechanical room, electrical room, and IT closet doors are to have any internal cabling pathways to facilitate installation of access control hardware in place from the manufacturer.

4. "Wrap around" steel frames shall be used in masonry walls so that the masonry wall fits into the frame. The use of "inset" type frames or "knock-down" type frames are prohibited.

08 50 00 Windows

1. Fall Protection: Any time a window system is specified and installed that will require elevating workers 4 stories (55') or greater to perform cleaning, fall protection anchorage that is permanently attached to the building structure shall be provided in accordance with IWCA 1-14.1-2001.

2. The use of window wells is not allowed.

08 60 00 Roof Windows and Skylights

1. The use of roof windows and skylights is discouraged.

08 70 00 Hardware

08 71 00 Door Hardware

Design Standards

1. The construction documents must have specific and complete hardware schedules on each door.

2. Exterior pairs shall have hardware for ingress on one leaf only. Any access control shall operate the active leaf. Every effort shall be made to ensure that free egress cannot be hindered by means of chaining, barring or otherwise disabling trim/pull/levers from the exterior of the building.

3. Interior pairs of doors shall follow the "Right Hand Reverse Active" convention (right side active as viewed from the interior public way/ingress side of the door) and have ingress hardware on the active leaf only. The secondary or "inactive" leaf shall be exit only and without ingress hardware. Every effort shall be made to ensure that free egress from interior spaces cannot be hindered by means of chaining, barring or otherwise disabling trim/pull/levers. Pairs of interior doors shall have keyed removable mullions.

4. Classroom doors shall have hardware configured as "fail secure" with single motion egress and key override for entry. It shall also keep the space locked unless activated by the access control system or manual key override. See Section 28 14 00 for access control hardware requirements.

5. Assembly spaces receiving electronic lockdown buttons are to receive panic hardware without manual locking functionality.

6. Locksets and panic hardware for spaces that would be appropriate for occupants to secure in but not deemed necessary receive electronic lockdown buttons shall have door hardware capable of manual locking the interior of the room. The locking mechanism must be part of the hardware and overridden by the normal function required to exit the space.

7. Spaces that are not normally occupied such as storage rooms, mechanical rooms, electrical rooms, IT closets etc. shall have storeroom function hardware that always remains locked and automatic door closers.

8. For walkout roof access, door hardware shall be configured to require key or electronic access control to go onto the roof but allow single motion egress from roof.

Finish Hardware

1. The A/E shall coordinate with the Access Control vendor and Clemson's Maintenance Building Security Shop to develop appropriate hardware schedule compliant with Division 28 specifications.

2. Access Control vendor shall furnish and install all hardware connected building access control system.

3. Door hardware vendor shall furnish and install all non-electrified components.

4. For new construction, all door and frame preparation shall be performed by the Division 8 vendor.

5. Every effort shall be made to ensure consistency in manufacturer, aesthetic and functionality across all door hardware provided by Division 8 and Division 28.

6. The following products must not be used on any University facility:
    - Pivot hinges on both interior and exterior doors.

- Bottom rail locking devices.
- Concealed or flush mounted head and foot bolts except for head bolts for fire hold open hallway doors.
- Concealed closers of any kind.
- Electrified strike plates or strike plates on mullions.
- Hardware requiring the use of concealed vertical rods or cables.

7. All locksets, exit devices, removable mullions, and keyed exit alarms shall be equipped with housings to accept small format interchangeable cores as manufactured by the Stanley Security Solutions (formerly Best Universal Lock Company) of Indianapolis, Indiana.

8. Specify the use of temporary or "construction" cores during the construction phase of the project.

9. Electrified door strike plates shall only be used on interior doors in housing and residential facilities so long as the installation does not require modification of the door frame.

10. Specify the contractor to begin coordinating the installation of permanent cores with Clemson's Maintenance Building Security Shop a minimum of 120 days prior to substantial completion.

11. All hardware removed that will not be reused within the project must be returned to Clemson's Maintenance Building Security Shop.

12. See Division 28 for electrified door hardware.

08 71 13 Automatic Door Openers

1. All power operated pedestrian doors shall be swinging type doors as defined by the edition of BHMA A156.10 referenced in the IBC as adopted by Chapter 5 of the OSE Manual. Sliding and rotating doors are not allowed.

2. Every new building must have power operated pedestrian doors at primary entrances. These doors shall be configured as double egress following the "right hand reverse" convention. Both leaves will be powered, and the mechanical mechanisms must be activated by touchless proximity sensors placed on both the interior and exterior of the building. All access control and door operator hardware shall be placed in accordance with Powered Door Access Control Device Typical

3. Where power operated door openers are specified on access-controlled openings; the Division 28 Access Control vendor shall furnish and install the powered operator system. The A/E shall coordinate with the Division 28 Access Control vendor to ensure that all required pathways, cabling, installation methods and testing procedures are specified for proper integration with the access control system.

4. Powered openers that are required for complying with the opening force in the most current version of ICC A117.1 shall also be connected to generator backup power, if

present.

5. Door hardware will require door preparation to be defined under project hardware schedule.

6. Conduit and/or pathways from accessible ceiling space and/or head-end equipment to all door devices shall be provided in accordance with Division 26.

7. All card reader equipment and installation, including the Door Hardware, shall be provided by the Access Control Vendor.

8. All access control power supplies and control panels shall be integrated into the emergency fire alarm panel in instances where an electronically locked door does not allow for a mechanical means of free egress.

9. All power operated pedestrian doors shall be inspected by Clemson's Maintenance Building Security Shop prior to acceptance.

08 80 00 Glazing

1. Glazing shall be selected paying careful consideration to the type of facility, location, proximity to other structures, daylighting impacts, thermal comfort, glare, and solar heat gain. See Section 08 88 00 for requirements pertaining to Special Function Glazing.

2. Clemson is committed to making its built environment successfully coexist with the surrounding natural environment. In doing so, Clemson requires that new construction and major renovations incorporate measures from the following areas to minimize bird strikes on glass surfaces.

    a. Apply window films designed to make glass visible to birds.
    b. Reduce reflection in glass that creates the illusion of open space.
    c. Eliminate uplighting on glass surfaces. When necessary, use downlighting.

08 88 00 Special Function Glazing

08 88 36 Switchable Glass

1. Any time designs call for windows and/or glass openings in the building facades, the effect of additional window shading and the additional thermal control it provides shall be considered for enhanced building function and increased occupant comfort. The results of this consideration shall be vetted with the Project Manager and any other appropriate University personnel. If it is deemed appropriate to incorporate the additional shading for building function and/or occupant comfort, electrochromic glass shall be the primary product choice over physical shading, blinds, permanent tinting, etc.
2. All electrochromic glass systems shall be capable of autonomous operation and

integration into the building automation system. It is incumbent upon the designer to determine which of the two methods of operation required to be present will best serve the building and shall provide sufficient detail to the University to justify the decision.

3. Electrochromic glass provider shall make available to Clemson University any needed software and/or tools to update troubleshoot or maintain and update glass function.

4. The A/E shall consider the effects of electrochromic glass on the design and operation of other affected building systems such as lighting and HVAC.

5. All proposed installations of systems other than electrochromic glass for the purposes stated above will be considered a deviation from these standards as described in the Preamble of this document.

08 88 49 Security Glass

1. All glass in entry doors and all glazing at the same elevation as entry doors in the same framing system shall have UL752 Level 3 Security Glass. All security glazing shall extend at least to the height of the entry door.

PRODUCTS AND MATERIALS- DIVISION 08 – OPENINGS

Mortise Locksets

- Dormakaba: Best Hardware/45H Series, 7 Core Housing, "AT" Function for classrooms and offices spaces not receiving access control. "D" Function Code for mechanical rooms and storage rooms. 15 Lever/Knob Style, "J" Trim Style with Full Escutcheon, 626 Finish, Door Hand - RH, LH, RHR, LHR.

- For Housing and Residential Facilities Only: Sargent 8200 series mortise lock, 7 core housing. Classrooms and office spaces shall have "05" Function Code. Storage rooms and mechanical rooms shall have "04" Function Code, 'L' lever, LW1 Escutcheon; RH, LH, RHR, LHR

Cylindrical Locksets

- Dormakaba: Best 9K3 Series Cylindrical Lock. Office Spaces, Classrooms and Bedrooms interior to apartments and suites shall be Office Function (AB). Storage rooms and mechanical rooms shall be storeroom Function.

Electrochromic Glass

- SageGlass or approved equal

Panic Hardware

- Von Duprin 98/99 series or approved equal: exterior and interior doors
- Sargent 8000 series or approved equal: Allowed only for direct replacement of existing Sargent panic hardware. Not for use in new construction.

Removable Keyed Mullions

- Von Duprin KR4954 series or approved equal

Automatic Door Openers

Doors Designed for Primary Operation by Powered Opener

- Record 8000/8100 Series ADA Low Energy Operator or approved equal
- LCN 9500/2800 Senior Swing Operator Low Energy Operator or approved equal

Doors Designed for Primary Operation by Manual Opening

- LCN 4630/4640 Auto-Equalizer Series Low Energy Operator or approved equal

Activator Mounting Post: BEA 10BOLLARDBRZ or approved equal.

Activator Switch: BEA Magic Switch MS41 Family, Norton 700 and 704 Series or approved equal

Cores

- Interchangeable small format (7-pin) cores as manufactured by Dormakaba/Best Universal and Medeco (Housing/Residential only). Cores shall be provided by University. Cylinders/housings shall be provided by vendor.

Closers

- LCN 4011 or approved equal
- LCN 4111 or approved equal

Doors

- Exterior doors with wide stile and rail profile only. See Section 08 10 00 for Dimensions

Hinges

- Select Hinges (Select Products Limited) - full mortise - specify continuous hinges on exterior doors.
- Pemko or approved equal – continuous hinges
- McKinney or approved equal – full mortise hinges

Security Glass

- IsoClima Child Gard 2118 or approved equal

DIVISION 09 - FINISHES

09 05 00 Common Work Results for Finishes

1. All finishes are subject to review and approval of Campus Planning and Design and the Facilities Interiors Manager.

2. Clemson University maintains a contract to provide installation of approved flooring materials for all installations. The contractor must review and submit to Clemson for evaluation of the pricing received in accordance with the terms and conditions of that contract. Specific details of each contract will be provided upon request.

3. At a minimum, the following must be included for the flooring provider in the project specifications: Name, Contact Information, Solicitation Number, Expiration Date.

4. Documentation of the evaluation of this pricing information must be retained as part of project closeout.

5. All interior finishes shall meet the Volatile Organic Compound limits given in the Green Globes Design Guide for New Construction.

09 50 00 Acoustical Ceilings

1. All acoustical ceilings shall provide adequate access to any serviceable equipment above it.

2. All suspended tile ceilings are to be constructed with 2'x2' tiles and supported per manufacturer's instructions.

3. No insulation shall be placed directly on top of ceiling tiles for any reason.

09 60 00 Flooring

1. Due to both the environmental impact and lifelong maintenance costs of certain types of resilient flooring, the use of flooring requiring continued "waxing" and other labor and material intensive maintenance, the use of these types of flooring (VCT or other similar products) is not allowed.

2. The use of vinyl laminate, marmoleum (MCT), terrazzo and other low maintenance flooring, with a focus on the life cycle environment impact, must be used.

3. The Designer shall specify flooring material that is uniform throughout areas that are subject to space reconfiguration via relocation of partitions and/or cubicles.

4. "Wet" laboratories shall be finished with heavy duty, chemically resistant, impermeable, slip resistant seamless flooring with integral base. Tiles and wooden planks are not acceptable in these areas.

5. Rooms called laboratories that do not use chemicals, radiation, genetic materials or biological materials may use other appropriate flooring materials. Examples of these rooms would be Speech Labs, Computer Labs, Language Labs, etc.

6. Floors in storage areas for corrosive liquids shall be of liquid tight construction.

7. Avoid specifying novel or unique materials.

8. Colors are to be determined by the design team, Campus Planning and Design and the Facilities Interiors Manager.

9. Specify that the agreed upon amount of attic stock be provided to the Owner upon completion of the project.

10. Specify that the contractor is to be responsible for the initial cleaning of any flooring product and responsible for its protection until completion and final acceptance of the facility.

09 66 00 Terrazzo

1. Terrazzo floors are to be sand cushion type, installed over a depressed slab.

2. Bonded terrazzo (terrazzo surfacing installed integrally with a structural concrete slab) is not to be specified.

09 68 00 Carpeting

1. The designer shall be aware of the restrictions on interior finishes as mandated by the IBC as adopted by Chapter 5 of OSE Manual, and all materials specified shall meet these code restrictions and any references therein to applicable fire codes.

2. Carpet may be bid through the Owner as a separate contract at the discretion of the Project Manager.

3. The proposal of the color and type of carpet must be included with the presentation of other interior finishes for the facility.

4. Carpeting must be approved by Campus Planning and Design and details of attachment must ensure that delamination, release, or excess movement does not occur. All treads must have contrast nosing for a visual alert. Consider changing egress paths and steps to a coordinating flooring pattern that is different from the main field.

~~5.~~ Carpeting shall not continue under walls.

6. Do not add a second layer of carpet under any circumstances. Any existing carpeting shall be removed prior to the installation of new.

7. Do not place carpet over asbestos containing material.

09 90 00 Painting and Coating

1. Paint colors must be presented to the University Project Manager, Campus Planning and the Facilities Interiors Manager.

2. for approval in conjunction with the presentation of other finishes to be used within the facility.

3. Specify that all exposed piping, ductwork, etc. is to be painted by the contractor.

4. Prohibit spray painting in the vicinity of machinery and equipment unless adequate masking and protection of the equipment and associated valves, gauges, etc. is in place to prevent overspray.

PRODUCTS AND MATERIALS- DIVISION 9 – FINISHES

Ceiling Tiles

- Armstrong or approved equal

Interior Paints

- Select from the Clemson Facilities Interior Design Paint Standard Program. Contact Facilities Interiors Manager for program information.

Flooring

- Clemson University has negotiated contracts and pricing for flooring material.

DIVISION 10 - SPECIALTIES

10 11 00 Visual Display Surfaces

1. The University utilizes dust free marker boards in lieu of traditional chalkboards.

2. The designer shall be aware of the program requirements for the spaces within the facility and specify the appropriate application of any visual display surfaces.

10 13 00 Directories

1. The procurement and installation of facility directories must be included in the bid documents as a Signage Allowance.

10 14 00 Signage

1. A wayfinding plan that governs locations and content of all wayfinding signage is to be developed by the A/E and approved by Campus Planning and Design.

2. At a minimum, the location, layout, and design of both interior and exterior signage that is either code required and wayfinding shall be the responsibility of the A/E.

3. All signage shall comply, as applicable, with the Exterior Signage Guidelines and Interior Signage Guidelines published by University Planning and Design. The letter style is to be consistent with existing University graphics and applicable codes as adopted by in Chapter 5 the OSE Manual.

4. Signage is to be included in contractor scope unless directed otherwise by the Clemson Project Manager.

5. All accessible parking spaces shall be designated with signage complying with Clemson's Accessible Parking Sign and Post Detail.

6. Room name and number signs are to be located on the wall adjacent to the lock side of the door rather than on the door itself and centered 48-60 inches above the floor.

7. In addition to the room number, residence hall signs shall have a built-in card holder under the room number.

8. Signage that provides emergency information or general circulation directions or identifies rooms or spaces must conform to requirements of ANSI A117.1 and ADA, as to character proportion and color contrast. Signage identifying rooms and spaces must also meet ANSI and ADA requirements for tactile characters and/or symbols.

9. Provide signage stating "Storage Prohibited by Order of the Fire Marshal" in the lowest level of stairwells and in all mechanical, electrical, fire command, fire riser, and IT rooms.

10 21 00 Compartments and Cubicles

10 21 13 Toilet Compartments

1. All toilet partitions in restrooms to be maintained by Facilities Custodial Department are to be the ceiling hung type. Clemson requires polymer based solid surfacing, solid core phenolic, and solid plastic toilet compartments and screen systems designed for long term durability. Laminate, powder coated steel, and stainless steel are not allowed.

2. Each toilet compartment is to be equipped with a coat hook, and with a double roll toilet tissue holder. Single use restrooms and all compartments in women's toilets are to be equipped with personal disposal bag dispenser for each water closet and shall be placed so that it does not impede the use of other accessible features such as dispensers and grab bars.

10 28 00 Toilet and Bath Accessories

1. Soap dispensers, paper towel dispensers, toilet paper dispensers, and trash receptacles shall be provided by the owner.

2. Do not specify hand dryers. Paper towel dispensers are to be used in all installations.

3. Do not specify Feminine Product Dispensers in restrooms.

4. Toilet Seat Cover Dispensers are only to be placed in public restrooms serving residence halls.

5. All permanent accessories must be surface mounted. As with toilet partitions, Clemson prefers solid surface countertops and shelves in bath locations.

6. Do not construct openings in countertops to receive trash.

7. Accessible reach ranges as defined by the most recent version of ICC A117.1 are to be maintained on all mirrors, shelves, coat hooks, dispensers, grab bars, etc.

8. Mirrors must be located such that reflected images will not be presented to adjacent rooms.

9. Design space to accommodate one 23-gallon waste receptacle near but not blocked by the door.

10. Provide fully detailed mounting locations for all accessories.

10 41 00 Emergency Access and Information Cabinets

10 41 16 Emergency Access Key Cabinets

Specify that all new facilities and facilities undergoing significant exterior renovation shall have an emergency access high security key box. Location of this key box shall be as specified by the Fire Code Official and mounted approximately 5’ above the finished walking surface.

PRODUCTS AND MATERIALS- DIVISION 10 – SPECIALTIES

Coat/Robe Hooks

- Housing: Bobrick B-76727 or approved equal

Emergency Access Key Cabinets

- Series 4400 Knox Box: Model 4443 (Recessed Mount, Dark Bronze)

Personal Disposal Bag Dispenser

- Hospeco Personal Bag Dispenser in White. Model: HOSSDW or approved equal

Paper Towel Dispensers

- Georgia Pacific enMotion 10” Automated Touchless Towel Dispenser. Model: 59462A or approved equal

Seat Cover Dispensers

- Owner specified if used. Must be approved by Custodial Services prior to installation.

Soap and Sanitizer Dispensers

- Nexa Classic Touch Free Dispenser in Black. Model: 5492021192 or approved equal

Toilet Paper Dispensers

- Georgia Pacific Compact Side-by-Side Double Roll Coreless Bathroom Tissue Dispenser. Model #: 56784A or approved equal
- For Residential Facilities: Georgia Pacific Quad 4 Roll Coreless Bathroom Tissue Dispenser. Model #: 56744A or approved equal

Trash Cans (Restrooms Only)

- 23 Gallon that meets the following:
  - Visually complements finishes, fixtures, etc. in space
  - Meets ADA reach ranges
  - Efficiently utilizes floor space within the restroom.

DIVISION 11 – EQUIPMENT

11 05 00 Common Work Results for Equipment

Installation

The installation of equipment on a project will usually fall under one or more of the following conditions:

1. **Contractor Furnished – Contractor Installed**

    - Installation shall conform to the provisions of the Contract Documents and be coordinated by the general contractor.

    - Specify that the installation shall be performed by competent and trained workmen in accordance with manufacturer's instructions, all applicable codes, and governing regulations. Where appropriate, the installation by the manufacturer shall be specified.

    - Documents must specify any necessary inspection by the installer that may affect installation. Specify that the installer shall not proceed until any unsatisfactory conditions are corrected.

    - Specify that any defects caused by unsatisfactory conditions or untimely installation shall be corrected at no cost to the Owner.

2. **Owner Furnished – Contractor Installed**

    Same requirements as Contractor Furnished – Contractor Installed

3. **Owner Furnished – Owner Installed**

    - Contract Documents for the general construction contract shall identify equipment, any space requirements, and any utility connections required.

    - Specify that installation must be coordinated with the Project Manager.

4. **Contractor Furnished – Owner Installed**

    - Same requirements as Owner Furnished – Owner Installed

Delivery

1. Specify that coordination of delivery shall be the responsibility of the general contractor. The contractor shall have a representative on site to receive the shipment.

2. Specify that all debris and crating material shall be removed from the site and properly

disposed of.

Testing and Operation

1. Specify that any equipment requiring testing of its operation is to be accomplished and properly documented, including any safety devices. When appropriate, operation and maintenance instruction shall be provided to the Owner's personnel. This instruction shall include demonstration of proper use, maintenance, safety features, cleaning procedures, and proper storage and handling.

2. Provide operation and maintenance manuals as appropriate in accordance with applicable sections of this manual.

11 08 00 Commissioning Equipment

1. When equipment is to be provided within the scope of the project and the design/selection is included as part of the A/E agreement, the services provided will include the identification of user needs, formulation of budgets, development of design documents for the purchase and installation of the equipment. Identification of user needs, and formulation of budgets shall be accomplished during the programming and design development phases of the project. The entire process shall be closely coordinated with the user group with the Project Manager involved. The result of this process must ensure compatibility with user requirements, current University standards, as well as compliance with governing codes and regulations.

2. Plans and specifications shall be prepared that adequately supply information necessary to purchase and install the equipment as approved by the University. Any applicable warranty or guarantee on material, installation, and/or manufacturing workmanship must be coordinated with the Project Manager. Approval of acceptable manufacturers shall be obtained from the Project Manager prior to the release of documents.

Purchasing

1. The University prefers that equipment be procured and installed under the provisions of the general construction contract. When this method of procurement is not possible or practical, it may become necessary to specify and purchase these furnishings through the University Purchasing Division. This method also requires complete bid documents including instructions to bidders which will detail provisions from related documents that may apply. Bid evaluations and recommendations shall be provided to the Project Manager for review and approval prior to award of a contract. When this method of procurement is used, the documents for the general construction contract must contain any necessary coordination requirements for this separate delivery and installation.

11 21 00 Retail and Service Equipment

11 21 23 Vending Machines

1. The location, type, and number of vending machines will be determined in conjunction with University Housing and Dining.

2. Allocate suitable electrical and data ports as needed in accordance with Divisions 26 and 27.

11 81 00 Facility Maintenance Equipment

1. Any specialty equipment required to perform routine maintenance shall be purchased as a part of the project. University Facilities' Maintenance Services is to be contacted for review and approval of any equipment selection.

11 82 00 Solid Waste Handling Equipment

11 82 13 Solid Waste Bins

1. The University uses an 8 cubic yard, front load dumpster for refuse disposal. These are to be enclosed in an approved screening device and located in a service area where they are accessible to a front-loading truck but not be objectionably visible to the general public. Site location and enclosure are to be coordinated with Campus Planning and Design, and the Director of Custodial, Recycling and Solid Waste.

2. Pay special attention to designing adequate structural integrity of pavement, concrete etc. around the dumpster container to minimize wear by repeated service.

3. Allocate space for one 23-gallon waste receptacle located near the door of each restroom.

4. Residence hall area waste receptacles and recycling containers shall be limited to 16 gallons or be fire rated with a lid.

11 82 23 Recycling Equipment

1. All recycling stations are to have, at a minimum, bins for Metal & Plastic, Paper, and Landfill.

2. An adequate supply of recycling bins shall be supplied to accommodate the anticipated material volume and are to be dispersed throughout the building such that they are easily accessible from all public areas within a building such as hallways, atriums, etc. to minimize travel distance to reach them. At no time should it be necessary for building occupants to go to another floor to reach a recycling station. Preferred locations for these are adjacent to vending machines and outside of large classrooms.

3. Do not place bins inside classrooms.

4. All recycling stations shall be placed in alcoves sufficiently sized to house all bins. When placing bins without a reconfiguration of space, the designer is to determine location(s) that minimize the impact to the function of the building and emergency egress.

5. Recycling bins are also to be placed in non-public areas such as work rooms, copy rooms, break rooms, computer labs, and lounges.

6. Residence hall recycling equipment shall be in enclosures.

PRODUCTS AND MATERIALS- DIVISION 11 – EQUIPMENT

Recycling And Waste Bins

- Public Areas: Clean River Transition TIM 72-4 or approved equal
- Non-public Areas: Clean River LeanStream with backboard or Busch Systems Waste Watcher with Sign Stand or approved equal
- Restroom Waste Bins: See Division 10 Products

DIVISION 12 - FURNISHINGS

12 05 00 Common Work Results of Furnishings

Installation

1. See installation portion of Section 11 05 00.

Delivery

1. Specify that coordination of delivery shall be the responsibility of the general contractor. The contractor shall have a representative on site to receive the shipment.
2. Specify that all debris and crating material shall be removed from the site and properly disposed of.

Testing and Operation

1. Specify that any furnishings requiring testing of its operation is to be accomplished and properly documented, including any safety devices.

2. When appropriate, operation and maintenance instruction shall be provided to the Owner's personnel. This instruction shall include demonstration of proper use, maintenance, safety features, cleaning procedures, and proper storage and handling.

3. Provide operation and maintenance manuals as appropriate in accordance with applicable sections of this manual.

12 08 00 Commissioning of Furnishings

1. When furnishings are to be provided within the scope of the project and the design/selection is included as part of the A/E agreement, the services provided will include the identification of user needs, formulation of budgets, development of design documents for the purchase and installation of the furnishings. Identification of user needs, and formulation of budgets shall be accomplished during the programming and design development phases of the project. The entire process shall be closely coordinated with the user group, Campus Planning and Design, and the Facilities Interiors Manager. The result of this process must ensure compatibility with user requirements, current University standards, as well as compliance with governing codes and regulations.

2. Plans and specifications shall be prepared that adequately supply information necessary to purchase and install the furnishings as approved by the University. Any applicable warranty or guarantee on material, installation, and/or manufacturing workmanship must be clearly communicated and documented. Approval of acceptable manufacturers shall be obtained from the Project Manager and the Facilities Interiors Manager. prior to the release of documents.

Purchasing Standards

2. The University prefers that furnishings be procured and installed under the provisions of the general construction contract. When this method of procurement is not possible or practical, it may become necessary to specify and purchase these furnishings through the University Purchasing Division. This method also requires complete bid documents including instructions to bidders which will detail provisions from related documents that may apply. Bid evaluations and recommendations shall be provided to the Project Manager for review and approval prior to award of a contract. When this method of procurement is used, the documents for the general construction contract must contain any necessary coordination requirements for this separate delivery and installation.

12 48 00 Rugs and Mats

12 48 13 Entrance Floor Mats and Frames

1. All exterior entrances must incorporate walk-off carpet tiles at building entrances and vestibules. The preferred distance is at least six feet inside and must extend at least the full width of the doors. They must be removeable for cleaning and/or replacement. All installations must comply with most recent version of ICC A117.1.

2. Specify the agreed upon amount of attic stock to be turned over to the Owner at the end of the project.

3. Do not specify permanent grates in place of entrance mats.

12 50 00 Furniture

12 50 05 Furniture Warranty

1. Clemson University requires a warranty period for all furniture purchases of not less than 10 years from date of acceptance of the products. If, during the warranty period, faults develop, they shall be repaired or replaced without any additional cost to the University including those associated with transportation and installation.

12 56 00 Institutional Furniture

1. Specify that all seating and furniture that has internal power and/or data are designed to be permanently fixed and immovable by room occupants. All connections to building systems shall be permanent and internal to the furniture system. Multiwire systems shall connect to building branch circuits in accordance with the National Electric Code as adopted Chapter 5 the OSE Manual. Building electrical and data systems shall be modified as necessary to allow for connection directly to furniture systems and shall not be done by visible cabling plugged into existing outlets and data connections.

12 56 39 Lecterns

1. All lecterns and associated controls are to be easily height adjustable and comply with ICC A117.1.

PRODUCTS AND MATERIALS- DIVISION 12 – Furnishings

Entryway Walk-off Carpeting

- Milliken OBEX Tile – Cut/Stipple

DIVISION 13 - SPECIAL CONSTRUCTION

13 05 00 Common Work Results for Special Construction

1. Clemson University often has special purpose needs in the academic and athletic environment. Auditoriums and classrooms, laboratories, clean rooms, information technology, and instrumentation needs are often integral to the functionality of a building. Designers shall consult with the Owner user groups early in the design development process and integrate any special construction needs while maintaining long term flexibility in building operations.

13 48 00 Sound, Vibration, and Seismic Control

1. Spaces will be designed as to have all noise producing sources co-located to the greatest extent possible as to isolate them from any space such as classrooms, offices, auditoriums, etc. where the reduction of noise pollution is desirable.

2. Primary instructional spaces shall conform to the most recent version of ANSI/ASA S.12.60 Part 1. Buildings and spaces housing administrative and/or support operations not directly associated to teaching and learning spaces shall follow ANSI/ASA S.12.60 Part 1 requirements for ancillary spaces.

3. All audio and sound reinforcement systems installed in primary instructional or ancillary spaces shall conform to the most recent version of ANSI/ASA S.12.60 Part 1.

DIVISION 14 - CONVEYING EQUIPMENT

14 20 00 Elevators

1. All installations shall be in compliance with ASME 17.1 as adopted by the South Carolina Elevator Code.

2. Specify that the contractor shall be required to obtain the necessary operating permits from the South Carolina Department of Labor and Licensing prior to Substantial Completion of the facility.

3. Specify that warranties on the elevator installation shall commence at the date of Substantial Completion.

4. Traction elevators are to be used in buildings over two stories.

5. Machine roomless elevators are not allowed. Elevator equipment, machines controls and communication devices shall be installed in a dedicated elevator equipment room.

6. Specify a design which can be maintained by any licensed elevator maintenance company employing journeymen mechanics, without the need to purchase or lease additional or proprietary diagnostic devices, special tools, or instructions from the original equipment Manufacturer.

7. All elevators shall be sized, at a minimum, to accommodate a standard EMS Stretcher (24”x84” with 5” Corner Radii).

8. Coordinate the car and door sizes of any freight or service elevators such that they will be able to accommodate the anticipated building functions such as material transport, equipment moving, etc.

9. Finishes need to be coordinates with others used in the building and approved by the Facilities Interiors Manager.

14 21 00 Electric Traction Elevators

1. All equipment, machines, controllers, electrical components, and communication systems associated with traction elevators shall be located in a machine room directly above the elevator shaft.

2. Provide battery drift function in the event of power loss.

14 24 00 Hydraulic Elevators

1. All equipment, machines, controllers, electrical components, and communication systems associated with hydraulic elevators shall be located in a machine room as near as possible to the elevator shaft on the lowest floor serviced by elevator.

2. If a hydraulic elevator is selected for use, the designer shall adequately cover subsurface information for the intended installation of the hydraulic jack.

3. Provide battery lowering function in case of power loss.

14 28 00 Elevator Equipment and Controls

1. All elevator designs shall specify all necessary provisions to allow the installation of a two-way emergency communication system in each elevator cab, including all conduits and associated wiring devices required for the installation. This shall be done such that the final installation utilizes Clemson's data network to provide uninterrupted connectivity for communication with Emergency Personnel.

2. Specify that the contractor and/or the elevator manufacturer and installer shall furnish complete diagrams for both power and control wiring of the elevators installed and included in the bound set of Maintenance Manuals and posted in the elevator equipment room unless otherwise directed by University Facilities Maintenance Services.

3. If the equipment for fault diagnosis is not completely self-contained within the controller, provide a separate detachable device or software as required to the Owner and Owner's service contractor as part of this installation. Such a device shall be in possession of and become property of the Owner. The software or device shall be made available to the Owner and Owner's Maintenance Contractor in the case of misplacement or loss of the original.

4. Provide any specialty tools required for service, repair and parts replacement.

5. Provide upgrades and/or revisions of software during the progress of the work, warranty period and the life of the elevator.

6. Installed equipment and software not meeting this requirement shall be removed and replaced with conforming equipment at no cost to the Owner.

PRODUCTS AND MATERIALS- DIVISION 14 – CONVEYING EQUIPMENT

Two-Way Emergency Communication Systems

- MAD Elevator, Inc.: Mosaic One or approved equal

DIVISION 21 - FIRE SUPPRESSION

21 05 00 Common Work Results for Fire Protection Systems

Design Standards

1. Specify a water-based fire suppression system in all buildings with sleeping quarters.

2. Except as allowed by the International Existing Building Code as adopted by Chapter 5 of OSE Manual, existing buildings at Clemson University that undergo renovations that exceed 50% of the building floor area shall be required to meet the same Fire Suppression Systems requirements as new construction.

3. Designer Qualifications: Fire Sprinkler System design shall be entrusted only to Professional Engineers with training and experience in fire sprinkler and fire alarm system designs that are listed in the SC State Board of Registration for Professional Engineers.

4. Provide an engineer-sealed Fire Protection System design that fulfills Clemson's Fire Suppression System Installations and Alterations Requirements. The design shall include all Underground and Above Ground components of Fire Sprinkler, Standpipe, Hose Station, Fire Hydrant, and Fire Pump Systems with a design for a complete system including specifications and drawings that show site plans, floor plans, piping schedules, area hazard classification, building cross sections, device types and locations, wiring diagrams, power requirements, back-up power supplies, including any necessary details to accurately depict the scope of work included in the project. Design must include all nozzles, piping, bracing, hangers, valves, tanks, and components necessary to furnish a complete system for the facility.

5. Risers shall be designed in accordance with University Facilities Fire Suppression and Domestic Water Riser Schematic.

6. All drains From RPZ Backflow Preventers shall be piped to a floor drain or the exterior of the building, whichever is closer.

7. For projects not on Clemson's main campus, consult with the responding Fire Department to coordinate the preferred type and location of hydrants and Fire Department Connections.

8. See Division 28, Section 28 30 00, for additional information and instructions concerning the design and installation of Fire Detection and Alarm Systems.

Submittals

1. Specify what submittals must be made to the appropriate AHJ's. Specify which approvals must be obtained before work may begin. Clemson University Fire Code Official and Life Safety Shop must approve all plans that include or affect any Fire Protection System.

Materials and Components

1. Specify that all materials and components be listed by an approved agency.

2. Specify that all materials and components used in any new Fire Protection system must be new. Reused or refurbished materials are not acceptable. For upgraded and up-fitted systems, reuse of existing materials and/or components is acceptable only when approved by the designer of record, Fire Code Official and Life Safety Shop

3. Specify that all piping is labeled in accordance with Section 33 05 97.

Acceptance Testing

1. Specify that all systems be tested according to codes as adopted by Chapter 5 of OSE Manual and that all required documentation of testing and test results be submitted to the Owner and Engineer of Record.

2. Specify that the Contractor give the Owner and Engineer a minimum of two (2) working days' notice before conducting tests to allow the Owner and/or Engineer the opportunity to witness the testing.

3. The CU Fire Code Official, or his designee, shall be present to witness testing of all fire protection apparatus.

21 10 00 Water-Based Fire Suppression Systems

21 11 00 Fire Suppression Systems Water Piping

1. Specify that underground piping and fittings shall be Ductile Iron Minimum Pressure Class 51 with thrust resisting couplings at all fittings, and at least 10 linear feet beyond the fitting. Underground piping also must comply with Divisions 31 (Earthwork) and Division 33 (Utilities) and the Urban Forest and Landscape Management Policy.

2. Specify that above ground piping be steel and a minimum Schedule 40 with threaded fittings and connections for piping of nominal diameters up to 2.5". Piping of nominal diameters of 2.5" and above are to be a minimum of Schedule 10 and joined with roll grooved, welded, or flanged connections. At no time shall segmented welding or plain-end mechanical couplings/fittings be used that employ steel gripping devices to bite into the pipe as a means of joining.

3. Specify that drainage piping and dry piping must be galvanized, of the same minimum schedule and joined with the methods as listed directly above.

4. Specify that all system drains are connected to storm sewer outside of the building and constructed in such a way that landscaping, public ways, nor accessible routes are disturbed.

5. Specify that control valves for Fire Sprinkler System water supply be installed on each floor of the building and are no higher than 7 feet, operable without the use of tools or having to remove a cover, panel, etc. These valves shall also have a tamper switch

that must be monitored when a Fire Alarm System is provided.

6. Provide a hose valve on every intermittent landing when fire risers as installed in stairways.

7. Specify that all hangers must conform to NFPA 13. Powder-actuated fasteners are not permitted.

8. Specify that all water-based fire suppression systems on Clemson's Main Campus are designed to operate with 150 psi of delivery pressure at the FDC. For University buildings in other locations, contact the Fire Code Official.

9. Specify that any signage attached to fire suppression piping shall be done by external mechanical fasteners such as U-bolts, clamps, etc. that do not drill into or in any way compromise the structural integrity of the piping system.

10. Specify that fire sprinkler systems are to be protected from freezing and are not to be subjected to temperatures below 40ºF. Any alternate heat sources shall be approved by Fire Code Official.

11. Specify that all underground piping shall be flushed at a minimum of full system flow until the water runs clear before connecting the underground piping to the fire sprinkler system or fire pump if a pump is required.

12. Specify that all sprinkler piping that is concealed in locations such as above acoustical ceilings, in mechanical rooms, etc. is to be labeled "Fire Suppression" in accordance with the conventions given in Section 33 05 97.

21 11 16 Fire Hydrants

1. Specify that placement of all fire hydrants are to be pre-approved by the Fire Code Official.

21 11 19 Fire Department Connections

1. Specify that placement of all fire department connections are to be pre-approved by the Fire Code Official.

2. All FDC's installed on Clemson's Main Campus are to be designed to operate at 150 psi. For University buildings in other locations, contact the Fire Code Official.

3. Free standing FDC's are to be installed according to the CUFD Free Standing FDC Standard. Both the location and orientation of the connection shall be approved by the Fire Code Official.

4. Specify that minimum Emergency Vehicle Turning Radius is to be per Clemson University Fire Department's Fire Apparatus Access Requirements. The Clemson University Fire Code Official must approve all proposed roadways, driveways, and parking lots to ensure adequate accessibility for firefighting apparatus.

21 13 16 Dry-Pipe Sprinkler System

1. Nitrogen generators shall be used on all new construction and new system installations.

2. If a compressed air system is allowed, all air compressors for fire service shall be UL listed and approved by the Fire Code Official.

21 22 00 Clean-Agent Fire Extinguishing Systems

1. When deemed appropriate by the Fire Code Official due to serving sensitive locations such as computer rooms, electronic systems, archives etc., the system shall be a clean-agent system in compliance with NFPA 2001 as referenced in the IBC as adopted by Chapter 5 of OSE Manual.

PRODUCTS AND MATERIALS- DIVISION 21 – FIRE SUPPRESSION

Fire Hydrants

- Mueller Super Centurion or approved equal

Emergency Access Key Cabinets

- Series 4400 Knox Box: Model 4443 (Recessed Mount, Dark Bronze)

Underground Piping

- AWWA C150/C151 ductile iron, thickness class 51, bituminous coated, cement lined, per ANSI A21.4, with UL approved thrust-restraint type couplings.

Above Ground Piping

- ASTM A795; ANSI/ASTM A53; ASTM A135.
- Piping less than or equal to 2.5” diameter shall be Schedule 40 with threaded couplings.
- Piping greater than 3” diameter shall be minimum Schedule 10, with roll grooved or welded couplings.

DIVISION 22 - PLUMBING

22 05 00 Common Work Results for Plumbing

22 05 19 Meters and Gauges for Plumbing Piping

1. Pressure gauges shall have maximum readings approximately two times the expected working pressure. A gauge cock must be specified between each gauge and the main line.

22 05 23 Valves

1. Specify that valves be installed with stems horizontal or above except as required for accessibility.

2. Arrange valve handles to be easily accessible.

3. All valves shall be identified with metal tags.

4. In addition to permanent metal tags, valves that are obscured by drop ceilings, movable structures, etc. are to have their access points labeled with same nomenclature as the metal tag on drop ceiling/obscuring structure such that it is visible upon entry onto the space where the valve is located.

5. Specify that valves be installed at all locations requiring shut off during maintenance including but not limited to large branch lines at mains, bases of Risers, floor branches at risers and meters.

6. Add valve stem extensions and sleeves as needed to allow operation of valves without breaking vapor seals or disturbing insulation.

7. Design domestic water supply systems such that the number of tempering valves is minimized.

8. Require that exterior hose bibcocks shall include an escutcheon plate for freeze protection.

9. Provide hose bibcocks in mechanical rooms.

10. All hose bibcocks, including wall hydrants and sill cocks shall be equipped with a vacuum breaker as per instructions from the S.C. Department of Public Health.

22 05 29 Hangers and Supports for Plumbing Piping and Equipment

1. Specify that wall clamps and brackets used for support of piping and equipment from concrete or solid masonry shall be secured will self-drilling concrete fasteners.

2. Clamps and brackets on hollow masonry block construction shall be supported with

toggle bolts.

3. Specify that horizontal, parallel, and adjacent piping shall be supported by gang hangers with appropriately sized hanger rods no smaller than 3/8” and clamps to match the pipe.

4. Specify that hangers supporting insulated piping be sized to fit over the insulation and have thermal inserts and protective shields.

5. Specify that piping support for supply lines serving toilets and urinals be supported by strapping or bracketry integral to the wall and directly behind the fixture.

6. Specify that supports and clamps in contact with copper pipe shall be copper plated.

22 05 48 Vibration and Seismic Controls for Plumbing, Piping and Equipment

1. Shock absorbers for plumbing fixtures up to 1” pipe size shall be the same size as the line on which they are installed.

2. Pipes larger than 1” shall have 1” shock absorbers installed.

3. Shock absorbers must be installed at the end of all branch lines.

4. No pipe extensions are to be used in place of shock absorbers.

22 05 53 Identification for Plumbing, Piping and Equipment

1. Specify that all piping is to be marked and coded with color coded tape in accordance with Section 33 05 97, in a neat and uniform manner.

2. Markings shall not exceed 20 feet apart in mechanical rooms.

3. The wording and color coding shall be coordinated with other mechanical, electrical, and other trades and suppliers.

22 05 76 Facility Drainage Piping Cleanouts

1. The design shall include all necessary clean-outs for efficient maintenance of the waste piping system for the facility. Clean-outs located in exposed areas of the facility shall be equipped with a chrome plated cover plate terminated just inside finished walls.

2. Provide clean-outs in each exposed P-Trap not integral with the fixture.

3. Cleanouts shall be the same nominal size of the pipe for sizes 4” and smaller and 4” nominal size for larger pipe.

4. Cleanouts shall be installed at the base of all stacks, not more than 50 horizontal feet apart, at every change of direction greater than 45 degrees. Specify coordination of any access panels with other trades.

5. Specify that cleanouts for sanitary sewer lines serving individual buildings be made using two 45 degree Y-fittings joined in opposing directions so that equipment can service either the building or the public utility without making a 90 degree turn within one fitting.

6. Housing Facilities: Independent or double cleanout for servicing building sewer connection shall be located within 5’ of foundation/footing.

22 07 00 Plumbing Insulation

1. New insulation systems must conform to the International Energy Conservation Code as adopted by Chapter 5 of OSE Manual, but in no case carry a lesser rating than applicable listed materials in Products and Materials section of this division.

2. Additions, Alterations, and Repairs will extend insulation the full length of the project scope following the same requirements as new construction.

3. All insulation systems must have composite Fire and Smoke Hazard ratings as tested under procedure ASTM E-84, NFPA 225 and UL 723 not exceeding a Flame Spread of 25 and a Smoke Development of 5.

4. All pipe insulation must be continuous through walls, partitions, ceiling openings and sleeves. Where pipes pass through fire-rated floors, walls, or partitions, the use of a UL approved system for through penetrations is required. The annular space around the pipes must be packed with mineral wool and sealed at each exposed edge to maintain the rating of the system.

5. Insulation on all cold surfaces must be applied with a continuous, unbroken vapor seal.

6. Specify that hangers supporting insulated piping be sized to fit over the insulation or if anchors are secured directly to cold surfaces they must be adequately insulated, and vapor sealed to prevent condensation.

22 11 00 Facility Water Distribution

22 11 13 Piping

1. Specify that the domestic water supply to the building be installed in accordance with University Facilities’ Fire Suppression and Domestic Riser Schematic.

2. Regulations contained in the Safe Drinking Water Act concerning lead and copper concentrations shall be complied with in the selection of piping materials.

3. Specify that all piping be neatly arranged, running parallel with primary lines of building construction, and that right-of-way must be given to piping that requires gravity sloping for drainage. All domestic water piping shall be sloped for drain down. All changes in pipe direction shall be made with appropriate fittings.

4. Approved connections between piping of dissimilar metals shall be dielectric fittings such as a union, nipple or flange.

5. Where possible, all water piping shall be located in heated areas of the facility.

6. All domestic water supplies that require backflow prevention shall be installed in accordance with Fire Suppression and Domestic Riser Schematic and mounted horizontally as to minimize repair time and shall have isolation valves integral to or before and after each backflow preventer to negate the need to shut off water to an entire facility during service or repair.

7. All drains from RPZ Backflow Preventers shall be piped to a floor drain or the exterior of the building, whichever is closer.

8. Overhead piping shall be located below ceiling insulation to prevent freezing.

9. Water, soil, or waste piping is not permitted on exposed parts of the building.

10. No pressure piping is allowed beneath the building slab except for fire suppression systems without an approved Deviation from these standards.

11. Utility piping entering the facility from underground must done in one of the following methods. All portions of piping remain accessible from service/mechanical spaces or building exterior:

    a. Passing through an exterior wall below grade directly into a mechanical or service space also below grade.
    b. Entering a mechanical or service space by turning up through the floor slab immediately inside the building envelope.
    c. Though an accessible trench or areaway.

12. Specify that unions or flanges be provided at all connections to each piece of equipment and on both sides of valves and other in-line devices that require removal for maintenance. Specify that cast bronze adaptors be used at all copper to flanged or IPS connections.

13. Specify that piping passing through or under corrosive fill be protected by appropriate coatings, wrapping, or galvanized sleeves. Sleeves shall be at least two pipe sizes larger than the pipe plus insulation.

14. Require all rough-in plumbing to be sealed off with test plugs, caps, etc., until fixtures are ready to be installed.

15. Specify that all openings between pipes and pipe sleeves shall be sealed with approved firestopping materials or systems at fire walls and where required to inhibit noise transmission.

22 13 00 Facility Sanitary Sewerage

22 13 16 Piping

1. Specify that all piping be neatly arranged, running parallel with primary lines of building construction, and that right-of-way must be given to piping that requires gravity sloping for drainage. All changes in pipe direction shall be made with appropriate fittings.

2. Approved connections between piping of dissimilar metals shall be dielectric fittings such as a union, nipple or flange.

3. Specify that traps be installed for each fixture and floor drain, with access to the traps on upper floors.

4. Require all rough-in plumbing to be sealed off with test plugs, caps, etc., until fixtures are ready to be installed.

5. Specify that all openings between pipes and pipe sleeves shall be sealed with a flexible fire-retardant sealant at fire walls and where required to inhibit noise transmission.

16. Utility piping entering the facility from underground must done in one of the following methods. All portions of piping remain accessible from service/mechanical spaces or building exterior:

    a. Passing through an exterior wall below grade directly into a mechanical or service space also below grade.
    b. Entering a mechanical or service space by turning up through the floor slab immediately inside the building envelope.
    c. Though an accessible trench or areaway.

6. Specify that there shall be no visible penetrations to the exterior envelope of building

7. Specify that cleanouts for sanitary sewer lines serving individual buildings be made using two 45 degree Y-fittings joined in opposing directions so that equipment can service either the building or the public utility without making a 90 degree turn within one fitting.

22 13 19 Sanitary Waste Piping Specialties

1. Floor drains shall be provided where required by the activity within the area.

2. Provide floor drains in all public rest rooms. Floor drains can be omitted in private restrooms such as those attached to individual offices with permission.

3. Provide floor drains for all emergency showers.

4. All floor drains shall connect to sanitary sewer.

5. Floor drains shall be acid resisting, with grate and openings to restrict small foreign matter like gravel, peanut hulls, etc.

6. Floor drain bodies shall be tapped for and have trap primers installed.

7. Provide Petro Plugs for Mechanical Room floor drains when equipment with petroleum fuel and lubricants are present.

22 14 00 Facility Storm Drainage

22 14 26 Facility Storm Drains

1. All storm drains that do not connect to a central storm sewer system shall not discharge onto any public way or accessible route.

22 30 00 Fuel-Fired Domestic Water Heaters

22 33 13 Tankless Gas Domestic Water Heaters

1. All gas fired condensing tankless water heaters shall have condensate lines that discharge into sanitary sewer system via an acid neutralizing tank that maintains the pH of discharge between 6.0 and 8.5.

2. All condensate piping between the heater and neutralizing tank shall be at a minimum, schedule 40 PVC or CPVC.

22 40 00 Plumbing Fixtures

22 42 13 Commercial Water Closets, Urinals, and Bidets

1. Specify that water closets and urinals are to be wall hung with plumbing chase of 30” min. clear width and having an access doorway as specified in Section 08 10 00.

    - Water closets in building not cleaned or maintained by Facilities Maintenance and Custodial departments, single occupancy, and apartment style residential restrooms may be floor mounted and can be exempt from this requirement.

2. Water closets shall have flush valve, vacuum breaker, top spud, elongated, vitreous china bowl, and white seat open front type. Seat heights and mounting locations on all water closets must comply with the most recent edition of ICC A117.1.

    - Water closets and seats used in apartment style residential units may use a tank type residential design with a closed front seat.

3. Urinals shall have flush valve, vacuum breaker, top spud, and be made of vitreous china. All mounting locations of urinals must comply with the most recent edition of ICC A117.1.

4. Waterless fixtures are not allowed.

5. All fixtures shall be WaterSense complaint.

22 42 16 Commercial Lavatories and Sinks

1. Any wall hung lavatory must be either vitreous china or enameled cast iron, with 4" faucet centers, 3/8" angle supplies with stops and equipped with a 1-1/4" min. P-trap. Countertop lavatories shall be equipped like wall hung lavatories.

2. Laboratory sinks shall have 8" faucet centers and vacuum breakers

3. All floor mounted mop basins shall be constructed of either stainless steel or Terrazzo with stainless steel edge caps and back splash along each along each wall the sink contacts for the width of the sink.

22 42 23 Commercial Showers

1. All Accessible showers in new construction shall be a roll-in design with seat (36"x60"') as defined by the most current version of ICC A117.1

2. Accessible showers installed in existing buildings can be a standard transfer type with seat (36"x36") if it is technically infeasible to install a roll-in shower. This must be approved through a deviation request as referenced in the preamble of this document.

3. All fixtures shall be WaterSense compliant.

22 42 39 Commercial Faucets

1. Use remote sensor lavatory faucets with maximum continuous flow rate of ½ gallon per minute and a maximum metered flow rate of ¼ gallon per 10 seconds.

2. All mixing valves and electronic controls associated with remote sensing faucets shall be mounted free from obstruction in a readily accessible area.

3. All faucets that have the potential to connect hot- and cold-water supplies via valves downstream of the hot- and cold-water shutoffs within the fixture must have one way check valves immediately upstream of the fixture. At a minimum, these must be installed with commercial kitchen and service sink faucets.

4. All fixtures shall be WaterSense compliant.

22 45 00 Emergency Plumbing Fixtures

1. Emergency showers and eyewash stations will be placed in locations dictated by applicable OSHA 29 CFR 1910.151C and installed in accordance with ANSI/ISEA Z358.1-2014.

2. All showers and eyewashes in labs and instructional spaces shall be of an in-wall, recessed design that is in accordance with Clemson's Accessible Eyewash and Shower Standards.

3. All showers and eyewashes not in lab or instructional spaces can be either a recessed

in-wall or freestanding design. Any of these locations meant for use by people other than custodial and service personnel shall be in accordance with Clemson's Accessible Eyewash and Shower Standards.

22 47 00 Drinking Fountains and Water Coolers

1. Specify one bottle filling station/fountain combination unit. Install such that fountain meets with all applicable requirements of ICC A117.1.
2. Install vandal resistant water fountains in all housing and residential facilities on Clemson's main campus.

22 63 00 Gas Systems for Laboratory and Healthcare Facilities

22 63 19 Laboratory Gas Storage Tanks

1. Buildings with laboratories shall have areas for handling the delivery and return of gas storage tanks (bottles).

2. Specify separate empty and full container holding areas including chain restraints per applicable codes.

PRODUCTS AND MATERIALS-DIVISION 22 – PLUMBING

Back Flow Preventer

- Domestic Water: Watts, Apollo, Ames, Febco, or approved equal solid brass, uncoated reduced pressure zone models that include service/isolation shutoffs before and after preventer. (Include protected test bypass and complete rubber parts repair kit)

- Fire Protection: Ames double check valve models that include service/isolation shutoffs before and after preventer. (Include protected test bypass and complete rubber parts repair kit)

Carriers

- Water Closets and Urinals: JR Smith, Josam, or approved equal

Clean-outs

- JR Smith
- Zurn
- Josam
- Wade

Domestic Water Heaters

- Steam: Leslie Constant Temp or approved equal

- Gas: Rheem or approved equal - Non-condensing preferred.
- Electric: Marathon Commercial or approved equal metal free where demand factor and fixture unit values allow
- Tankless/Instant: Rinnai, AO Smith, Takagi, Noritz, Peerless
- Acid Neutralizers for Condensing Tankless: Follow manufacturer recommendation. If no recommendation is given, use limestone chip style.

Domestic Water Piping

- 1" thru 3" Metal Piping: Copper Type L
- Greater than 3" Metal Piping: Carbon steel, Schedule 40 or Copper Type L
- PEX Piping: Type A and Type B
- Polypropylene piping systems are not to be used.

Drinking Fountains

- Elkay LZS8WSK or approved equal
- Elkay LVRC8WSK or approved equal (Vandal Resistant)

Emergency Shower, Eyewash, Facewash, and Combination Units

- Freestanding Units
  - Haws Axion or approved equal
  - Encon Model #01050216 combination eye and safety shower, and universal emergency sign or approved equal

- Recessed/In-Wall Units
  - WaterSaver SSBF2350 or approved equal
  - Speakman SE-575-DP-237, SE-575-DP-238, or approved equals
  - Guardian GBF2350 or approved equal

Fittings for Domestic Water Piping

- Copper: Solder Jointed wrought copper conforming to ANSI B16.22, Viega ProPress compression fittings ½" – 4", Grooved Victualic fittings greater than 4".
- Ductile Iron: Welded, Threaded, Flanged, Viega MegaPress.
- PEX Type A: Uponor or approved equal
- PEX Type B: Viega PureFlow or approved equal

Flush Valves

- Manual for all Locations: Sloan Regal 110XL or approved equal
- Automatic for University Facilities: Sloan Regal 100XL with EBV500A Sensor/Actuator or approved equal
- Automatic for Housing Facilities: Toto TET1GA32#CP or approved equal
- In-Tank Valve: FluidMaster Pro 45 or approved equal

Hangers and Support Devices

- Grinnell, Unistrut, Fee & Mason, Elcen, Kindorf, Mueller, Auto-Grip

Hose Bibcocks

- Interior: Woodford Manufacturing with wheel handle that fits standard garden hose or approved equal.
- Exterior: Woodford Manufacturing that is freeze-proof, tee key actuated and fits standard garden hose or approved equal.

Insulation

- Domestic Hot Water Piping: 1" fiberglass
- Domestic Cold Water Piping: ½" fiberglass
- Soil and Waste Lines (above ceiling): ½" fiberglass or 1" foamed plastic

Residential Kitchen Faucets

- Moen Chateau Single Handle Models 7423 and 7437 or approved equal

Lavatory Faucets

- Residential Facilities: Manually operated Moen Commercial M-Bition Single Handle Models 8432 and 8434 or approved equal
- All Other Locations: Touchless and WaterSense Complaint T & S 5Ef-1D-DS or Sloan Optima ETF-80 or approved equal

Mop Basins

- Floor Mounted Placement Along Wall: ACORN Terrazzo-Ware TDF-32- SSC or dimensional equivalent in stainless steel with 48" backsplash or approved equal.
- Floor Mounted Corner Placement: ACORN Terrazzo-Ware TCR-28- SSC or dimensional equivalent in stainless steel with 48" backsplash or approved equal.
- Mop Basin Faucet: T&S B-0665-BSTR or approved equal.

Nipples

- Brass when used with copper piping
- Dielectric: Galvanized Steel

Pressure Gauges

- Ashcroft, Dwyer, or approved equal

Service Sinks

- Kohler Model K-6718 or approved equal, with T&S Model B-0674-BSTR or approved equal

Shock Absorbers

- Josam 1480/1481, Watts or Zurn with shut off valve

Shower Valves and Trim

- Kohler Coralais, Moen, or approved equal
- Housing Facilities: Moen Posi-Temp Mixing Valve Model 62370(CC) with Moen Chateau Posi-Temp Trim Kit TL181, TL182 or TL183 or approved equal

Shower Heads

- WaterSense Compliant

Strainers

- Watts or approved equal

Wall Mounted Toilets

- Flushometer Equipped: American Standard 2257.101, Kohler with top spud, TOTO with top spud or approved equal

Floor Mounted Toilets

- Tank Toilet: American Standard 215CA.104 or approved equal
- Flushometer Equipped: American Standard 2234.001 or approved equal

Toilet Seats

- Bemis, Beneke, Sperzel Open front type.
- Residential apartment style may use closed front models.

Trim

- Kohler, Chicago Faucet, T & S Brass, Crane, Eljer, American Standard

Unions

- Copper to Steel: Insulating dielectric nipple and union with ball valve
- Copper to Copper: 200 lbs. SWP, brass ground joint
- Steel to Steel: 250 lbs. SWP, malleable iron with brass iron seat

Vacuum Breakers

- Domestic Water: Watts or approved equal
- Fire protection: Ames or approved equal

Valves

- 2" or Less: 150 # minimum Ball valves with replaceable packing full port with

stem extensions for insulation installations
- 2-1/2” or Larger: 150# bronze flanged full port with packing gland and rising stem and flanged connections.

Chemical Drains

- Blue Orion or approved equal
- Spears or approved equal

Waste & Vent Piping

- Above slab: PVC, Schedule 40, cast iron or copper
- Below slab: PVC Schedule 40 or ductile iron - depending on location and use
- No hub couplings: 4 band stainless steel. Husky, Clamp-all, or equivalent. No “Fernco” all rubber fittings.

Deionized and Reverse Osmosis Water Piping

- Niron or approved equal

Water Meters

- Octave Ultrasonic Master Meter or approved equal capable of connecting with current campus-wide Metasys system.

DIVISION 23 - HVAC

23 05 00 Common Work Results for Heating, Ventilating, and Air Conditioning

Design Standards

1. Specify that all condensate drains discharge directly to sanitary sewer or to the exterior of the building. At no time shall any drain be allowed to discharge onto finished floor or directly into the storm sewer.

2. Do not specify any piping beneath the building slab. Utilities shall enter the building through a utility trench or areaway.

3. The steam piping system shall meet the most recent versions of ASME and ANSI B31 Pressure Piping Code and include a steam flow metering system with connectivity to Johnson Controls Metasys.

4. Chilled water system drawings shall show primary and secondary diagrams.

5. Specify that the building primary chilled water loop have a crossover bridge with a check valve to allow for building flow to prevent campus chilled water loop short-cycling.

6. The HVAC system shall also be designed for compatibility with and connection to building automation and energy management systems.

7. The designer shall require submittal and product data on all equipment and products necessary to ensure compliance with the contract documents and for inclusion in required maintenance manuals.

8. The designer shall include adequate climate control for all equipment rooms associated with elevators and account for the thermal load of all machinery, electrical and electronic devices installed.

9. Do not specify variable refrigerant flow systems for habitable spaces. VRF systems can only be used in the form of mini-split type units where each evaporator and fan are served by a single condenser and compressor to control additional heat loads in mechanical, electrical, telecommunications, and equipment areas.

10. Specify testing, adjusting, and balancing of any appropriate mechanical system by an independent testing firm that is compliant with Section 23 05 93. The balance report shall be required and shall contain data considered necessary to properly document the results of this balancing. These reports shall be included in the closeout documents.

11. Installers shall provide as-built locations of all remote-control devices such as differential pressure transmitters, duct static pressure transmitters, duct smoke detectors, etc. on control drawings and record drawings.

12. Specify that all filters in air handlers and terminal devices are changed at the time of Building Turnover as well as providing one extra set of filters for each device as attic stock.

13. The Designer shall provide a comprehensive and detailed Sequence of Operation (SOO) and fully coordinated control diagrams for all HVAC equipment included in the project. These must be:

    a. Clearly shown on the construction drawings and not relegated to specifications or submittals.

    b. Specific to each piece of equipment and system, including but not limited to:
        - Air handling units
        - Chillers and boilers
        - Terminal units (e.g., VAVs, fan coils)
        - Exhaust and supply fans
        - Pumps and control valves
        - Energy recovery systems

    c. Integrated with the control system architecture, showing:
        - Sensor locations and types
        - Control points and sequences
        - Interlocks and safeties
        - Communication protocols and network diagrams (if applicable)

Equipment Sole-Source Suppliers

Clemson University has Johnson Controls, Inc. under contract to provide installation of building automation systems and components. The contractor must review and submit to Clemson the pricing received in accordance with the terms and conditions of that contract. Specific details of each contract must be provided in the specifications; name, contact information, solicitation number, and expiration date. Documentation of the evaluation of this pricing information must be kept for review by Audit and Certification.

23 05 19 Meters and Gauges for HVAC Piping

1. Pressure gauges shall have maximum readings approximately two times the expected working pressure. A gauge cock shall be specified between each gauge and the main line.

2. Specify that steam meters and chilled water meters provide connectivity to campus Johnson Controls Metasys.

23 05 23 Valves

1. Specify that valves be installed with stems horizontal or above. Arrange valve handles to be easily accessible.

2. Add valve stem extensions and sleeves as needed to allow operation of valves without breaking vapor seals or disturbing insulation.

3. All valves shall be identified with metal tags.

4. Specify that valves be installed at all locations requiring shut off during maintenance, component isolation and troubleshooting.

5. All low pressure (below 40 psi) valves for steam piping within buildings shall be a bronze rising gate valve conforming to MSS-SP80, and ANSI Class 125 pressure and temperature ratings at a minimum.

6. All medium and high pressure (above 40 psi) valves for steam piping within buildings shall be a stainless-steel gate valve with ANSI Class 4 leakage, and ANSI Class 800 pressure and temperature ratings at a minimum.

23 05 29 Hangers and Supports for HVAC Piping and Equipment

1. Specify that all hangars and supports shall be engineered to carry the anticipated loading.

2. Specify that hangers supporting insulated piping be sized to fit over the insulation and have thermal inserts and protective shields.

3. Specify that supports and clamps in contact with copper pipe shall be copper plated.

23 05 53 Identification for HVAC Piping and Equipment

1. Specify that locations of valves, dampers and any other equipment above drop ceilings be marked on the grid with appropriate labels the blend aesthetically with the ceiling.

2. Specify that all piping is to be marked and coded with color coded tape in accordance with Section 33 05 97, in a neat and uniform manner. Markings shall not exceed 20 feet apart in mechanical rooms with a minimum of one label per space. The wording and color coding shall be coordinated with plumbing, electrical, and other trades and suppliers.

3. The wording on identification markers shall be descriptive of the item identified, i.e., "H.W. Return", not "Pump 28."

23 05 93 Testing, Adjusting, and Balancing for HVAC

1. Specify any necessary tests that are to be conducted by a testing adjusting and balancing (TAB) contractor who's Lead Technician is an AABC certified Test, Adjust, and Balance Engineer (TBE) or a NEBB certified professional in Testing Adjusting and Balancing on any equipment or systems as appropriate for each specialty of the mechanical system.

2. Specify that all tests are to be made in the presence of the mechanical contractor or Clemson University, and that accurate records be kept of test readings and that the test results shall be incorporated in the maintenance manuals.

3. Specify that the TAB contractor is to furnish all labor and technical personnel, instruments, and appliances for these tests. If the gauges, thermometers, etc., that

are used for these tests are to be left permanently installed, then they are not to be installed until just prior to the tests so that possible changes in calibration can be avoided.

4. Specify any action necessary to protect components of the systems being tested from damage during these tests.

5. Clemson University retains the right to contract directly with a TAB contractor to perform all tests and adjustments to the mechanical systems in accordance with the design.

6. Specify that the HVAC contractor shall coordinate and cooperate with the TAB contractor to ensure that the testing and balancing work can be accomplished in an appropriate and timely manner.

7. The designer shall coordinate their design with the TAB contractor in order that the installation of effected equipment (fittings, connecting devices, etc.) will ensure an efficient method of accomplishing the testing and balancing.

8. Upon completion of testing and balancing, all transfer grills shall be open and functioning, and all steam and chilled water supply and return valves shall be open and flowing.

9. Specify that the final TAB report shall include final duct static pressure setpoints, final differential pressure (DP) values for chilled water and heating hot water systems (if DP-controlled), and final outside air damper positions to meet design specifications.

23 07 00 HVAC Insulation

23 07 13 HVAC Duct Insulation

1. Specify that exterior insulated ductwork have insulation protection made of metal or a resilient, self-healing material.
2. Insulation shall not be pulled overly tight around ducts when wrapping.

3. Use 8” minimum length board type insulation on bottoms of ducts at trapeze hangers.

4. No duct liner is permitted. Specify that insulation shall be installed on exterior of duct only.

5. Specify that outside air intake ducts shall be insulated.

6. Return ducts and exhaust ducts shall not be insulated unless passing through unconditioned space.

23 07 19 HVAC Piping Insulation

1. Specify that pipe insulation shall be installed with staggered longitudinal joints.

2. Specify the use of vapor barriers for insulated pipes that may be subject to condensation on its exterior or on piping located in damp areas.

3. Specify that exterior insulated piping have insulation protection made of metal or a resilient material.

4. Specify that insulation on steam and condensate lines should be of a thickness to reduce surface temperature to 110 degrees Fahrenheit except in buildings where it is necessary meet requirements for insulation value from the International Energy Conservation Code as adopted Chapter 5 of OSE Manual.

5. Steam, condensate, and vent piping shall have insulation applied with side and end joints butted tightly.

6. Pipes fittings and valves on hot water lines shall be insulated in accordance with the requirements in the International Energy Conservation Code as adopted by Chapter 5 of OSE Manual or to the level of the any existing system being connected to, whichever is greater.

7. Pipes fittings and valves on cold water and chilled water lines shall be insulated with fabricated or mitered sections of pipe insulation or pre-molded sections and vapor sealed.

8. Pipe fittings and valves on steam, condensate, and vent lines shall be insulated with fabricated, mitered segments of pipe insulation. At screen strainers and other fittings requiring routine access for maintenance, fabricate the insulation so that it can be removed and replaced as necessary.

9. Specify that each pipe support on piping 2" and larger shall be provided with equal thickness 12" long sections of Foamglass with jacket carried continuously over the Foamglass and vapor sealed as appropriate.

23 09 00 Instrumentation and Control for HVAC

1. The design of the HVAC system shall provide for a complete system of automatic temperature control of the direct digital type as manufactured by Johnson Control Company. No other control manufacturer will be allowed.

2. The system controls shall provide a distributed process network control system complete with all necessary hardware and software, including all required programming. The system shall be PC microprocessor based and monitored by connection to the existing building automation system to allow for alerts for leaks.

3. The Owner will provide a fiber optic data transmission cable to the specified site location to transmit data to the University Energy Management System.

4. Specify that thermostats shall be wall mounted within acceptable reach ranges in accordance with the current version of ICC A117.1. Thermostats shall have the capability of range limits and "dead band" control in accordance with policies set forth by the Facilities Sustainable Energy Policy.

5. All secondary overflow pans for AHU's described in Section 23 73 00 and fan coils described in Section 23 82 00 shall have a float switch that is interlocked with chilled

water cutoffs that activates when pan is filling with excess water.

6. Update building automation systems, including user views, to reflect changes to and the addition or deletion of any connected system component.

7. All building automation systems shall be designed and installed in accordance with the Clemson Building Automation Standards.

23 09 13 Instrumentation and Control Devices for HVAC

1. Clemson University has Johnson Controls Inc. under contract to provide installation of approved Building Automation Systems and components. The contractor must review and submit to Clemson for evaluation of the pricing received in accordance with the terms and conditions of that contract. These specific details of each contract must be provided in the specifications; name, contact information, solicitation number, and expiration date. Documentation of the evaluation of this pricing information must be kept in each procurement file for review by Audit and Certification.

23 11 00 Facility Fuel Piping

23 11 23 Natural Gas Piping

1. All rigid Natural gas piping shall be schedule 40 black iron.

2. All fittings for rigid gas piping shall conform to the following:

   - Fittings for pipe 2 ½" or smaller shall have threaded connections
   - Fittings for pipe larger than 2 ½" shall have flanged or welded connections
   - All black iron gas fittings shall be malleable black iron.

3. All flexible gas piping shall allow for proper grounding and bonding.

4. Approved connections between piping of dissimilar metals shall be dielectric fittings such as a union, nipple or flange.

23 11 26 LP Gas Piping

1. Follow Section 23 11 00 above.

23 20 00 HVAC Piping and Pumps

23 21 00 Hydronic Piping and Pumps

1. Specify that all piping be neatly arranged, running parallel with the primary lines of the building construction, and that right-of-way be given to piping that must slope for drainage.

2. Specify that unions or flanges are to be provided at all connections to each piece of

equipment and on both sides of automatic valves and devices that require removal for maintenance.

3. Approved connections between piping of dissimilar metals shall be dielectric fittings such as a union, nipple or flange.
4. Specify that bronze adaptors are to be used at all copper to flanged or I.P.S. connections.
5. In locations where piping passes through or under corrosive fill or walls, specify that the piping shall be protected through the full depth of the construction by protective coating, wrapping, or with galvanized sleeves. Sleeves shall be at least two pipe sizes larger than the pipe plus insulation.
6. Specify that all bare steel piping, pipe hangers, supports and miscellaneous metal mechanical rooms and elsewhere exposed to view shall be cleaned and painted in accordance with requirements specified in Division 09.
7. Specify that all condensate drains discharge directly to sanitary sewer or to the exterior of the building. At no time shall any drain be allowed to discharge onto finished floor, walking path, sidewalk or accessible route.
8. All pumps shall have isolation valves installed to allow servicing the pump.
9. All pumps shall be controlled by differential pressure sensors. No sensorless pumps shall be installed.
10. Horizontal steam and hot water piped are tapped for feeder lines, the tap shall be placed on the top or side of pipe.
11. All steam condensate lines shall be Schedule 80 piping.

23 21 16 Hydronic Piping Specialties

1. Include a Chilled water bridge installed per Clemson's Chilled Water Bridge Detail in all new building construction and renovations affecting building Chilled Water Connections.

23 22 23.13 Electric-Driven Steam Condensate Pumps

1. Floor mounted electric steam condensate duplex receiver assemblies shall not be used except for individual pieces of steam consuming equipment that is technically infeasible to connect to the main condensate receiver system of the building. These must include separate incoming condensate flash recovery vessels vented to the outside of the building and auto flow limiting valves to minimize the possibility of pump under variable pump system demands.

23 22 23.23 Pressure-Powered Steam Condensate Pumps

1. The main steam condensate duplex receiver assemblies for any building shall be driven by steam and have an elevated condensate receiver tank with integral or separate flash recovery vessel vented to the outside of the building.

23 30 00 HVAC Air Distribution

23 34 00 HVAC Fans

1. All rooftop curb-mounted exhaust fans are to include a hinge kit to for ease of service.

23 35 33 Listed Kitchen Ventilation Exhaust Systems

1. All rooftop curb-mounted kitchen exhaust fans shall have a hinge kit installed for ease of service.

23 38 13 Commercial Kitchen Hoods

2. All interconnected kitchen exhaust hoods, control systems, and exhaust fans shall be provided by the same manufacturer to ensure full compatibility

23 38 16 Fume Hoods

1. Laboratories that are designed to be equipped with ventilation fume hoods shall be well planned with the necessary duct work system to support the hood operation.

2. Clemson University Department of Occupational and Environmental Safety has operation and maintenance guidelines as well as design information for fume hoods that must be followed.

23 40 00 HVAC Air Cleaning Devices

23 41 00 Particulate Air Filtration

1. Filtration design shall be based on the latest edition of ASHRAE 52.2 to provide MERV 13 or better filtration according to the application. Higher standards may be necessary for some laboratory applications and clean room designs.

2. All MERV 13 and HEPA filter banks shall have an appropriately selected prefilter as a means of extending their service life.

23 52 00 Heating Boilers

2. All Boilers shall conform to ASME CSD-1 and any other regulations and guidance set forth by the SCLLR Boiler Safety Program

23 64 00 Packaged Water Chillers

1. Centrifugal chillers with single stage compressors are preferred at Clemson University.

2. Refrigerants shall not be blended and shall be selected based on current availability, but the chiller shall be capable of being easily converted to accommodate the use of less ozone depleting refrigerants, without having to be derated, as they become

commercially available.

23 73 00 Indoor Central Station Air Handling Units

1. Air handling units shall be appropriately sized and selected to fit the application with the appropriate modules for the required functions.

2. All air handling units within a project or new facility shall be specified to be supplied by a single manufacturer.

3. Specify that all air handers shall have a stainless-steel drain pan that is constructed either of a single sheet or with welded joints. This pan shall also be at least 4" deep and maintain between 6"-12" of horizontal clearance from the air handler. The air handler shall be attached to the concrete pad without creating a leak in the auxiliary pan. At a minimum, there shall be a ¾" positively sloping gravity drain to evacuate the pan that doesn't interfere with the operation of the required float switch.

23 81 00 Decentralized Unitary HVAC Equipment

23 81 26 Split-System-Air-Conditioners

1. Provide hail guards for condensers.

2. Repair or replace coils per manufacturer's instructions if the unit sustains damage.

23 82 00 Convection Heating and Cooling Units

23 82 19 Fan Coil Units

Specify each unit shall have the following:

1. Cabinets are to have extended pocket, 18-gauge galvanized construction, closed cell insulation with insulated stainless steel or heavy composite drain pan. Coordinate finish color with Project Manager.

2. Fan coil units for service spaces such as penthouses, mechanical rooms, IT closets, etc. are to be vertically oriented instead of the customary horizontal units used in occupied spaces.

3. Specify MERV 8 filtration at a minimum.

4. Specify a factory installed service disconnect switch.

5. All overhead fan coils concealed above ceiling shall have a removable stainless-steel secondary drain pan that is constructed either of a single sheet or with welded joints. This pan shall also be at least 4" deep and maintain between 6"-12" of horizontal clearance from the fan coil.

6. All chilled water piping components shall be located above secondary drain pan.

7. A condensate overflow switch shall be installed per Section 23 09 00.

8. Units are to be configured for chilled water and hot water connections on either side.

9. Fan motors shall have three speeds. All cooling and heating performance data must be based on high-speed fan operation.

10. Chilled Water Entering Water Temperature shall be 48 degrees.

11. Hot Water Entering Water Temperature shall be 140-160 degrees.

12. A Preheat Coil shall be installed, and Low Limit protection shall be provided if the unit has Outside Air connected to the unit.

13. Coils shall be furnished with manual air vents. Chilled Water and Heating Coils shall be downstream of Preheat Coil. Heating Coil shall be located downstream of Chilled Water Coil.

14. Specify that the contractor shall provide a piping package for each Fan Coil Unit (FCU) that fully complies with the Chilled Water and Heating Water flow rates and pressure drop requirements as defined by the design engineer. The piping package shall include all necessary components—such as control valves, strainers, balancing valves, and isolation valves—and must be submitted for review and approval as part of the FCU submittal package. Final approval is contingent upon verification of compliance with the specified hydronic performance criteria.

15. All control valve actuators shall be proportional control 0-10VDC. All control valves shall be 2-way configuration. All control analog inputs and outputs shall have the ability to be field calibrated.

16. Unit microprocessor shall be factory supplied or factory installed and must have BACnet communication capability. All set points shall be adjustable via BACnet communication.

17. Provide adequate owner training for unit controls and operation startup with commissioning. All software and hardware for the field accessibility of the unit controls is required.

18. All units shall have the following points configured:

    - Discharge Air Temp, Room Temperature, Occupied Mode, Occupied Cooling SPT, Occupied Heating SPT, Standby Cooling SPT, Standby Heating SPT, Unoccupied Cooling SPT, Unoccupied Heating SPT, Supply Fan Start/Stop, Supply Fan Status, Condensate Overflow Switch Status.

    - <u>If Dehumidification is Required</u>: Room Humidity, Dehumidification SPT IF ECM MOTOR IS INSTALLED Supply Fan Speed Control

    - <u>If Unit has Outdoor Air Connected</u>: Outside Air Damper Position, Low Limit Status, Room CO2

- Condensate pan overflow sensors shall shut off chilled water to unit.

PRODUCTS AND MATERIALS – DIVISION 23 – HEATING, VENTILATION, AND AIR CONDITIONING

Access Doors (Equipment)

- Titus
- Krueger
- Cesco
- Dowco
- Air Balance
- Kees
- Louvers & Dampers
- Ruskin

Air Control Tank Fittings

- Bell & Gossett or approved equal

Air Filtration Media

Comply with standards listed in Section 23 40 00.

Air Handling Units

- Trane
- York
- VTS
- Carrier
- Daiken

Do not mix brands in the same installation

Chillers

Must comply with Section 23 64 00.

- Trane
- Carrier
- York

Dampers

- Manual Volume Control Dampers**:** Ruskin, Dowco, Louvers & Dampers, Air Balance, Arrow
- Fire Dampers**:** Air Balance, Louvers & Dampers, Prefco

Exhaust Fans

- Carnes
- Jenn-Aire
- I.L.G.
- Penn
- Acme
- Greenheck
- Broan
- Cook

Epoxy Coatings

- Sherwin Williams Resoflor Topfloor Mer 1 or approved equal
  - Color: Owner Selected High Gloss

Fan Coil Units

- Trane
- Johnson Controls
- Rittling

Flexible Ducts

- Wiremold
- United States Metal
- Clevepack
- Metal Flex

Flow Switches

- Fluid: McDonnell-Miller FS-4, Johnson Controls, Penn
- Air: Penn or approved equal

Gas Piping

- Rigid Piping: Black Iron, Schedule 40 meeting most current version of ASTM A53f or A120
- Fittings: Malleable Black Iron
- Flexible Piping: FlashShield+ or approved equal

Hangers and Support Devices

- Grinnell
- Unistrut
- Fee & Mason
- Elcene
- Mueller
- Auto Grip
- Kindorf

Insulation

- Chilled and Hot Water Piping**:** Armaflex or 1-1/2" Fiberglass minimum with 850 degree F rating with self-sealing all-purpose jacket, 25/50 spread/smoke development rating. Insulation on fittings and valves shall match that installed on piping or approved equal.
- Low Pressure Steam and Condensate Piping: Pyrogel XTE or approved equal: Use in steam vaults and areas with limited accessibility/working clearances.

  John-Mansfield Thermo-12 Gold or approved equal: Use in all locations except those with limited accessibility/working clearances.
- Hot Water Storage Tanks and Generators**:** 3" blocks of 85% magnesia, securely wired into place, covered with 1-1/2" mesh wire with layer of plastic insulating cement 3/8" troweled over the wire, then finished with a 1/8" layer of hard finish cement, troweled to smooth hard finish.
- Converters**:** Same as hot water storage tanks, except use ½" magnesia and add

one coat of vapor barrier sealant
- Refrigerant Piping**:** 1" Armaflex or approved equal
- Supply Ducts (Exposed Areas):
    - 1-1/2" glass fiber blanket, ¾ lb. density with .002 aluminum foil backing as manufactured by Owens-Corning, Certainteed, Johns-Manville, Armstrong, or BFG.
    - 1-1/2" fiberglass, 3.0 lbs/cf density, with foil reinforced Kraft jacket (O-C Type 703) or approved equal
- PVC Fitting Covers**:** Certainteed or approved equal

Mastics, Coatings, and Adhesives

- Mastics**:** Insul-Coustic, Lion Oil, Foster, Armstrong, Childers white breaker coating, or Foster 30-36
- Breather Mastic**:** Foster GPM or approved equal
- White Vapor Barrier Coating**:** Foster 30-35 or approved equal
- Duct Insulation Adhesive**:** Foster 85-20 or approved equal
- Lap Adhesive**:** Foster 85-75 or approved equal
- Flexible Joint Sealer**:** Foster 30-35 or approved equal

Mini-Split/VRF Systems for Service Spaces

- Trane
- JCI/York
- Daikin
- Mitsubishi

Packaged AC Equipment

- Trane
- Carrier
- Lennox
- York

Pre-Filter Chemical Feeder

- Neptune or approved equal

Pressure Gauges

- Ashcroft or approved equal
- Dwyer or approved equal

Pumps

- Taco
- Bell & Gossett
- Patterson Pumps

Steam Condensate Duplex Receiver/Pumps

- Main Building Condensate: Spirax Sarco Series PPEC duplex pump package or approved equal.

Steam Flow Meter:

- Veris-Acclelabar Model AFS with Foxboro IMV30 Multivariable Transmitter with remote mount, instantaneous steam flow rate (lbs/hr) and energy total (BTU x 100), and connectivity to Johnson Control Metasys or approved equal.

Chilled Water Meter:

- Onicon Sysem-10-N2/BACnet Model F-3500 Featuring campus flow (gpm), instantaneous energy rate (KBTU/hr) and energy total (BTU x 100), and connectivity to campus Johnson Control Metasys or approved equal.

Steam Traps:

- Nicholson
- Spirex
- Armstrong

High Pressure Steam Piping and High-Pressure Condensate:

- Thermal Pipe Systems Super Temp-Tite or approved equal

Low Pressure Condensate and Hydronic Water Piping:

- Metal Piping**:** Meeting ASTM A120 Grade A or ASTM A53 Grade A
- Metal Fittings**:** Meeting ASTM A234
  < 2-1/2" – screwed or compression fittings
  >2-1/2" – butt weld or compression fittings
- Metal Unions**:** Federal Specs WW-V-531 Type B less than 2"
- Metal Flanges**:** Meeting ASTM A181 Grade I (Forged carbon steel – weld neck)
- Gaskets**:** Compression type with spirotallic construction without asbestos
- Compression Fittings for Metal Pipe: Viega ProPress, Viega MegaPress, or approved equals
- Plastic Piping**:** ViegaPEX Barrier tubing or approved equal
- Plastic Piping Fittings: lead free Viega PEX PureFlow or approved equal
- Dielectric Nipples: Galvanized Steel
- Polypropylene piping system are not to be used.

Thermometers

- Weiss DVS35, Weiss DVU35, or approved equal

Valves

- Steam Valves (Under 40 PSI): Milwaukee 148 Series or approved equal
- Steam Valves (Over 40 PSI)**:** Sharp Series 3483 or approved equal
- Chilled Water and Heating System Valves**:** Wafer butterfly type – Demco, Nibco, Watts

DIVISION 26 - ELECTRICAL

26 05 00 Common Work Results of Electrical

Design Standards

1. Design for a complete electrical system with specifications and drawings that show floor plans, riser diagrams, schedules, all power, lighting, and communication plans, including any necessary details to accurately depict the scope of work included in the project. Design must include all conductors, raceways, fittings, circuit protection devices, wiring devices, fixtures, panel boards, boxes, supports, meters, switches, and other electrical equipment necessary to furnish a complete electrical system for the facility.

2. Clearly specify that the products to be provided for installation under this Division are in strict accordance with the Product and Material listing for this Division.

3. Design must specify the necessary testing of the system prior to being put into service.

4. Coordinate the installation of electrical equipment that is specified in other divisions.

26 05 19 Low-Voltage Electrical Power Conductors and Cables

1. Specify that all building power wiring shall be stranded copper of 12 AWG or larger, rated at 600V minimum, type THWN-2, THHN, or XHHW-2, and have a 90 °C (194 °F) minimum temperature rating for both dry and wet applications.

2. Nonmetallic-sheathed Cable (Romex) is not allowed in any circumstance.

3. Conductors pulled inside Electrical Metallic Tubing (EMT) is the standard construction method for low voltage pathways (under 600V) in all cases except those listed below:

    - Rigid Metal Conduit (RMC) is to be used in areas likely to see impact or damage as well as for exposed interior pathways above the finished floor to a height of 7’-0”.

    - Other more robust metallic conduit types may be used when conditions warrant.

    - Flexible conduit is to be used for final connections to light fixtures in drop ceilings. The maximum length of flexible conduit or cable shall be 6 feet.

    - Flexible conduit or cable is to be used for all connections to vibrating equipment such as motors, air compressors, etc. The maximum length of flexible conduit shall be 6 feet.

4. All feeders must be individual conductors pulled in EMT, RMC, GRC, etc. as appropriate.

5. Metal Clad (MC) cabling containing a dedicated insulated ground conductor may be

substituted for conductors pulled inside EMT only in the following limited situations:

- Raised computer floors utilized as air plenums so long as runs are contained in a single room or space and there is readily available service access.

- Final flexible connections to lighting fixtures, fire alarm devices, etc. with readily available service access. These connections must be 6 feet or less.

- In-wall interconnection of no more than 6 outlets on a single circuit in individual spaces. Branch circuits must be fed to each room or space via individual conductors in EMT or RMC as appropriate and then transitioned to MC cable at the first outlet box. This will not be allowed in classrooms, commercial kitchens, laboratories, common areas in residential buildings or other spaces deemed likely to be frequently reconfigured.

- Locations where EMT presents constructability concerns or is technically infeasible. Approval for these locations will be treated as a Deviation from these Standards and considered on a case-by-case basis.

- Housing Only: Branch circuit power and mechanical home runs from panels to the point of connection, for circuits rated 50A and below serving dwelling units**.**

- All installation of MC cable must be done in a neat, uniform and professional manner. The support system must be trays or cable management brackets specific to MC cable that maintain straight runs, minimize cable crossing, facilitate easy location and service of individual cables, and ensure long-term cable support and system integrity.

- Specify cable support within 12” of any through-wall or through-floor penetrations.

6. See information in Division 33 for instructions regarding cable installation for delivery of electrical service to the facility service entrance.

26 05 26 Grounding and Bonding

1. Specify that all ground connections are to be of a type which will ensure against corrosion and electrolysis. Bolted connections are to be used for connections to removable equipment.

2. Specify that all neutral circuit conductors beyond the service entrance switch shall be insulated in all cases. Service entrance cable without individual insulation on the ground circuit conductor shall not be used beyond the service entrance.

3. Specify that ground connections for all panelboards, cabinets, wiring gutters, or troughs are to be by means of bonding the enclosure to the separate grounding conductors, and that an appropriately sized green colored insulation grounding conductor is to be installed in all raceways.

26 05 29 Hangers and Supports for Electrical Systems

1. Specify that firm, workman-like supports are to be provided for all electrical equipment. All supports exposed to the weather are to be hot-dip galvanized.

2. Specify that conduit hangers for banked conduit runs are to be made of steel angle, channel iron, or light steel framing, of adequate size and supported by steel all-thread rods from ceiling inserts or building structure and not attached to other mechanical equipment. Specify that single conduits are to be supported by means of clamps to the building structure or pipe hangers supported by steel all-thread rods from ceiling inserts or building structure. Do not allow the use of wire supports or perforated steel straps.

26 05 33 Raceways and Boxes

1. Specify that raceways for all conductors and cables have a minimum ¾" conduit, and a pull wire be installed in all empty conduits.

2. All raceways are to be installed in straight lines, parallel and/or perpendicular to building lines.

3. Conduit shall be installed with no more than 360 degrees of bend and 100' of length between pull boxes.

4. The design must provide for two conduits (one used and one spare) for each service entrance to the facility.

5. Specify that Galvanized Rigid Conduit (GRC) or Intermediate Grade Metallic Conduit (IMC) is to be used for Service Entrances.

6. Specify that raceways installed below grade and indoors for grounding conductors be PVC Schedule 40.

7. Specify that raceways installed outdoors, and Branch circuit raceways exposed to weather be installed in Galvanized Rigid Conduit (GRC) or Intermediate Grade Metallic Conduit (IMC).

8. Specify the installation of proper fire-stopping material where conduits pass though rated wall or ceiling assemblies. See Section 07 84 00.

9. The installation of "back-to-back" boxes in walls and partitions is not allowed.

10. Specify that all junction boxes shall be installed with a screw attached cover plate.

26 05 53 Identification for Electrical Systems

1. Specify that each major piece of equipment, electric starter, motor panel, and control device be provided with name plate attached for identification.

2. Specify that all panels be labeled on outside top of door frame.

3. Specify that all electrical panelboard and switchboards have a complete and current

schedule and nameplate formatted in accordance with Clemson's Electrical Panel and Switchboard Identification Standards. Any circuit tracing needed to accomplish this is the responsibility of the designer.

4. Specify that color coding is required for all service, feeder, branch, control, and signaling circuit conductors as follows:

   - 120/240 volt and 120/208 volt systems:
     - Phase A - Black
     - Phase B - Red
     - Phase C - Blue
     - Neutral - White
     - Ground - Green
   - 277/480 volt systems:
     - Phase A - Brown
     - Phase B - Orange
     - Phase C - Yellow
     - Neutral - Gray or White
     - Ground - Green
   - Motor Control Wiring:
     - Start Circuits - Black
     - Stop Circuits - Red
     - Common - Orange

5. Specify that conductors smaller than #6 AWG or smaller are to be color coded with a solid color insulation, and that colored, permanent, non-aging, insulating tape banding at conductor ends may be used on larger sizes. Green colored grounding conductors are to be installed in all raceways. Require that multi-conductor cables for control, signal, and alarm circuits requiring a ground wire are to be color coded in accordance with the most recent IPCEA Standards, except as noted otherwise.

6. Specify that multi-colored/multi-conductor cord is Type "SO" and contains a green colored grounding conductor.

7. Specify that identifying markers are to name each circuit pathway in full or abbreviated form with black letters on a background color as follows:

   - Power feeders and branch circuits - Orange background with voltage named
   - Lighting feeders and branch circuits - Yellow background with voltage named
   - Emergency feeders and branch circuits – Red background with voltage named

   These markers shall be affixed at every raceway termination or junction for conduit and every 10 feet for any flexible pathways.

8. Specify that the position of markers is to be such that the view of them is unobstructed, preferably placed lengthwise along the raceway, or that the markers be wrapped around the raceway to form a tag.

9. Provide arc-flash hazard warning labels on equipment. Install labels based on the

information generated from an arc flash analysis conforming to the specifications linked in Section 26 05 73.19. Labels, at a minimum, shall indicate the available energy, personal protective equipment requirements and approach distances.

26 05 73.19 Arc Flash Hazard Analysis

1. For new construction and renovations, arc flash analysis conforming to the applicable specifications below will be required.

   Arc Flash Risk Assessment Specifications for New Construction
   Arc Flash Risk Assessment Specifications for Renovations

2. If an arc flash analysis is to be performed independently of any system addition or modification, it is to be done in accordance with the specifications below:

   Arc Flash Risk Assessment Specifications for Existing Buildings

3. All Arc Flash analysis is to be done in the latest version of SKM System Analysis, Inc. Power Tools and upon completion of the study, a backup copy of the model generated is to be submitted to Clemson University Facilities.

26 05 83 Wiring Connections

1. All branch circuits must have individual, dedicated neutral conductors. Multiwire branch circuits sharing a neutral conductor shall not be installed as part of permanent building wiring.

26 09 00 Instrumentation and Control of Electrical Systems

26 09 23 Lighting Controls

1. Applicable codes adopted by Chapter 5 of the OSE Manual, govern the required locations and types of intelligent lighting control to be employed in University buildings.
2. When any lighting control is employed other than a mechanical switch or dimmer, it shall meet the following additional requirements:

   - Be designed so that no additional routine maintenance, such as changing batteries, is required.
   - Wireless switching shall be self-powering via kinetic energy recovery or other similarly functioning system.
   - Be well labeled and operate intuitively.

3. Do not install occupancy or vacancy sensors in bedrooms.

26 12 00 Medium Voltage Transformers

1. Clemson prefers loop fed, pad mount transformers for all medium voltage distribution

systems.

2. All transformers must shall conform to Clemson's Pad Mount Transformer Specifications

3. Provide one spare conduit run from the transformer to the service entrance in addition to those required for connection of electrical service.

26 21 00 Low-Voltage Service Entrance

26 21 16 Low Voltage Underground Service Entrances

1. Specify that at least one spare conduit be installed for each service entrance to the facility.

2. Specify that Galvanized Rigid Conduit (GRC) or Intermediate Grade Metallic Conduit (IMC) is to be used for Service Entrance from inside the building to at least 18" outside the building footprint.

3. All service entrance conductors over 4/0 in size shall be XHHW-2.

26 24 00 Switchboards and Panelboards

26 24 13 Switchboards

1. Specify that safety switches are to be 240 volt, or 600 volt as indicated, with quick-make, quick-break operating mechanism, and that safety switches are to be heavy duty type with full cover interlock and indicator handle.

2. Specify that safety switches are to meet applicable requirements of Federal Specification W-W-865C for heavy switches. They are to be UL listed, and are to meet the applicable requirements of NEMA KS1 for Type HD.

3. Specify the number of poles, ampere rating, whether fusible or non-fusible type of NEMA enclosure, and other data is to be as noted.

4. A Switchboard will be required in lieu of a panelboard for any metered service entrance over 800 amps.

26 24 16 Panelboards

1. Cabinets for all panelboards are to be large enough to provide a minimum wiring gutter space 4" wide by 5" deep on all four sides. Specify that front trim is to be single sheet full-finished, code gauge, sheet steel, and that door opening is to expose only the operating handles of the circuit breakers. The inside of the door shall accommodate a typed directory card, protected by a heavy sheet of unbreakable transparent plastic.

2. Specify that panelboard bus work is to be copper and all branch circuit breakers are to be bolt on type.

3. Specify that all panelboards in existing hallways have the front trim and door given a coat of rust-inhibiting primer, followed by paint to match the adjacent wall surface.

4. The designer shall allow for at least 25% spare breaker space in every lighting and power panelboard.

26 24 19 Motor Control Centers

1. All conventional motor control centers shall conform to the following requirements:

   - Magnetic type motor controllers are to have under voltage protection when used with momentary contact pushbutton stations or switches and are to have under voltage release when used with maintained contact pushbutton stations or switches.

   - All controllers used with pilot devices or maintained contact switch, are to have an integral switching system that allows for manual and automatic motor starting as well as an off position capable of lockout.

   - Details and connections for all pilot devices are to be specified with the piece of equipment served.

   - All enclosures for starters and controllers shall be NEMA 1 per the most recent version of NEMA ICS6, unless otherwise required.

   - All fixed multiple speed motor controllers and reversible motor controllers are to be across the line type, electrically and mechanically interlocked. Multiple speed controllers are to have compelling relays and are to be multiple button station type with pilot lights for each speed. Combination starters are to be provided with integral circuit breakers.

   - All motors and motor controllers are to be furnished with the driven machine and sized to assure the specified output and operation of the driven equipment without excessive temperature rise, and suitable for their operating environment.

   - Unless otherwise specifically indicated, all motors of ½ horsepower or smaller are to be for 120-volt operation, single phase, 60 hertz. Motors of ¾ horsepower and larger are to be for operation on 208 volts, three phase, 60 hertz, or 480 volts, three phase, 60 hertz as required.

   - Include a manually operated, non-fused switch which will disconnect the motor from the source of supply is to be placed within sight of the motor location.

   - All overload protective devices are to give adequate protection to the motor windings, be of the thermal inverse-time-limit type and include a manual reset type push button on the outside of the motor controller case.

   - The cover of a combination motor controller and manual switch or circuit breaker is to be interlocked with the operating handle of the switch or circuit breaker so that the cover cannot be opened unless the handle of the switch or circuit breaker is in the “Off” position.

- Pilot devices are to be rated with contacts designed to handle inrush and continuous currents of the control system and suitably enclosed for the environment and for the type and class of area in which they are installed.

- Control circuits are to be provided with individual control power transformers and adequate over-current and short circuit protection. Unless otherwise required, control circuit voltage is not to exceed 120 volts, 60 hertz.

- All pushbutton stations are to be provided with "start-stop" momentary contacts having one normally open and one normally closed set of contacts and lights indicating motor operation. Specify that stations are to be heavy duty, oil tight, designed for either flush or surface mounting with LED pilot lights

- All motors and motor operated equipment are to be checked for proper rotation, clearance alignment, and lubrication and left in completely satisfactory operation.

- Specify that motors operated by control centers are to be wired using a short section of liquid tight, flexible metal conduit, with an insulated grounding conductor.

- Motor controllers are to be accessibly located, equipped with properly selected overload heater elements, and checked for proper contact alignment and operation.

- All pilot devices, disconnect switches, etc., are to be accessibly mounted and set or adjusted as required.

2. All Variable Frequency Drives shall adhere to the following:

   - Clemson University VFD Specifications
   - All motors connected to VFD's shall be done so with dedicated drive cable.

26 27 00 Low Voltage Distribution System

26 27 13 Metering

1. Unit substations shall include one main electrical meter in a metering compartment that is isolated from the main bus. The metering compartment shall have a separate hinged cover for easy access. Wiring to the main meter shall include a shunt block for current transformers and finger-safe fusing blocks for voltage connections.

2. New construction and major renovations must include sub-metering of lighting, plug loads, equipment loads, and HVAC loads at the building level. It is expected that this will be accomplished with 10 or fewer submeters. All meters shall be connected through Ethernet to Clemson University's Powerlogics server. Consult with University Utility Services for approval of submetering layout and design prior to installation.

3. Consult with University Utility Services regarding the type and location of power metering devices. Some buildings such as laboratory or research facilities as well as some utility systems have stringent metering requirements that must be met in order to support the work being performed in the building.

26 27 26 Wiring Devices

1. Do not allow the use of oversized or "jumbo" cover plates except where there is no other reasonable alternative.

2. Specify the installation of duplex outlets in hallways for use by floor cleaning and other housekeeping equipment. Outlets shall be rated as needed for the equipment to be used.

26 32 00 Emergency Power

26 32 13 Engine Generators

1. All Generator Sets and Transfer Switchgear shall be approved by University Utility Services and the University Facilities Maintenance Life Safety Shop prior to purchase and installation.

26 41 00 Facility Lightning Protection

1. All new construction and major renovations affecting more than 50% of the building floor area shall have a Risk Assessment done in accordance with the most recent version of NFPA 780 to determine if a lightning protection system is recommended.

2. Specify any installation of lightning protection systems conform to the requirements of the most recent version of NFPA 780 and Underwriter's Laboratories "Standards for Installation of Lightning Protection Systems (UL96 and 96 A)".

26 51 00 Interior Lighting

1. The use of incandescent and low voltage lighting is not permitted.

2. Indoor lighting levels shall be as recommended by the Illuminating Engineering Society of North America, IESNA. Careful consideration of the end user must be used in classrooms and labs with special needs or multipurpose uses.

3. For general purpose lighting, specify installation of LED fixtures with a minimum advertised service life of 50,000 hours. Areas with drop-in ceiling tile systems shall use either 24"x 24" or 24"x48" fixtures.

4. Fluorescent lighting is to only remain in place if no work is being performed outside of routine maintenance.

5. If existing fluorescent fixtures are to remain in place, they are to be converted to LED function via a retrofitting kit that replaces the ballast with an LED driver, bulbs, and upfits with occupancy sensors as needed.

6. Support for all fixtures must be in accordance with all applicable structural and seismic requirements. Fixtures shall be supported independently of ceiling grids.

7. All exposed fluorescent and tube style LED bulbs shall be protected from breakage caps at time of installation.

8. Specify that any plastic used in the fixtures will carry the correct fire resistance rating for the building and conditions served, and not subject to disintegration or discoloration with age.

9. All fixtures shall comply with applicable requirements of Underwriter's Laboratories.

10. All lighting fixtures must be accessible using standard vertical devices such as A-frame ladders. Locations unable to be made accessible with standard vertical devices will require supplying necessary equipment such as automatic winches or articulated lifts. These shall be provided as auxiliary building equipment stored in a logical place within the building.

26 52 00 Safety Lighting

26 52 13 Emergency Lighting

1. All exit signs shall have LED backlighting, and the EXIT text shall be green.

26 56 00 Exterior Lighting

1. The University uses several different exterior lighting fixtures and poles, depending on the application and location. Refer to Division 26 Products and Materials for application specific product selections.

2. New exterior lighting shall be laid out and carefully coordinated with existing adjacent surroundings and systems. This includes preserving the functionality of any existing system and providing adequate pathways for any portion of an existing system that must be rerouted.

3. Provide at least 2 spare exterior lighting pathways into buildings during new construction and renovations that include exterior lighting upgrades. These pathways should connect to an electrical panel that is designated for powering lighting.

4. LED fixtures shall be used when appropriate. These fixtures are listed in the Products and Materials section of this Division.

5. All exterior Lighting pole installations shall conform to the Site Lighting Base Detail

6. Concrete foundations must have a minimum height of 12" above existing grade and are to be placed, with no grass divider, against any adjacent concrete walks, curbs, or paved areas. Concrete foundations are to have a ¾" chamfer on all vertical and horizontal corners. Concrete foundations are to have an 8' ground rod. Concrete foundations exceeding 36" in depth shall be designed by a professional engineer.

7. All exterior pole mounted lighting is to have a watertight LED surge protection module and in-line fuse holders installed in the AC supply for each fixture above the pole foundation and accessible from ground level through a hand hole in the pole or pole

base as means of device protection and disconnecting a single light prior to service. In-line fuse and holder assemblies shall meet the following requirements:

- Have an appropriate voltage and current rating for the device being protected.
- Provide individual fuse for each leg of supply wiring except for neutral conductors.
- Have a dielectric strength of at least 600V.
- Remain watertight unless open for servicing.

PRODUCTS AND MATERIALS – DIVISION 26 – ELECTRICAL

Boxes

- General: Ferrous metal, cadmium or zinc coated, complying with UL 514, as manufactured by Steel City, Thomas & Betts, or Appleton.
    - Lighting Fixtures: 4” octagonal x 1” deep.
    - Switches and Receptacles:
        - Single Gang: 4” x 2” x 2-1/8”.
        - Double Gang: 4” x 4” X 2-1/8.
    - Telephone/communications: See Division 27.

Exterior Lighting (Historic District)

- Street Lights and Walk Lights:
    - Fixture: Holophane Granville Classic Standard LED3 or approved equal
        - 120-277 volt compatible
        - 4000K LED Color Temperature
        - Photocell Controlled
        - Bronze Housing Color
        - Type 5 Glass Globe
        - Holophane OTF Top Finial
        - Part Number: GVD3-P2040K-MVOLT-CLF-G5-GVD27BZ-L1H
    - Pole: 10’ Holophane Columbia Series or approved equal
        - Material: Aluminum
        - Color: Bronze
        - Part Number: CLA-10-FTJ-20D-C03-BZ
    - Concrete Base: See Site Lighting Base Detail
    - LED Retrofit Kit: Beacon LRK-2V/55W/T5/UNV/LSP/GYS or approved equal

Exterior Lighting (Non-Historic District)

- 12’ High Pedestrian Sidewalk LED Lighting
    - Fixture Head: Signify Gardco P26 with Comfort Optics, McGraw-Edison Galleon II or approved equal meeting the following specifications:
        - Head Mounting Style: Side Arm
        - Casing Color: Bronze

        - Lighting Color Temp.: 4000k
        - Dimming Control: 0-10V
        - Operating Voltage:120-277V
        - Signify Gardco Part Number: P26-196L-1150-NW-G2-AR-x-UNV-DD-xxxxx-TLRD7-xx-xx-BZ
        - McGraw-Edison Part Number: GALN-SA1B-740-U-xx-BZ-PR7

    - Pole Type: 12'x4" Aluminum Square Pole from Signify Gardco, KW Industries, or approved equal meeting the following specifications:
        - Wind Rating: 110 MPH 3 Second Gust and 90MPH Sustained
        - Finish/Color: Dark Bronze
        - See Pole Mounted Camera and Wifi Access Point Typical for any attachments made to poles.
        - Signify Gardco Part Number: SSA-CA-4-xx-12-xx-xx-BZ-VDA
        - KW Industries Part Number: SAP12-4.0-11-BRZ-xx-BC

    - Pole Base: Site Lighting Base Detail

- 20' High Parking Lot Area LED Lighting
    - Fixture Head: Signify Gardco P26 with Comfort Optics, McGraw-Edison Galleon II or approved equal meeting the following specifications:
        - Head Mounting Style: Side Arm
        - Casing Color: Bronze
        - Lighting Color Temp.: 4000k
        - Dimming Control: 0-10V
        - Operating Voltage:120-277V
        - Signify Gardco Part Number: P26-196L-1150-NW-G2-AR-x-UNV-DD-xxxxx-TLRD7-xx-xx-BZ
        - McGraw-Edison Part Number: GALN-SA1B-740-U-xx-BZ-PR7

    - Pole Type: 20'x5" Aluminum Square Pole from Signify Gardco, KW Industries, or approved equal meeting the following specifications:
        - Wind Rating: 110 MPH 3 Second Gust and 90MPH Sustained
        - Finish/Color: Dark Bronze
        - See Pole Mounted Camera and Wifi Access Point Typical for any attachments made to poles
        - Signify Gardco Part Number: SSA-CA-5-xx-20-xx-xx-BZ-VDA
        - KW Industries Part Number: SAP25-5.0-7-BRZ-xx-BC

    - Pole Base: Site Lighting Base Detail

- 30' High Street LED Lighting
    - Fixture Head: Signify Gardco P34 with Comfort Optics, McGraw-Edison Galleon II, or approved equal meeting the following specifications:
        - Head Mounting Style: Side Arm

        - Casing Color: Bronze
        - Lighting Color Temp.: 4000k
        - Dimming Control: 0-10V
        - Operating Voltage:120-277V
        - Signify Gardco Part Number: P34-96L-1050-NW-G2-AR-x-UNV-DD-xxxxx-TLRD7-xx-xx-BZ
        - McGraw-Edison Part Number: GALN-SA6B-740-U-xx-BZ-PR7

    - Pole Type: 30'x6" Aluminum Square Pole from Signify Gardco, KW Industries, or approved equal meeting the following specifications:
        - Wind Rating: 110 MPH 3 Second Gust and 90MPH Sustained
        - Finish/Color: Dark Bronze
        - See Pole Mounted Camera and Wifi Access Point Typical for any attachments made to poles
        - Signify Gardco Part Number: SSA-CA6--xx-30-xx-xx-BZ-VDA
        - KW Industries Part Number: SAP30-6.0-3-BRZ-xx-BC

    - Pole Base: Lighting Pole Base Detail

- Uplighting for Buildings, Gates, Sculpture, etc:
    - Fixture: BK – KZ-68-BZW-13-C or approved equal
    - Ballast: HP70-120 V, in ground or approved equal
    - Lamp: 70W Par 38, Metal Halide or approved equal

  In projects where area lighting already exists and is not listed above, coordinate with University Planning and Design to determine appropriate fixture type for consistency and compatibility.
- Fuse Holder

    - Bussman HEB and HEX series or approved equal

- LED Lighting Protection Module

    - Littelfuse LSP Series or approved equal

Lighted Exterior Bollards

- Cordia LED Lighted Bollard LBCOR-LED or approved equal with either 3000K or 4000K LED engine as specified.

Site Lighting Conduit

- In-ground rated HDPE conduit, pre-wired or not, can be used for buried power distribution for all exterior site lighting. Conduit shall transition to GRC where exposed from 5ft above grade to 18" below grade.

Generator Sets

- Cummins/Onan
- Caterpillar
- Generac
- Kohler

Hangers and Support Devices

- Support Rods and Straps: Galvanized all-thread rod with applicable connections or heavy duty, zinc-coated conduit hangers or straps of proper size and spacing.
- Ceiling and Wall Anchors: Lead, expansion, lag type suitable to particular location and application.

Identification of Electrical Systems

- Name Plates: Engraved, white on black Bakelite.

Interior Lighting

- Phillips EvoKit Series LED retrofit kit in 2”x2” and 2”x4” or approved equivalent.
- Phillips EvoGrid Series LED fixture in 2”x2” and 2”x4” or approved equivalent.
- Phillips FBX Series Hi-Bay fixture or approved equivalent.
- T-5:228MVPS-A ballast and GE F28W/T5/841/ECO lamps or approved equal
- T-8: GE*32MAX-N-ULTRA ballasts and F28T8/XL/SPX41/ECO lamps or approved equals
- Housing: Ceiling Mount LED: Progress LED Models: P350051-009-30 and P350052-009-30 or approved equals
- Housing: Bathroom Vanity: Lithonia Lighting: Model: FMVTSL 48IN MVOLT 40K 90CRI BN or approved equal

Medium Voltage Distribution

- Switches: G & W or S & C SF6 or approved equal insulated to match existing switches in the system.
- Splice Kits and Terminations: Elastimold, Cooper, or Richards.
- Cabling: Shall conform to Clemson’s Medium Voltage Cable Specifications
- Cable Racks: Underground Devices, Inc. Heavy Duty Underground Rack or approved equal
- Grounding Materials: Cadweld or approved equal

Panelboards

- Panelboards and Load Centers: Square D, ABB, Siemens, or Eaton. All panelboards and load centers shall be furnished with locks, and all keyed alike within the facility.

Power Meters

- Housing, Classroom, and office Buildings: Schneider Electric METSEPM5560, METSEPM5563RD or approved equal with connectivity to Powerlogics server.

- Laboratory/Research buildings and Critical Utility Equipment: METSEPM8240, METSEPM8244 or approved equal
- See Section 26 27 33 and 33 05 00 concerning requirements for sub-metering.

Raceways

- Galvanized Rigid Conduit (GRC): UL 6 and ANDI C80.1 with full weight screwed fittings. Bushings shall be malleable iron; bushings 1-1/4" and larger shall have insulated throat and grounding lug.
- Intermediate Grade Metallic Conduit (IMC): UL 1242, galvanized with full weight screwed fittings. Bushings shall be the same as specified for galvanized rigid conduit.
- Electrical Metallic Tubing (EMT): UL 797 and ANSI C80.3, galvanized with compression type fittings. Fittings 1-1/4" and larger shall have nylon insulated throat. Set screw, indented, or drive-on fittings are not allowed.
- Flexible Steel Conduit: UL 1, with galvanized fittings.
- Liquidtite Flexible Steel Conduit (Sealtite): UL 360 compliant, with compression type fittings.
- Plastic Conduit: Schedule 40, polyvinylchloride (PVC), NEMA Standard TC-2, TC-3, and UL Standards. Conduit, solvent, and fittings shall be supplied by the same manufacturer.
- Cable trays: Cablofil, open ladder, divided type configuration. Minimum size shall be one foot wide and three inches high. Closed cable trays are not allowed.

Wire and Cable

- Conductors: Copper, soft drawn, per ASTM B3. All conductors to be stranded and no solid conductors are allowed.
- Low Voltage Cable (less than 600 volts): See Section 26 05 19
- Medium Voltage Cable: 15kV Shielded Power Cable, type MV-105, copper tape shield, EPR 133%, single copper conductor. Contact University Utility Services if additional information is needed.
- Grounding Materials: Cadweld or approved equal

Wiring Devices

- Switches: Hubbell, Pass & Seymour, Leviton; 20 amp, 120/277 volt, side and back wired in color specified. Single or double pole, three or four way as needed.
- Receptacles: Hubbell, Pass & Seymour, Leviton; 15 or 20 amp, 125 volt, three wire grounding, NEMA 5-15R, side and back wired in color specified.
- Ground Fault Interrupter Receptacle (GFI): Hubbell, Pass & Seymour, Leviton; 15 or 20 amp, 125 volt, feed through type, complying with UL 943.
- Cover Plates: Reinforced fiberglass or metal in white, ivory, black, or stainless.

DIVISION 27 – COMMUNICATIONS

27 05 00 Common Work Results for Communication Systems

Existing System and Design Information

1. Clemson University operates and maintains its own communications distribution system for voice, data and video system. This infrastructure includes both inside plant infrastructure (under Division 27) and outside plant infrastructure (under Division 33).

2. When starting a project, design teams shall inquire with the Facilities project manager to determine who from the Clemson Network Services and Telecommunications (NST) department has been assigned to serve as the NST Technical Lead (NSTTL). It is imperative that the NSTTL and the telecommunications designer on the A&E team be involved from the beginning of the project (typically the pre-design phase).

3. Refer to Telecommunications Distribution Design Guide (TDDG) for instructions about designing telecommunications infrastructure on campus. Adherence to these requirements is mandatory, and many of the requirements involve interaction with the NSTTL to inquire about project-specific nuances.

4. In addition to the design guidelines in the TDDG, a set of specification sections have been prepared to adapt for specific projects on campus. For any projects involving telecommunications infrastructure, please send an email to ITHELP@clemson.edu and request that the current version Word documents for the following sections be sent to you. Designers shall directly edit these specification documents for applicability to each Clemson project.

27 32 00 Voice Communications Terminal Equipment

27 32 26 Ring-Down Emergency Phones

1. Place emergency phones on an accessible pathway within the project site such that there is a clear line of sight and easily traversable path to at least one phone from anywhere on the project site.

2. Coordinate the placement of emergency phones and whether or not network connected security cameras need to be included in the installation with CUPD's Physical Security Program Coordinator.

27 32 43 Radio Communication Equipment

1. Specify all projects be coordinated with the Clemson University Fire Department to determine whether an in-building Emergency Radio Communications Enhancement System (ERCES) will be needed.

2. Systems shall operate on all frequencies used by the responding Public Safety agencies. A list of those is for Clemson's Main Campus can be found in the Public Safety Radio Frequency Index. Other campus locations are available upon request.

PRODUCTS AND MATERIALS – DIVISION 27 – COMMUNICATIONS

Area of Refuge Communication End Devices

- Viking 1600 Series or approved equal that is VOIP Compatible, Flush Mounted, ADA Complaint
- Gai-Tronics: 397-710 Red Alert VOIP phone or approved equal

Emergency Phone

- Gai-Tronics 234SBA-GTE21010 Tower Assembly or approved equal
- Gai-tronics 541-001 Strobe Light or approved equal
- Gai-tronics 397-710 Red Alert VoIP Phone or approved equal

ERCES System Components

- Repeater and Head End: ADRF FIRe-78-8-U or approved equal
- Remote Module: ADXV-R-3378P-U or approved equal

DIVISION 28 - ELECTRONIC SECURITY

28 05 00 Common Work Results for Electronic Safety and Security

1. Clemson University has deployed a centrally managed Physical Access Control System for all university facilities. This system is managed and administered by TigerOne – Division of Student Affairs.

2. The design of the access control system must be consistent in every way with the centralized system and comply with TigerOne's Access Control Standards and the University Access Control Policy.

3. The decision whether to have the access control system as part of the construction contract or to contract directly with the University-approved vendor will be made on a project-by-project basis. The Project Manager, in consultation with TigerOne, will provide that decision and supply all contact information.

4. The designer shall coordinate drawings and specifications with all other related trades to include Div. 8 (door/frame/hardware), Div.26 (pathways, power) and Division 27 (data cabling, MDF/IDF elevation). Coordinate system design with the Division 28 Access Control Vendor, CUPD and TigerOne.

28 05 07 Power Sources for Electronic Safety and Security

1. All access control power supplies shall be permanently wired to the building electrical system. Access control power supplies are not to be powered from a plug-in receptacle.

2. For new construction, renovations affecting over 50% of the building floor area, and upgrades to backup power supply systems, Access Control power supplies shall have a dedicated circuit that is connected to backup power from either a generator or UPC battery backup if either are present and serving the building. If both are present, connection to generator will take precedent.

3. All Access Control power supplies shall have an internal battery capable of operating all connected devices for a minimum of 3 hours independently of any other power source.

28 14 00 Access Control Hardware

1. All devices must be compatible and approved for use with the Genetec Security Center Synergis access control software.

2. All credential readers shall be capable of reading the HID Elite iClass SE and Elite SEOS credentials.

3. All controller hardware shall be Mercury brand and licensed for Genetec Security Center.

4. All IP enabled locks shall be licensed for Genetec Security Center.

5. All electronic locking mechanisms must be 12 or 24 volt.

6. All electronic locking mechanisms shall be capable of being powered by centralized power supplies located in a secure area only accessible to approved service personnel with maximum distance of 300' (size conductors according to manufacturer specification)

7. All exit devices equipped with electric latch retraction shall be of the quiet motor driven type. High amperage in-rush solenoids are not acceptable.

8. Instructional spaces, including classrooms and teaching labs, shall have credential readers on at least one entry door. There shall also be a lockdown button located beside the primary entry that disables the credential reader system and secures all ingress into the room including shutters and "roll up" doors. Activation of the button shall automatically contact Clemson University Emergency Dispatch via the Access Control system. See Section 08 71 00 for door hardware requirements.

9. All entryways with power operated doors shall have access control and door activation hardware installed in accordance with Powered Door Access Control Device Typical.

10. Hardware utilizing keypads for restricted access shall not be used. Any space requiring restricted access shall use a card reader.

28 14 19 Access Control Enclosures

1. All new construction and renovations affecting at least 50% of the building floor area shall consult Clemson's Maintenance Building Security Shop regarding the need for the inclusion of an Electronic Key Storage Box for use by Maintenance and Custodial staff.

2. Electronic key storage boxes buildings shall have the following features:

    - Located in an inconspicuous area that is accessible to anyone with access to the building but avoiding high traffic or heavily used areas as much as possible.
    - Tamperproof, permanently wired 120V power connected to an emergency circuit, if present.
    - Tamperproof, hardwired network data connection
    - Credential reader connecting to access control hardware that provides primary access to key inventory.
    - Secondary manual key override capable of accepting small format interchangeable cylinder housing.
    - Video surveillance with a clear view of the key box

28 20 00 Video Surveillance

1. Video surveillance is employed in many existing facilities and is required in all new facilities for security purposes. These systems shall be designed and installed in accordance with Clemson's Electronic Surveillance Policy and Clemson's Telecommunications Distribution Design Guide.

2. All light pole mounted cameras are to be attached in accordance with Clemson's Pole Mounted Camera and Wifi Access Point Typical

3. Any elevator upgrades and new installations shall include a camera capable of continuous and uninterrupted monitoring of the inside of the car while providing a video feed over Clemson's network to Clemson University's Physical Security Operations Center. Specify that CUPD's Physical Security Program Coordinator is consulted in the selection of the camera. All cameras used shall be National Defense Authorization Act (NFAA) certified.

28 30 00 Electronic Detection and Alarm

Equipment Sole-Source Suppliers

1. When electronic fire detection and alarms systems are required by applicable codes as adopted by Chapter 5 of the OSE Manual or when specified by the University, the following will be decided by the University on a case-by case basis after consulting the local responding Fire Department:

    - Whether or not to have the fire detection and alarm system as part of the construction contract or to contract that work directly with the System Supplier.
    - Whether or not use to the existing contract the University has in place with Johnson Controls.

2. If University's contract with Johnson Controls, Inc. is chosen to provide the fire alarm system as part of the construct contract, The contractor must complete the following:

    - Review and submit to Clemson for evaluation of the pricing received in accordance with the terms and conditions of that contract.
    - Include the following specific details in the project specifications; name, contact information, solicitation number, and expiration date.
    - Retain documentation of the pricing evaluation of pricing information in each procurement file for review by Audit and Certification.

System Requirements

1. All fire alarm and detection systems shall comply with all applicable codes as adopted by Chapter 5 of the OSE Manual and the most current version of ICC A117.1.

2. The design of fire alarm and detection systems for facilities at Clemson University shall provide for a fully addressable containing the following features:

    - All new Fire Alarm and Detection Systems shall include voice evacuation

functionality for all new construction, renovations affecting more than 50% of the building floor area and any fire alarm repairs or upgrades that include fire alarm panel replacement.

- All new FACP's shall have the capabilities mentioned directly above as well as being connected to the campus fiber network with the ability accurately communicate all supervisory, trouble, and alarm signal including per point device reporting to the University Public Safety Dispatch Center. If connection to the campus fiber network is technically infeasible, the FACP shall report to University Public Safety Dispatch Center by means approved by the Fire Code Official.

- All new FACP's are to have a dual line LCD information display and physical navigation and function selection buttons. The use of touch screens are not allowed.

- All fire alarm cabling shall be protected in appropriate conduit or cable tray systems.

3. The Authority Having Jurisdiction (AHJ) for the design and installation of fire alarm systems at Clemson is the University Fire Code Official.

PRODUCTS AND MATERIALS – DIVISION 28 – ELECTRONIC SECURITY

Classroom Lockdown Button

- Button Assembly: Safety Technology Institute Model E02014KL or approved equal
- Signage/Visual Notification: Provided by TigerOne.

Electrified Locking Devices and Accessories

Electrified Mortise Locks

- Sargent NAC Eco-Flex 8200 series electrified mortise locks or approved equal w/ integral request-to-exit switch and integral 'IDP' option for 3-point monitoring (door position, internal auxiliary latch, latch bolt position). Sample Part No.: NAC 82271-24V IDP LW1L (fail secure).
- Dormakaba Electrified mortise locks or approved equal w/ integral request-to-exit switch and door position switch. Sample Part No.: 45HW-7-DEU-15H-626-RQE-DS-C.

Electrified Cylindrical Locks

- Stanley electrified cylindrical locks or approved equal w/ integral request-to-exit switch Sample Part No.: 9KW-3-7-DEU-15-C-S3-626-RQE-C-12/24v

Electric Latch Retraction Exit Devices

- Sargent: 8000 series exit devices with '56' electric latch retraction and '55' integral

request-to-exit switch. Sample Part Number: 55-56-8804F-PSB
- Von Duprin: 98/99 series exit devices with "QEL" electric latch retraction and "RX-LC" integral request-to-exit switch. Sample Part No.: RX-LC-QEL-99NL-06

Electric Door Strike

- For Housing and Residential Facilities Only: Assa Abloy HES 8300 or Allegion Locknetics NC 450.

IP Enabled

PoE

- IT Closets Only: Sargent IN220 w/BLE (mortise, cylindrical, trim)

Power Transfers

- New Construction: Securitron EL-CEPT, Von Duprin EPT-10 or approved equal
  Retrofit: Securitron EL-EPT or approved equal.

Power Transfer Hinges

- McKinney or approved equal
- Ives or approved equal

Key Storage Boxes

- KSI Security Asset Manager 32, 64, and 96 Position or approved equal.

DIVISION 31 - EARTHWORK

31 05 00 Common Work Results for Earthwork

1. Clearly specify that all grading activities shall comply with the tree protection requirements specified in Division 1 and in Clemson's Urban Forest and Landscape Management Policy.

2. Specify that debris and excess material be managed effectively to prevent onsite accumulation.

3. Specify that all earthwork be coordinated with other trades especially when considering soil compaction requirements.

4. Request any required subsurface investigation of the site in accordance with provisions of the A/E Agreement. The designer shall designate the location of any proposed soil boring locations and shall be especially aware of the locations of existing utilities. Notification to the local utility locating service and the CU Facilities Survey is also required and must be contacted for any preliminary subsurface investigation and must also be specified as a requirement for the contractor in any subsequent construction operations. The Owner will usually retain the appropriate geotechnical firm for subsurface investigation as well as testing services during construction.

5. The consulting A/E shall give special attention to ensuring that all required permits are obtained from the appropriate regulating authorities and that they are obtained within the prescribed time. It is the consultant's responsibility to ensure that these permits are obtained. See Section 31 25 00 and the University Stormwater Planning and Management Policy for further information.

31 11 00 Clearing and Grubbing

1. Whenever possible, coordinate the placement excess material on campus as directed by the Project Manager.

2. Specify that topsoil is not being reused on the project shall be stockpiled on the campus at a location designated by the Project Manager.

3. Specify that all waste material and debris other than soil is to be removed from the campus and deposited in a legal disposal facility or landfill. Clemson University utilizes a C & D refuse service and may be available for limited amounts of waste material.

4. Require that hazardous waste of any kind be identified to the greatest extent possible in construction drawings disposed of in accordance with applicable Federal and State laws and regulations.

5. Prohibit the burning of trash and debris and the use of explosives on campus.

31 22 00 Grading

1. Specify the proper quality control, safety measures and adequate protection as given in applicable codes and regulations for all excavations.

2. The designer is cautioned to pay special attention to compaction requirements to assure a uniform, coordinated specification in each area of fill placement. Specify compaction requirements for each particular area to comply with the appropriate ASTM density requirements.

3. The acquisition of any required additional fill material shall be specified as part of the contractor's responsibility.

4. Cut and fill slopes shall adhere to one of the conditions below:

    - Vegetated but not mowed slopes shall be no greater than 3:1.
    - Mowed slopes are to be no greater than 2:1
    - Stabilized but not vegetated slopes shall have a slope that is a safe angle of repose for the material being used.

5. Slopes greater than 2:1 shall have special stabilization such as river rock over rip-rap.

6. Should any area require a graded slope of 4:1 or greater, a retaining wall shall be employed to reduce the slope.

7. Provisions should be made to safely conduct surface water to storm drains or suitable natural water courses and to prevent surface runoff from damaging cut faces and fill slopes.

8. Terraces or diversions should be provided whenever the height of the cut or fill exceeds 20 feet. These should divide the slope face as equally as possible and should convey the water into stable outlets. Benches should be kept free of sediment during all phases of development.

31 25 00 Erosion and Sediment Control

1. All Erosion and Sedimentation Controls and Soil Stabilization Practices shall follow design standards defined in the SCDES BMP Handbook or the elected permit authority's Stormwater Management Program as required by Clemson University's Stormwater Planning and Management Policy.

2. Be sure that all provisions of the plan specified are in compliance with the Regulations contained in Chapter 72, Article 2, South Carolina Code of Regulations (Erosion and Sediment Reduction and Stormwater Management Regulations).

3. The design must include an approved erosion control plan as required in Appendix H of OSE Manual.

31 31 00 Soil Treatment

1. Specify the appropriate soil treatment for the control of subterranean termites on the project site. Specify that the person applying these soil treatments must be licensed with the Clemson University Department of Pesticide Regulation.

2. Specify that the termiticides shall be applied at the highest label rate, and that the treatment must follow the standards for the prevention and control of wood destroying organisms prescribed by law.

3. Specify that the termiticide to be used, the rate of application, and the total quantity of material to be applied must be approved by Facilities Maintenance Services prior to the contractor awarding this subcontract for the work. The contractor shall also submit follow-up documentation of the actual use rate and total quantity of material applied to the site.

4. Specify that the contractor shall notify a representative of Facilities Maintenance Services at least 48 hours prior to the termiticide treatment. Inherent in this notification is the right of the Facilities staff to observe the termiticide containers being opened, seals being broken, mixing, and application. The termiticide used shall also be made available to University Facilities for testing and sampling.

5. Specify that the final surface preparation must be done by the pest control operator prior to the treatment. This will include the removal of foreign matter and debris which would decrease the effectiveness of treatment and the loosening and raking the soil in the treated area prior to treatment.

6. Specify that termiticides must not be applied when the soil is excessively wet or frozen, or when rainfall is predicted as imminent.

7. Specify that the treatment of soil adjacent to exterior foundation walls is to be done only after all required grading, excavating, and final landscaping and filling operations are completed, except as otherwise required in construction operations.

8. Specify that voids in block wall construction shall be treated as practicable to the footing in order that the termiticide reaches the footing rather than being absorbed by the masonry.

9. Specify that rodding alone is not permitted as the primary technique of treating the soil adjacent to the foundation walls. Trenching or trenching combined with rodding is acceptable.

10. Specify that signs shall be posted in the areas of application to warn workers that soil termiticide treatment has been applied.

11. Specify that a quality control inspection be conducted post treatment and documentation of this inspection be submitted to the Pest Control Department at University Facilities.

12. The contractor shall furnish a written warranty certifying that the applied soil treatment will prevent infestation of termites, and that if termite activity is discovered during the warranty period, the contractor will re-treat the soil and repair any damage caused by termite infestation. This warranty will consist of a five-year period from

the date of Substantial Completion, signed by a representative of the pest control company and the general contractor. After this initial warranty period, Clemson University will have the right to assume the annual renewal with the pest control company.

PRODUCTS AND MATERIALS – DIVISION 31 – EARTHWORK

Termiticides

- Fipronil (Termidor)
- Isofenphos (Pryfon 6)
- Permethirin (Dragnet TF and Torpedo)
- Cypermethrin (Demon TC and Prevail FT)
- Fenvalerate (Tribute)

Erosion and Sedimentation Control

- All erosion and sedimentation control BMPs shall use materials specified in the SCDES BMP Handbook or the elected permit authority's design manual.

Soil Stabilization

- All soil stabilization BMPs shall use materials specified in the SCDES BMP Handbook or the elected permit authority's design manual unless otherwise noted.
- All erosion control blanket is to be completely biodegradable.

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 01 00 Operations and Maintenance of Exterior Improvements

32 01 16 Cold Milling of Existing Asphalt Pavement

1. Milling shall reference the requirements of Division 31 and the appropriate sections of the SCDOT "Standard Specifications for Highway Construction". Specify milling must be scheduled so that the period between the milling and the installation of the new paving is minimized. The schedule must be approved by the Project Manager.

2. Specify the equipment to have a self-contained water system to control dust and other fine particles.

3. Specify the planed surface to be free from gouges, ridges, oil film, and shall have a uniform appearance suitable as a riding surface that is capable of handling traffic prior to the installation of the new paving.

4. The designer shall require particular care to be taken in milling adjacent to existing utility rings and covers and beneath existing tree cover. Damages to adjacent structures and areas where all the existing paving is removed shall be stabilized and/or repaired as directed by the project manager at no additional cost to the owner.

5. The milling debris becomes the property of the contractor and shall be disposed of by the contractor in compliance with all statutes governing the disposal of this waste.

32 05 00 Common Work Results for Exterior Improvements

1. Specify that all exterior improvements are to be coordinated with work covered by other divisions of this document including but not limited to site utilities, landscaping, OSHA regulations, erosion and sediment control, notifications to the local utility locating services.

2. Specify that all work is to comply with the University Fire Apparatus Access Requirements and CUFD Fire Lane Markings.

3. Specify that all testing and quality control requirements identified in Sections 01 40 00 and 01 45 00 are satisfied. The designer will also specify all testing requirements in accordance with pertinent codes and standards.

4. The University retains the right to engage a testing laboratory as needed to perform materials testing on the specified products as it sees fit.

5. Materials and work failing to meet the specified requirements shall be retested at the contractor's expense.

6. Specify that the testing agency will conduct and interpret tests and state in each report whether tested work complies with or deviates from specified requirements.

7. Specify that the contractor shall be responsible for coordination of testing services and maintain a log, preparation of test cylinders, etc. as needed.

8. Specify complete technical data and performance properties for each product design, certifications, qualification of firms, etc. be provided to the University.

9. Specify any warranties, certificates, or test reports signed by the applicable manufacturer or contractor, certifying that each material complies with requirements.

10. Specify that SDS sheets on each product shall be provided as requested by the the University.

11. Specify that the contractor is to conduct operations to minimize any disruption to the owner's operation.

12. Specify that the contractor is responsible for the protection of any existing property or utilities in or adjacent to the construction site.

13. All exterior improvements shall be protected from damage. Protect the surface finish of newly placed concrete or asphalt paving from damage by rainwater or construction traffic. Maintain exterior improvements free of stains, discoloration, dirt, and other foreign material until substantial completion.

32 10 00 Bases, Ballasts, and Paving

1. The designer shall detail the examination, preparation, quality control measures, temperature and other environmental factors, for the installation of the base courses, paving, and concrete materials in accordance with the above referenced standards.

2. Design all surface paving and exterior flatwork with a positive drainage flow towards appropriate conveyance.

3. Specify the type and frequency of testing and inspection.

4. Specify alterations or correction procedures.

5. Specify that the contractor verifies existing conditions before starting work.

6. Design, material, and execution shall adhere to applicable standards that apply to aspects of asphalt and concrete construction. Among these referenced may include the following:

    A. American Association of State Highway and Transportation Officials (AASHTO):

    - M 154 Air-Entraining Admixtures for Concrete
    - M 226 Viscosity Graded Asphalt Cement
    - T 179 Effect of Heat and Air on Asphalt Materials

- T180 Moisture-Density Relations of Soils Using a 4.54-kg rammer and a 457- mm drop.
- T 245 Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus

B. American Concrete Institute (ACI) Publications:

- ACI 301 Specifications for Structural Concrete
- ACI 305 Recommended Practices for Hot Weather Concreting
- ACI 306 Recommended Practices for Cold Weather Concreting
- ACI 308 Standard Practice for Curing Concrete
- ACI 318 Building Code Requirements for Structural Concrete
- ACI 347 Guide to Formwork for Concrete

C. American Society for Testing and Materials (ASTM) Publications:

- A 82 Steel Wire, Plain, for Concrete Reinforcement
- A 185 Welded Steel Wire Fabric for Concrete Reinforcement
- A 307 Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
- A 615 Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- A 780 Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- C 31 Making and Curing Concrete Test Specimens in the Field
- C 33 Concrete Aggregates
- C 39-72 Compressive Strength of Cylindrical Concrete Specimens
- C 42 Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
- C 94 Ready-Mixed Concrete
- C 143 Slump of Hydraulic-Cement Concrete
- C 150 Portland Cement
- C 171 Sheet Materials for Curing Concrete
- C 172 Sampling Freshly Mixed Concrete
- C 231 Air Content of Freshly Mixed Concrete by the Pressure Method
- C 260 Air-Entraining Admixtures for Concrete
- C 309 Liquid Membrane-Forming Compounds for Curing Concrete
- C 494 Chemical Admixtures for Concrete
- C 881 Epoxy-Resin-Base Bonding Systems for Concrete
- C 1059 Latex Agents for Bonding Fresh To Hardened Concrete
- C 1064 Temperature of Freshly Mixed Hydraulic-Cement Concrete
- D 698 Laboratory Compaction Characteristics of Soil Using- Standard Effort
- D 946 Penetration Graded Asphalt Cement for Use in Pavement Construction
- D 979 Sampling Bituminous Paving Mixtures
- D 1188 Bulk Specific Gravity and Density of Compacted- Bituminous Mixtures Using Coated Samples
- D1556 Density of Soil in Place by the Sand-Cone Method.
- D1557 Laboratory Compaction Characteristics of Soil Using Modified Effort

- D 1751 Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
- D 1752 Preformed Sponge Rubber Cork and Recycled PVC- Expansion Joint Fillers for Concrete Paving and Structural Construction
- D 2167 Density and Unit Weight of Soil in Place by the Rubber Balloon Method
- D 2726 Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
- D 2922 Density of Soil and Soil-Aggregate in Place by Nuclear Methods
- D 2950 Density of Bituminous Concrete in Place by Nuclear Methods
- D 3017 Water Content of Soil and Rock in Place by Nuclear Methods
- D 3549 Thickness or Height of Compacted Bituminous Paving Mixture Specimens
- D 5581 Resistance to Plastic Flow of Bituminous Mixtures
- E 329 Agencies Engaged in Construction Inspection, Testing, or Special Inspection

D. Asphalt Institute: MS-4 "The Asphalt Handbook"

E. Concretes and Reinforcing Steel (CRSI): "Manual of Standard Practice"

F. South Carolina Department of Transportation "Standard Specifications for Highway Construction"

32 11 00 Base Courses

32 11 23 Aggregate Base Courses

1. Provide placement instructions and emphasize that application on frozen, muddy, or soft surfaces is prohibited unless addressed in the design.

2. Contractor shall provide a ten (10) foot straight edge and any needed labor for its use in the vicinity of paving operation at all times for measuring surface irregularities. The surface of all courses shall be checked with a straight edge as necessary to detect surface irregularities.

3. Unless other conditions warrant, design tolerances from the above referenced standards are:

   - Flatness: Maximum variation of ½ inch measured with an acceptable 10–foot straight edge.

   - Scheduled Compacted Thickness: Within 3/8 inch.

   - Variation from Design Elevation: Within ½ inch.

32 11 26 Asphaltic Base Courses

1. As with aggregate base courses, tolerances shall be checked with a straight edge as necessary to detect surface irregularities. Unless other conditions warrant, design tolerances from the above referenced standards are:

    - Flatness: Maximum variation of 1/4 inch measured with an acceptable 10-foot straight edge.
    - Scheduled Compacted Thickness: Within 3/8 inch.
    - Variation from Design Elevation: Within 3/8 inch.

32 12 00 Flexible Paving

32 12 16 Asphalt Paving

1. Design must indicate placement of hot-mix asphalt binder course in number of lifts and thicknesses. Unless other conditions warrant, design tolerances from the above referenced standards are:

    - Base and Binder Course Thickness: Within ½ inch.
    - Surface Course Thickness: Within ¼ inch.

2. Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straight edge applied transversely or longitudinally to paved areas:

    - Base or Binder Course: ¼ inch
    - Surface Course: 1/8 inch
    - Crowned Surface: Test with crowned template centered and at right angle to crown.
    - Maximum Variance from template is ¼ inch.

3. Designate contractor to reset utility frames for manhole covers, cleanout covers, valve boxes, and other such units with areas to be paved to the final grade as part of this work. It is required that adjustments be made with appropriate paving rings.

4. Surround the frames that have been adjusted to grade with a ring of compacted asphalt base prior to paving. Adjust frames as required for paving, providing temporary closures over openings to prevent damage during the rolling operations and construction traffic. Replace covers at the completion of the paving operation.

5. The contractor shall be responsible for the installation of any signalization sensors or inductive loops beneath the finish asphalt surface course. The installation of these sensor loops shall be provided by an SCDOT approved installer/contractor. Loops shall not be saw-cut into the surface course of asphalt. They shall be installed prior to its placement.
6. Design concrete paving in lieu of asphalt, at any loading dock, dumpster pad, or receiving area subject to heavy vehicular traffic, or where liquid oxygen or nitrogen may be present.

32 13 00 Rigid Paving

33 13 13 Concrete Paving

1. Unless other conditions warrant, specify concrete with the compressive strength of 4000 psi for 28-day strength as minimum for pavements and curb and gutter subject to vehicular traffic.

2. Specify reinforcement method.

3. Specify slump in the range of 1" for slip-form paving and no greater than 4" for fixed-form or other means of paving.

4. Specify entrained air voids in the mix ranges from 3% to 6% at the point of placement in the roadway. Unless other conditions warrant, design tolerances are:

    - Maximum Variation of Surface Flatness: 1/4 inch in 10 feet.
    - Maximum Variation from True Position: 1/2 inch.
    - Maximum Variation in Thickness: 1/2 inch.

5. Specify that concrete pavement operations can be performed only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

6. The contractor shall provide and maintain sufficient tools and equipment on hand to facilitate uninterrupted placement of the concrete.

7. Do not use concrete that is not placed within one hour after water is first introduced into the mix.

8. Consolidate concrete with care to prevent dislocating formwork, reinforcement, dowels, and joint devices. Honeycombed areas are considered defective and will not be accepted.

9. Specify construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete.

10. Specify temperature and environmental conditions acceptable for concrete pouring.

11. Specify that concrete failing to meet strength requirements, dimensional tolerances, weathertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the project manager at no expense to the University.

12. Specify finish surfaces appropriate for the intended use. Broom finishes shall be drawn across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

13. Allow concrete curing by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these methods.

14. Contractor to protect freshly placed concrete from mechanical injury, premature drying, and excessive cold or hot temperatures. Exclude vehicular traffic from concrete pavement for at least 14 days after placement.

32 14 00 Unit Paving

32 14 16 Brick Unit Paving

1. Walkways and pedestrian circulation are discussed in the University Site Design Guidelines and must be reviewed by Campus Planning and Design when selecting paving material for walkways on the campus.

2. The brick that is in general use for brick paved areas on the campus is a solid paver in the red-brown range. All brick pavers shall be installed with a 4" concrete sub-base with a ¾" sand base.

32 16 00 Concrete Curbs, Gutters, Sidewalks, and Driveways

1. Concrete work shall reference the requirements of Division 3 as well as Section 32 13 13. The location and type of curb and gutter shall match adjacent whenever possible.

2. Provide concrete with the compressive strength of 3000 psi for 28-day strength as minimum for sidewalks and curb and gutters not subject to vehicular traffic. Specify slump and air entrainment, environmental conditions, reinforcement method and joint location.

3. Finish all concrete surfaces in accordance with the following schedule:

    - Form finish: Surfaces not ordinarily exposed to view; including the underside of slabs not exposed to view by repairing defective concrete, filling tie holes and depressions deeper than 1/4". Remove fins exceeding 1/8" in height.

    - Broom finish: Exterior slabs exposed to view including: Outdoor floor slabs and walkways, other floors which may become wet or otherwise require a non-skid surface, Sidewalks and concrete pavements. Provide a scored texture by drawing a broom across the surface perpendicular to predominant travel direction.

    - Edge finish: Tool edges with a ¼" radius tool.

32 16 23 Sidewalks

1 All sidewalks and concrete walking paths shall be at least 5 feet in width.

2 Sidewalks shall also have a maximum of 2% cross-slope, and a maximum of 5% running slope everywhere technically feasible. Notify Building Official when these slopes are exceeded for any reason.

3 All sidewalks and concrete walking paths also meet all applicable requirements set

forth in the current edition of ICC A117.1.

32 17 00 Paving Specialties

32 17 23 Pavement Markings

1. Specify paving to cure for 14 to 30 days before starting pavement markings.

2. Sweep and clean surface prior to painting to remove any loose material and dust. Apply paint with mechanical equipment to produce pavement markings with uniform, straight edges.

3. Pavement markings shall consist of pavement marking paint or thermoplastic pavement markings as required by the Project Manager or authorities having jurisdiction. Paint shall typically be used for low traffic installations such as parking lots and Thermoplastic shall be used for higher traffic applications.

4. Fire lane markings shall be placed in accordance with the CUFD Fire Lane Markings Standards and approved by the University Fire Code Official.

32 31 00 Fences and Gates

32 31 11 Gate Operators

1. All vehicular access gates that will be used for emergency vehicle access shall be powered and shall be siren operated unless card access is provided.

32 80 00 Irrigation

1. Provide an irrigation system if determined necessary by the Campus Planning and Design for all new or renovated lawn areas and planting beds designed and constructed by the project.

2. Specify all site irrigation system controls shall be Weathermatic compatible.

3. Specify that all irrigation systems contain a master valve.

4. Design all systems with appropriate backflow preventers and require a manual shutoff valve to isolate the irrigation system from the water supply main.

5. Record "as-built" drawings for all newly installed, removed and/or relocated irrigation sprinkler piping including location and type designation of all associated sprinkler heads, valves, controllers, etc.

6. The contractor shall take necessary precautions to protect site conditions to remain. All work in the vicinity of trees shall be in accordance with the Urban Forest and Landscape Management Policy.

32 84 00 Planting Irrigation and Underground Sprinklers

1. Clemson University Retains the right to self-perform any sprinkler installation. The designer shall discuss this with the Project Manager.

2. If the installation of the underground sprinkler system is specified as part of the construction contract, specify that the contractor shall notify Landscape Services prior to beginning the installation and make all underground work available for inspection by Landscape Services and University Facilities Survey Group prior to covering.

3. Design system such that two trickle bubblers are provided per planted tree.

32 92 00 Turf and Grasses

1. All permanent ground cover, seeding schedules, etc. must be approved by Campus Planning and Design and Landscaping Services as the needs will differ based on the area of Campus served.

2. Except for Turf Grass, do not specify non-indigenous species.

3. Do not specify any nuisance or invasive species.

PRODUCTS AND MATERIALS - DIVISION 32 – EXTERIOR IMPROVEMENTS

Aggregate Base Course

- Shall conform to Section 305 of SCDOT Standard Specifications.

Emergency Gate Operator Sensor

- SOS VIII Siren Operated Sensor or approved equal

Geosynthetic Soil Reinforcement Grid

- Tensar BX1100 Geogrid 32 12 16-2 or approved equal

Hot Mix Asphalt Surface Course:

- Type C as specified in Section 403 of SCDOT Standard Specifications (2” compacted typical) unless otherwise directed.

Hot Mix Asphalt Binder Course:

- Type C as specified in Section 402 of SCDOT Standard Specifications (3” compacted typical) unless otherwise directed.

Hot Mix Asphalt Base Course:

- Type B as specified in Section 310 of SCDOT Standard Specifications (4" compacted typical) unless otherwise directed.

Security Bollards

- Historic District: Sternberg 230B Manor Unlit Bollard in Dark Brown or approved equal.
- Nonremovable for Non-Historic Areas: Columbia Cascade Dome Top Model 2190 in Dark Brown or approved equal.
- Removable for Non-Historic Areas: Columbia Cascade Dome Top Model 2190RH in Dark Brown or approved equal.

Note: Contact Campus Planning and Design for inclusion or omission of reflective striping on bollards.

Traffic Marking Paint:

Sherwin Williams Pro Mark Traffic Marking Paint (Lead Free) or approved equal:

- Handicap Blue: Finish 0.0TM2133 –Blue Base
- Fire lane Red: Finish 0.0TM2132 – Red Base
- Blackout Black: Finish 0.0TM2135 – Black Base
- Highway Yellow: Finish 0.0TM0227 – Yellow Base
- Highway White: Finish 0.0TM0226 – White Base
- Green Marking Paint: Finish 0.0TM0226 – White Base (Formula [5 gallons] – 50/32 b1, 60/32 y3, 8 oz. G2, 47/32 y1)
- Clemson Orange Marking Paint: Finish 0.0TM0227 –Yellow Base (Formula [5 gallons] – add 1-gallon Red Base to 4 gallons Yellow Base)
- Magenta: Finish 0.0TM0226 - Acrylic Waterborne Traffic Marking Paint White (Formula [5 gallons] 4 oz. 47/32 b1, 61/32 1/128 r2, 16 oz. .38/32 r33)

All paints must comply with AASHTO M-247

Underground Sprinkler Irrigation Systems

Bubbler:

- Rain Bird 1400 Series Pressure Compensating Trickle Bubbler .5 GPM or approved equal

Controller:

- Weathermatic SL9648TW, SL9696TW, or approved equals

Each shall come with a Weathermatic SL-Aiircard-M1 LTE with one-year subscription

Decoder:

- Weathermatic SLDEC1, SLDEC2, or SLDEC4 or approved equals

Drip:

- NDS Agrifim SFPC-BR-6412-05 (.620) or approved equal with 40PSI pressure regulator and filter.
- Only Jain Power-Loc fittings to be used.

Lightning Arrestor:

- Weathermatic SLGDT or approved equal. Install at each end of wire runs and every 600 feet.

Master Valves:

- 1'' = Weathermatic max-dw-10 for 1” or approved equal
- 1.5'' = Weathermatic max-dw-15 for 1.5” or approved equal
- 2'' = Weathermatic max-dw-20 for 2” or approved equal
- Contact Landscape Services for valves larger than 2”

Rotary Heads:

- Weathermatic T3, CT70 or approved equal (Contact Landscaping Services for replacement if unavailable)

Spray Heads:

- Rainbird1800 with Rainbird VAN nozzle or approved equal

Valves:

- 1'' = Weathermatic max-dw-10 for 1” or approved equal
- 1.5'' = Weathermatic max-dw-15 for 1.5” or approved equal
- 2'' = Weathermatic max-dw-20 for 2” or approved equal
- Contact Landscape Services for valves larger than 2”

Valve Boxes:

- NDS Pro Series 6'' 208BC or approved equal
- NDS Pro Series 10'' 212BC or approved equal
- NDS Pro Series Square 314BC or approved equal

Weather Station:

- Weathermatic Smartline SLW 5 or approved equal

Wire:

- Weathermatic SLWIRE 142-1000, SLWIRE 142-2500, SLWIRE 122-1000, SLWIRE 122-2500 or approved equals

Wire Connectors:

- Weathermatic SLCONN or approved equal

DIVISION 33 - UTILITIES

33 05 00 Common Work Results for Utilities

Design Standards

1. The design must include all necessary specifications and drawings to adequately detail the work to be installed. The designer shall account for any portion of the exterior utility work that may be accomplished by subcontractors doing work specified in other divisions.

2. A single, comprehensive drawing showing all sitework and utilities shall be provided. Depending on the complexity of the project, individual drawings may also be required.

3. New construction and major renovations must include sub-metering of lighting, plug loads, equipment loads, and HVAC loads at the building level. It is expected that this will be accomplished with 10 or fewer submeters. All meters shall be connected through Ethernet to Clemson University's Powerlogics server. Consult with University Utility Services for approval of submetering layout and design prior to installation.

4. All submetering shall be compatible with and be integrated into the Schnider Electric PowerLogic server present on Clemson's campus.

5. See Section 01 51 00 concerning the requirements and charges for temporary utilities that may be specified.

6. Clearly specify soil compaction requirements for the backfill in the trenches used for the installation of all utilities in this Division. This needs to agree with any compaction requirements specified in Division 31.

7. Clearly specify that all trenching activities shall comply with Clemson's Urban Forest and Landscape Management Policy.

8. The designer shall give special attention to assuring that all required permits for both the construction of these utilities and the operation of them are obtained from the regulating authority.

9. Consult the OSE Manual for information concerning requirements, codes, and standards that are applicable to this design. The design shall comply with all local codes having jurisdiction, OSHA regulations, ADA compliance, and any applicable seismic codes.

10. Clearly specify the appropriate level of testing and inspections that are required of the individual utility systems and the specific phases of the inspections to be done at intervals of the installation, i.e., prior to backfill of the trench over any piping.

11. Designs shall provide for manholes or catch basins at each point where either the grade or direction of storm sewers change. Manholes or catch basins in excess of 4 feet in depth must be provided with ladder type steps on a vertical wall of the

structure.

12. All manholes and catch basins must be provided with frames and/or covers to allow access for maintenance.

13. Clearly specify that the products to be provided for installation under this Division are in strict accordance with the Product and Material listing for this Division.

Trenchless Utility Installation

1. The University incorporates trenchless utility installation (directional boring) in instances that are either economically feasible or are a better choice in dealing with possible disruption of other services on campus.

Utility Line Signs, Markers, and Flags

1. The University maintains a thorough mapping of the utility systems on campus. Although special attention is given to obtaining field locations of these utility systems as they are installed, various methods of marking these utilities for future reference is also desired. The designer shall utilize current industry standards in providing on-site marking methods that will assist in utility location at later dates.

33 05 09 Piping Specialties for Utilities

2. All piped utilities entering a building shall be fully restrained from the interior of the building by a coupling or system that is fully independent of other supports that are outside the building.

33 05 97 Utility Identification

1. All new construction and any renovation that establishes labeling conventions for non-electric utilities shall follow the standards set forth in the most recent version of ANSI/ASME 13.1.

2. Labels shall indicate the type of utility and direction of flow on all labels. Labels shall also be no more than 20 feet apart. For dual temperature hydronic piping, the standard convention of green with white writing shall be used with labeling as Dual Temp. Supply (DTS) and Dual Temp. Return. (DTR).

3. When an existing convention other than the one listed above is present, the existing color-coding system shall be followed for all new work on the system while maintaining the label spacing and direction of flow indication above.

33 10 00 Water Utilities

Existing System and Design Information

1. Clemson University operates its own potable water distribution system, receiving water from Anderson Regional Joint Water System's (ARJWS) Hartwell Lake Filter Plant. The water purchased from ARJWS is piped into Clemson University through

two (2) master meters in parallel 8-inch turbine located at the Kite Hill standpipe. There is also an emergency service connection provided by the City of Seneca (Seneca Light & Water), a surface water system. Storage for Clemson University's drinking water includes the 300,000 gallon Ravenel storage and the 1,000,000 gallon standpipe on Kite Hill.

2. Details of the water distribution system can be found on the University Atlas and the University Water Network GIS maps. To gain access to these documents, contact your appropriate University project manager. Distribution pressure varies around the campus, therefore, for any proposed facility, request that a flow test for both static and residual pressure be made. University Utilities can usually conduct these tests as needed.

33 11 13 Public Water Utility Distribution Piping

1. Specify that no domestic water piping is installed as to enter a building from under the finished concrete slab.

2. Design must allow for and specify that piping shall be buried below recorded frost penetration, but no less than 36" below finished grade.

3. Specify the installation of appropriate thrust blocks that are needed to properly anchor piping at changes in direction and other required locations. The design must clearly indicate the details required for these thrust blocks.

4. Clearly specify the coordination of any permitting requirements for the installation of these water lines – both the permit to construct and the permit to operate the system. See Division 01 for permitting responsibilities.

5. Specify the level and the method of disinfection of these water lines in accordance with permit requirements or other code requirements.

6. Regulations contained in the Safe Drinking Water Act concerning lead and copper concentrations shall be complied with, including the specification and the selection of piping materials to ensure this compliance.

7. Specify that all new and repaired water distribution system piping shall be inspected my Utilities Services and recorded by the University Facilities Surveyor prior to any backfilling.

33 11 19 Fire Suppression Utility Water Distribution Piping

1. Most water distribution lines on campus serve multiple building systems such as domestic water supply and fire suppression. In these cases, the construction of these lines will be done to the most restrictive of the applicable codes, laws and regulations.

2. The color scheme of fire hydrants installed on the fire suppression water system shall be in accordance with instructions contained in the most current version of AWWA C502.

33 12 13 Water Supply Backflow Preventer Assemblies

1. Reduced pressure type backflow preventers shall be used for domestic water service. Building backflow protection devices shall be designed and installed in parallel to facilitate annual maintenance. See University Fire Suppression and Domestic Water Riser Schematic for installation details.

2. The type of backflow preventer will be based upon the degree of hazard:

   - All cafeteria buildings, food service buildings, buildings with wet laboratories, nursing buildings, and medical facilities will be provided with reduced pressure principal devices.
   - Buildings with wet fire sprinklers will be provided with devices that are rated for such service.
   - All irrigation systems will be provided with at least double check valve assemblies.
   - Carbonated beverage dispensers will be provided with the manufacturer's backflow preventers.

3. Reduced pressure principal devices will be installed in a manner that prevents immersion when the device discharges water.

4. Any installation that results in a direct cross connection between a public water supply and a source of contamination is prohibited.

5. Provide a complete rubber parts repair kit attached to the valve for future maintenance.

33 12 16 Water Utility Distribution Valves

1. Specify that all underground valves shall be provided with a valve box and cover to allow access.

2. Valves installed in unpaved areas shall have concrete "donut" rings around the valve cover at the ground surface for protection.

3. Installations requiring special operating tools shall have the applicable tool furnished with the installation.

4. Specify that contractors are not to operate existing water valves in Clemson's water distribution system. The contractor is to contact Clemson's Utilities Services to have University personnel perform any valve operations.

33 12 19 Water Utility Distribution Fire Hydrants

1. Adequately detail the orientation of fire hydrants to accommodate access by firefighting equipment and vehicles. Consult with the Project Manager and the University Fire Code Official concerning coordination of the location and orientation of all hydrants.

33 12 33 Water Utility Metering

1. Clemson University prefers that water meters for a particular facility be located in a mechanical room or other appropriate location within the facility. This meter assembly must include all applicable backflow preventers and isolation valves. See Division 22 for additional information on metering.

2. Provide combination meters for potable water and standard meters for irrigation.

33 13 00 Disinfecting of Water Utility Distribution

1. The disinfection of new water distribution systems and piping must be specified in accordance with South Carolina DHEC requirements.

33 30 00 Sanitary Sewerage Utilities

Existing System and Design Information

1. Clemson University operates its own sanitary sewerage collection system and sewerage treatment plant. The locations of piping connected to the system are available from University Utilities Services.

2. Clearly specify the coordination of any permitting requirements for the installation of any sanitary sewer lines. This includes both the construction and operating permits.

33 31 00 Sanitary Utility Sewerage Piping

1. Clearly specify any allowable installation tolerances from specified line and grade.

2. Reinforced concrete piping is not allowed for sanitary sewer piping.

3. The maximum between manholes shall not exceed 250 linear feet.

4. All new sanitary sewer systems shall be inspected via a recording CCTV system. Contact University Utilities for submittal requirements.

5. Specify that all new and repaired sanitary sewerage piping shall be inspected my Utilities Services and recorded by the University Facilities Surveyor prior to any backfilling.

33 31 00 Sanitary Utility Sewerage Structures

1. Manholes must be located at all changes in plan direction and abrupt changes in elevations. Drop manholes must be specified in accordance with accepted design standards.

2. Specify that all inverts in sanitary manholes shall be constructed in place. Pre-cast inverts are not allowed.

3. Pre-cast sanitary sewer manholes shall be specified to with an eccentric top section with cast in place ladder rungs.

4. Manhole rings and lids shall be specified to meet the requirements of the application. Lids shall have cast in letters stating, "Sanitary Sewer".

5. Specify that all new and repaired sanitary sewerage structures shall be inspected by Utilities Services and recorded by the University Facilities Surveyor prior to any backfilling.

33 39 23 Sanitary Utility Sewerage Cleanouts

1. At a minimum, locate cleanouts in accordance with International Plumbing Code as adopted by Chapter 5 of OSE Manual.

2. The designer shall be responsible for identifying any need for additional cleanouts beyond those needed for a code compliant installation and shall include these in the completed design. Consult with the Project Manager and other applicable University personnel as early in the design process as possible for requirements regarding specialized equipment or any unique conditions or needs that may exist.

33 40 00 Storm Drainage Utilities

Existing System and Design Information

1. Clemson University's storm sewerage system is generally laid out in three major distribution trunks, each draining approximately one-third of the campus. Proper storm drainage shall be addressed on any new structure or facility tied into the existing system.

2. The designer shall be aware of the requirements of EPA/DHEC permitting requirements for NPDES Permits for Storm Water Discharges and assure that any applicable aspects of these requirements are complied with. The Project Manager can provide current information concerning any existing NPDES Permit issued to Clemson University.

3. Design calculations for large drainage projects shall be submitted as part of closeout documentation.

4. The University's storm sewer system is not designed to handle storms of greater intensity than the theoretical ten-year frequency.

33 41 00 Storm Utility Drainage Piping

1. The minimum acceptable size for storm drainage piping receiving surface water from ground or paved areas is 15 inches in diameter.

2. Curbs and gutters shall be planned to facilitate the disposal of storm water.

3. Planter boxes and planted areas surrounded by walks shall be piped to the storm sewer system rather than discharging onto walkways.

4. All drop inlets and catch basins shall be designed to allow adequate drainage assuming 50 percent blockage of all water accepting openings.

5. Drop inlets are not allowed in walking surfaces.

6. Catch basins and drop inlets along roadways and in parking lots shall be placed outside of vehicular and pedestrian pathways.

7. Drainage systems serving foundations, areaways, and roofs shall connect to the University's storm sewer system at a catch basin with a top elevation lower than the ground floor elevation of the building.

8. Specify that all new and repaired storm drainage systems shall be inspected by Utilities Services and recorded by the University Facilities Surveyor prior to any backfilling.

9. All new storm sewer systems shall be inspected via a recording CCTV System. Contact University Utilities Services for submittal requirements.

33 47 26 Storm Drainage Water Retention Structures

1. Storm Drainage Water Retention Structures shall follow design standards defined in the SCDES BMP Handbook or the elected permit authority's design manual as required by the Clemson University Storm Water Management Program.

2. Clemson University recognizes the following BMPs as LID storm drainage structures when designed in accordance with specifications in the SCDES BMP Handbook:

   - Vegetated Conveyance Swales
   - Bioretention Areas
   - Vegetated Filter Strips
   - Infiltration Trenches
   - Porous Surfacing

3. As stated in the University Stormwater Management Program, use of LID BMPs is the preferred method of stormwater management and should be implemented whenever practical as part of the policy objective.

4. The requirement of the construction of storm water retention structures will be dictated by to the DHEC/NPDES permit that may be required for the project.

33 60 00 Hydronic and Steam Energy Utilities

Existing System and Design Information

1. Chilled water is distributed throughout the campus via a campus loop chilled water supply and reverse return systems. Detailed information relating to the chilled water system is available upon request from University Utility Services.

2. Steam and condensate systems are distributed throughout the campus via an underground conduit system or through the main utility tunnel system. This piping

system consists of a steam line at 115 psig saturated, a pumped condensate return line, and a high-pressure condensate drip line if required.

33 61 00 Hydronic (Chilled Water) Distribution Piping

1. Specify that the minimum depth of uninsulated chilled water lines be 6 feet below finished grade.
2. Specify insulation of chilled water lines in accordance with the Products and Material Listing for this Division.

3. Include a chilled water bridge installed per Clemson's Chilled Water Bridge Detail in all new building construction.

33 61 33 Metering

1. Chilled water to all facilities must be metered.

2. The designer shall pay particular attention to clear piping requirements for the appropriate meter installation.

33 63 13 Underground Steam and Condensate Distribution Piping

1. Steam manholes must be designed for proper drainage. Pipe the drainage to existing storm drainage system if possible.

2. Main distribution steam line piping must be designed utilizing an underground conduit system. Design and layout of the distribution piping must be such to allow for expansion in the underground conduit system through the use of expansion loops. The design must adequately detail type and location of all required anchors, guides, and supports.

3. Service connections to individual facilities are to be installed utilizing direct burial, pre- insulated piping as indicated in the Products and Materials Listing at the end of this Division.

4. Specify insulation of steam lines in accordance with the Products and Material Listing for this Division.

33 63 33 Metering

1. Steam distribution to the facility must be metered.

2. The designer shall pay particular attention to clear piping requirements for the appropriate meter installation.

33 70 00 Electrical Utilities

Existing System and Design Information

1. Clemson University operates its own power distribution system through both concrete encased duct bank systems and the main utility tunnel system. Power is transmitted

at 4160 or 12,470 volt wye, 3 phase, 4 wire, 60 cycle AC. Consult Utilities Services for the primary voltage to be provided for a project and standards on the specific circuit and connection equipment required as well as the number of conduits to be installed in a particular duct bank system.

2. Electrical utilities systems shall conform to the following documents as applicable:
   - Clemson University Electrical Utilities Guidebook
   - Clemson University Pad Mount Transformer Specifications
   - Clemson University Medium Voltage Cable Specifications

33 71 19 Electrical Underground Ducts and Manholes

1. Conduit encased in concrete shall have spacers and supports installed in accordance with manufacturers specifications prior to concrete placement. The concrete encasement surrounding the duct bank shall be rectangular in cross-section and provide at least 3 inches of concrete cover for the ducts. Conduit shall be separated by a minimum of 3 inches of concrete. Coordinate the requirements of the concrete encasement with the requirements for other concrete specified in Division 3.

2. The first 10’ of conduit entering and exiting a manhole or structure must be RMC or NEMA rated Sch. 40 – PVC, in concrete-encased duct bank.

3. Conduit joints shall be staggered by rows and layers to provide a duct line of maximum strength.

4. Specify that during construction, contractor shall protect partially completed line from the entrance of debris and dirt with suitable conduit plugs. At the completion of each section of duct line, specify that each conduit shall have a stiff bristle brush having the same diameter as the conduit pulled through it until clear, then plugged with temporary end plugs.

5. A pull string shall be installed in all empty conduit not used in the present project.

6. Duct lines shall have a continuous slope away from buildings of not less than 3%.

7. Changes in direction of the conduits shall be accompanied with long sweep bends having a minimum radius of curvature of 25 feet.

8. Changes in direction of duct banks shall be minimized between manholes to facilitate pulling of cable. There shall be no more than 180 degrees of bend between manholes.

9. A 12” sump with cover shall be provided in the bottom of each vault.

10. Take special care in determining the finish elevations of manhole tops and covers to accommodate the installation and minimize surface water infiltration. The highest point of the vault shall be 18” below final grade.

    - Conduits shall be cleaned and tested for continuity prior to installation of cables or pull strings as follows:

- The conduit shall then be swabbed out by pulling through a brush and/or rags which remove any additional debris from the conduit. The process shall be repeated until the conduit is free of debris.

- A steel mandrel not less that 2 inches long and having a diameter no less than 70 percent of the inside diameter of the conduit or an equivalent approved by the CU Utilities Electrical Engineer shall be passed through the entire run of conduit from one end to the other between vaults, transformers, and/or poles without binding. The mandrel's length shall be that it will only pass through conduit/innerduct with a bending radius of 24 inches. Conduits which do not allow the mandrel to be pulled or passed through freely will be repaired or replaced and re-tested.

- Should the mandrel become stuck in the conduit then the length of conduit where the mandrel was stuck shall be condemned and replaced to the satisfaction of the University Utilities Electrical Engineer.

33 71 49 Medium Voltage Wiring

1. All medium voltage systems shall comply with the Electrical Utilities Guidebook.

2. The designer shall be especially thorough in coordinating the requirements for wiring under this Division with those requirements specified in Division 26 of this document.

1. Specify adequate experience level and documentation of all personnel engaged in the installation of medium voltage wiring and the making of cable splices for this wiring. It is preferable that this task be done by a single individual throughout the project.

4. Adequately specify any special tests, precautions, notifications, etc. that are needed prior to energizing any medium voltage cable and associated equipment. Medium voltage cables shall be VLF withstand tested following IEEE 400.2 guidelines before being placed into service.

5. Specify the proper protection of medium voltage cable both prior to installation and during the actual installation within a conduit system.

6. For any additional information on Medium Voltage installations, please contact University Utility Services.

33 72 00 Utility Substations and Associated Equipment

1. The installation and construction of new substations or additions to existing substations require design based on the requirements of the individual substation. University Utility Services can supply the appropriate information on this type of facility and its specific requirements.

2. Specify adequate experience level and documentation of all personnel engaged in the installation of medium voltage wiring and the making of cable splices for this wiring.

3. Adequately specify any special tests, precautions, notifications, etc. that are needed prior to energizing any medium voltage cable and associated equipment. Medium voltage cables shall be VLF withstand tested following the most recent IEEE 400.2 guidelines before being placed into service.

33 80 00 Communications Utilities

Existing System and Design Information

1. Clemson University operates and maintains its own outside plant communications distribution system for voice, data and video system. This infrastructure includes underground ductbanks, manholes and fiber optic cabling.

2. Clemson uses Voice-over-IP (VOIP) for campus telephone services and therefore does not install any Clemson-owned outside plant copper cabling. Instead, for the limited amount of analog telephone services needed, Clemson obtains telephone utility services from AT&T.

3. Inquire with the Facilities project manager to determine who from the Clemson Network Services and Telecommunication (NST) department has been assigned to serve as the NST Technical Lead (NSTTL). It is imperative that the NSTTL and the telecommunications designer on the A&E team be involved from the beginning of the project (typically the pre-design phase).

4. Refer to Clemson's Telecommunications Distribution Design Guide (TDDG) for instructions about designing outside plant telecommunications infrastructure on campus. Adherence to these requirements is mandatory, and many of the requirements involve interaction with the CCITPM to inquire about project-specific nuances.

5. In addition to the design guidelines in the TDDG, a set of specification sections have been prepared for specific projects on campus. For any projects involving outside plant telecommunications infrastructure, please send an email to ITHELP@clemson.edu and request that the current version Word documents for the following sections be sent to you. Designers shall directly edit these specification documents for applicability to each Clemson project, rather than using their own specification documents.

PRODUCTS AND MATERIALS – DIVISION 33 – UTILITIES

Water Utilities

Fire Suppression Water Distribution Piping

- Ductile Iron – Schedule 40, with resilient joints. Use mechanical joints for fittings and appurtenances.

Fire Hydrants

- Mueller Super Centurion 250 without Aquagrip or approved equal having a 3-way valve, with two 2-1/2" and one 4" hose connections.

Potable Water Distribution Piping

- Ductile Iron – Schedule 40, with resilient joints. Use mechanical joints for fittings and appurtenances.
- Polyvinylchloride (PVC) – Schedule 40, may be acceptable for use in some locations. Consult the University Utilities prior to specifying the use of PVC.

Restraint Couplings (Piped Utility Entry Points)

- Romax Alpha FC or approved equal

Valves

- Eddy #F-2405, AWWA or approved equal with iron body, bronze trim, non-rising stem, mechanical joint connection, 200 psi, open to the left, with 2" operating nut.
- Underground installations shall require valve box and cover for access.

Sanitary Sewer Utilities

Manholes

- Concrete pre-cast manholes with eccentric top section, and cast in place ladder rungs.

Manhole Rings and Lids

- Cast iron, selected for proper strength for particular application.
- Lids shall have cast in letters stating, "Sanitary Sewer."

Sanitary Sewerage Piping

- In areas subjected to heavy traffic loading or in difficult maintenance locations – Ductile Iron – Schedule 40.
- In areas not subjected to heavy traffic loading –Contech A-2000 PVC or approved equal.

Storm Drainage Utilities

Catch Basins and Junction Boxes

- Pre-cast concrete, or built-in-place masonry, with cast in place steps if deeper than 4 feet.

Manhole Lids and Grates

- Cast iron selected for proper strength for particular application.
- Lids must have cast in letters stating, "Storm Sewer."

Storm Drainage Piping

- Reinforced concrete (RCP), Contech A-2000, ADS (Advanced Drainage System slip-joint), or approved equal.
- The use of corrugated metal pipe is not allowed.

Storm Drainage Water Retention Structures

All storm drainage water retention structures shall use materials specified in the SCDES BMP Handbook or the elected permit authority's design manual.

Mechanical Utilities

Hydronic (Chilled Water) Distribution Piping

- 6" and Smaller: Schedule 40 Ductile Iron
- 6" Through 12": Schedule 30 Ductile Iron
- 12" and Larger: Schedule 20 Ductile Iron

Restraint Couplings (Piped Utility Entry Points)

- Alpha FC or approved equal

Steam Distribution Piping

- Steel pipe meeting ASTM A120 Grade A or ASTM A53 Grade B

Valves

- Steam Piping: Class 150 cast steel, bolted bonnet, seal welded seat rings, butt weld ends.
- Chilled Water Piping: Wafer type butterfly valves, as manufactured by Nibco, Demco, or approved equal with 2" square operating nut, with valve box and cover.
- Chilled Water Bridge Valve: Sentinel Segmented V-Ball and Pratt Electric Operator or approved equal.

Insulation

- Steam Piping: Consult University Utilities Services
- Pumped Condensate: No insulation

Electrical Utilities

Electrical Underground Ducts

- Concrete Encased Ductbanks: Rigid PVC, Type DB 60 by Carlon, Queen City Plastics or approved equal. Spacers, supports, and end bells shall be PVC or high

impact polystyrene.

- Direct Burial Ducts: Rigid steel conduit, galvanized with bitumastic coating.
-

Manholes

- Pre-cast concrete, with 36” or 42” opening in top for frame and cover, based on AASHTO HS 20 loading, complete with cast iron frame and cover, pulling irons, cable racks, bottom sump, with provisions for attaching entering duct or conduit, and provisions for electrical grounding.
- Power manholes to be octagonal 8’ x 8’ x 6.5’ inside dimension.
- Telephone and Communication manholes to be 6’ x 6’ x 6’ inside dimensions.

Manhole Frames and Covers

- Sumter Machinery Company – EJIW 1825 or approved equal that is cast iron, Neenah rated for AASHTO HS 20 loading vehicular traffic. Ring and cover shall provide a minimum 32” clear opening when collar is 3’ or less and 36” clear opening when collar is taller than 3’.
- Covers to have cast in letters stating either “Electric” or “Communications” as appropriate.

DIVISION 34 – Transportation

34 41 00 Transportation Signaling and Control

34 41 13 Traffic Signals

1. All traffic signal repairs, upgrades, etc. will be coordinated with Clemson University Utilities Services.

34 41 16 Traffic Control Devices

1. Provide all necessary barricades, flagmen, or other traffic control devices in accordance with the most current Manual on Uniform Traffic Control Devices, Section 600 of SCDOT’s Standard Drawings, and any University approved project specific traffic control plans to prevent injury to people or damage to adjacent property or facilities. This protection includes the existing landscape and plantings.

2. Provide protection for people and pedestrian traffic around the construction area.

3. Do not close or obstruct adjacent streets and pedestrian walkways without permission from the project manager.

4. Promptly repair, or remove and replace, project components, damaged utilities and owner’s property, that are broken, defective or that do not comply with requirements in this Division as directed by the project manager at no additional expense to the owner.

5. All traffic calming devices, both temporary and permanent, such as speed bumps, speed tables, delineators, etc. shall be approved by the Clemson University Fire Marshal or Fire Code Official prior to installation.

34 71 00 Roadway Construction

34 71 13.16 Vehicle Crash Barriers

1. All traffic guardrail installations shall be approved by Campus Planning and Design prior to installation.

2. Unless otherwise specified, all installations shall be installed in accordance with the current SCDOT Standard Drawings and to include the following:

    - Powdercoated w-beam or thrie beam rails as deemed necessary.
    - Metal support posts
    - Energy dissipating leading end treatments
    - Rounded trailing end treatments

Revision Log

- 01/31/2025: All Products Divisions: “or approved equal” added to all products with less than 3 options.
- 01/31/2025: 00 31 19: OES link added
- 01/31/2025: 01 14 13: Special permission clause for football gameday work removed.
- 01/31/2025: 01 14 19: Noisy operations definition updated.
- 01/31/2025: 01 33 00: Site plan requirements added.
- 01/31/2025: 01 33 00: Requirement to have CSI section and page number on each page of specs added.
- 01/31/2025: 01 33 00: Drawing requirements updated.
- 01/31/2025: 01 33 16: Coordination of Room numbers between all plans and systems added.
- 01/31/2025: 01 33 16: New Construction and Renovation sections combined.
- 01/31/2025: 01 33 16: New construction requirements for lactation room applied to all lactation rooms.
- 01/31/2025: 01 33 16: Redundant code references removed.
- 01/31/2025: 01 33 16: Wellness Room required for all buildings.
- 01/31/2025: Attics with mechanical equipment and mechanical penthouses given option to have access by elevator.
- 01/31/2025: 01 33 16: Requirement for Fire Command Room added for new construction and major renovations.
- 01/31/2025: 01 33 16: Floor drains added for custodial closets.
- 01/31/2025: 01 33 16: Inclusive Facilities Policy linked.
- 01/31/2025: 01 33 16: Case-by-case review of roof hatch on renovations added. Roof access information from 07 05 00 moved to this section.
- 01/31/2025: 01 35 53: Uniforms added to acceptable Worker Identification and requirements for workers to adhere to applicable Clemson Policies.
- 01/31/2025: 01 41 19: Section created and code information moved here and updated
- 01/31/2025: 01 51 36: CU provided water meters removed.
- 01/31/2025: 01 56 00: Section Removed. Information moved to 01 14 19.
- 01/31/2025: 01 55 00: Requirement to coordinate onsite parking with other projects added.
- 01/31/2025: 01 55 00: Compliance ADA Regulations added.
- 01/31/2025: 01 56 00: Requirement that Fire Code Official approve temporary barriers and site entrances added.
- 01/31/2025: 02 26 00: Redundant PM coordination verbiage removed.
- 01/31/2025: 03 05 00: Removed information redundant with other standards.
- 01/31/2025: 03 30 00: Removed requirement to comply with ACI Recommendation for formwork.
- 01/31/2025: 04 21 00: Colored mortar requirement updated to remove deviation language and just require Planning approval
- 01/31/2025: 04 21 00: Tooled joint requirement removed.
- 01/31/2025: 04 22 00: Section Removed.
- 01/31/2025: Division 5: Division Removed.
- 01/31/2025: 06 05 00: Requirements for Fire retardant plywood and paint removed.
- 01/31/2025: 07 05 00: Penthouse roof access option added.
- 01/31/2025: 07 05 00: Roof hatch operation from floor and OSHA requirements for hatches and ladders added.

- 01/31/2025: 07 05 00: Requirement for protective matting around roof mounted equipment added.
- 01/31/2025: 07 05 00: Leak testing requirement added to roof drain testing.
- 01/31/2025: 07 05 00: Roof slope requirements updated.
- 01/31/2025: 07 05 00: Removed PM consulting requirement on closing abandoned penetrations.
- 01/31/2025: 07 51 00: Asphalt kettles prohibited
- 01/31/2025: 07 53 00: Prohibition of Elastomeric roofs removed. 90 mil minimum thickness added to EPDM.
- 01/31/2025: 07 72 53: Section added
- 01/31/2025: 07 84 13: Section added
- 01/31/2025: Division 23 Products: Firestopping penetration assemblies added
- 01/31/2025: Division 7 Products: FiberTite replaced Tamko for Mod. Bit. Flashing and Cap Sheet.
- 01/31/2025: 08 10 00: Mechanical room and plumbing chase door sizes specified.
- 01/31/2025: 08 10 00: Frame strike pocket dimensions added.
- 01/31/2025: 08 50 00: OES reference removed from fall protection.
- 01/31/2025: 08 60 00: Verbiage for skylights change to discourage use.
- 01/31/2025: 08 71 00: Redundant Verbiage removed.
- 01/31/2025: 08 71 00: Removed requirements for lockable panic hardware on assembly spaces without lockdown button.
- 01/31/2025: 08 71 00: Notification to Maintenance Security Shop extended to 120 days for lock core installation.
- 01/31/2025: 08 71 00: Return of removed door hardware restricted to units not to be reused.
- 01/31/2025: Division 8 Products: Mortise and cylinder lockset functions updated.
- 01/31/2025: 09 50 00: Access to serviceable parts added
- 01/31/2025: 09 68 00: Updated to prohibit carpet over asbestos containing material.
- 01/31/2025: 10 11 00: Bulletin board requirement removed.
- 01/31/2025: 10 14 00: Signs prohibiting storage in mech rooms and at bottom of stairs added.
- 01/31/2025: 10 21 00: Ceiling hung toilet partition requirement restricted to areas cleaned by Facilities custodial.
- 01/31/2025: 10 41 00: Knox Box location updated and required to be approved by Fire Code Official.
- 01/31/2025: 10 28 00: Accessory mounting detail requirements updated
- 01/31/2025: 10 28 00: Feminine Product Disposal updated to use personal disposal bags and moved to 10 21 00.
- 01/31/2025: Division 10 Products: Restroom Trash Cans Updated, Soap/Sanitizer Dispenser Updated, Residential Toilet Paper Dispenser Added, Feminine Product Receptacle swapped for Personal Disposal Bag Dispenser, Approval of toilet seat cover dispensers by custodial added.
- 01/31/2025: 11 82 23: Redundant verbiage removed.
- 01/31/2025: 12 05 00: Redundant verbiage removed regarding not proceeding till unsatisfactory conditions corrected.
- 01/31/2025: 12 48 00: walk-off entrance grates prohibited
- 01/31/2025: 12 50 00: Redundant verbiage removed.
- 01/31/2025: 14 20 00: Redundant code reference removed.
- 01/31/2025: 13 21 00: Verbiage redundant with code removed.
- 01/31/2025: 21 05 00: Verbiage redundant with code removed.
- 01/31/2025: 21 10 00: Requirement to place hose valve on intermittent landings in

stairwells.

- 01/31/2025: 21 10 00: Requirement for concealed sprinkler pipe to be painted red added.
- 01/31/2025: 21 11 00: Reliable sprinkler head donation clause removed.
- 01/31/2025: 22 11 13: Requirement prohibiting visible building envelope penetrations removed.
- 01/31/2025: 22 11 16: Requirement prohibiting visible building envelope penetrations removed.
- 01/31/2025: 22 14 00: Section added.
- 01/31/2025: 22 42 13: Plumbing chase width updated and requirement for door access to plumbing chase added
- 01/31/2025: 22 24 13: Facilities not cleaned or maintained by Clemson Facilities and custodial exempted from wall hung toilets and urinals.
- 01/31/2025: 22 42 23: Section added.
- 01/31/2025: Division 22 Products: Toilet Sections combined.
- 01/31/2025: Division 22 Products: Victualic couplings added to domestic copper water fittings larger than 4”.
- 01/31/2025: Division 22 Products: Wall hydrant and hose bibb sections added
- 01/31/2025: 23 05 00: Verbiage redundant with code removed.
- 01/31/2025: 23 05 29: Reworded to specify hangers be able to support anticipated loads.
- 01/31/2025: 23 07 13: Glued duct insulation requirement removed.
- 01/31/2025: 23 07 13: Requirement added to have exterior duct insulation protected added.
- 01/31/2025: 23 07 13: Requirement added to have exterior pipe insulation protected added.
- 01/31/2025: 23 09 00: BAS standards made available by request.
- 01/31/2025: 23 11 26: Section added.
- 01/31/2025: 23 30 13: Section Removed.
- 01/31/2025: 23 38 13: Section added.
- 01/31/2025: 23 73 00: Thickness requirement for epoxy coating on AHU pads removed.
- 01/31/2025: 23 81 00: Bent fin repair clause removed. Redundant with contracts.
- 01/31/2025: 23 82 00: Thermostat mounting requirement moved to 23 09 00.
- 01/31/2025: 26 05 13: Section Removed-Redundant with Division 33
- 01/31/2025: 26 05 19: Written permission requirement removed for allowable uses of MC Cable.
- 01/31/2025: 26 05 26: Transformer bonding requirement at substations removed.
- 01/31/2025: 26 05 26: Redundant verbiage with code removed.
- 01/31/2025: 26 05 29: Redundant verbiage with code removed.
- 01/31/2025: 26 05 33: Conduit Requirements for service entrances, below grade, indoor and outdoor raceways updated.
- 01/31/2025: 26 05 33: Reference to 07 84 13 added.
- 01/31/2025: 26 05 53: Telecom marking requirements removed and Emergency Circuits markings added.
- 01/31/2025: 26 05 83: Switching of grounding conductors for cubicles and furniture removed.
- 01/31/2025: 26 05 83: Verbiage removed that conflicted with code.
- 01/31/2025: 26 10 00: Section Removed-Redundant with Division 33
- 01/31/2025: 26 12 00: Requirement for one spare conduit in service entrances added.
- 01/31/2025: 26 14 00: A3 and JCI Sole Source clauses removed.

- 01/31/2025: 26 14 13: Requirement to use switchboard for metered service entrances over 800 amps added.
- 01/31/2025: 26 24 19: Requirement to use drive cable between VFD’s and Motors added
- 01/31/2025: 26 24 19: Removed redundant verbiage with code.
- 01/31/2025: 26 27 13: Submetering and Power Metering requirements updated
- 01/31/2025: 26 27 26: Reference to following plans and mounting fixtures plumb removed.
- 01/31/2025: 28 30 00: A3 sole source clause removed and JCI sole source clause updated.
- 01/31/2025: 26 56 00: Requirement to provide extra exterior lighting conduit added.
- 01/31/2025: 26 56 00: Requirement to maintain functionality of existing exterior lighting systems and provide adequate rerouted pathways when needed for the same systems.
- 01/31/2025: Division 26 Products: Power Meters updated.
- 01/31/2025: 27 32 26: Section added.
- 01/31/2025: 27 32 43: Section added.
- 01/31/2025: Division 27 Products: Emergency Phones moved from Division 28 Prod.
- 01/31/2025: Division 27 Products
- 01/31/2025: 28 05 00: TigerOne card access standards linked
- 01/31/2025: 28 14 00: Keypad door hardware prohibited.
- 01/31/2025: 28 14 00: updated to require Genetec compatibility from all IP enabled hardware.
- 01/31/2025: 28 14 00: Electronic locking devices updated to allow 12- and 24-volt operation.
- 01/31/2025: 28 20 00: Elevator camera requirements added.
- 01/31/2025: 28 30 00: FACP reporting and controls layout requirements updated.
- 01/31/2025: Division 28 Products: POE locks restricted to IT closets only.
- 01/31/2025: 31 05 00: Redundant OSHA reference removed
- 01/31/2025: 31 05 00: Native soil description removed.
- 01/31/2025: 31 11 00: Management of excess material clause moved to 31 05 00.
- 01/31/2025: 31 22 00: Sloping, stabilization, and retaining wall requirements added.
- 01/31/2025: Division 31 Products: Requirement for biodegradable erosion control blanket to be used.
- 01/31/2025: 31 25 00: Redundant permitting verbiage removed.
- 01/31/2025: 32 16 23: Notification of Building Official when ADA complaint slopes are not met added.
- 01/31/2025: 32 31 11: Section added.
- 01/31/2025: Division 32 Products: Requirement for siren sensor on gates added.
- 01/31/2025: 33 05 00: Metering Requirements updated.
- 01/31/2025: 33 12 16: Requirement to have University Utilities operate all public water system valves added.
- 01/31/2025: 33 41 00: Inspection by University Utilities and recording by University Surveyor added.
- 01/31/2025: 33 41 00: Inspection by University Utilities and recording by University Surveyor added.
- 01/31/2025: 33 71 19: 180 deg. of bending maximum specified between manholes.
- 01/31/2025: 33 71 49: Requirement for Medium Voltage Guidebook compliance added.
- 01/31/2025: 33 72 00: Added requirement to follow most recent IEEE 400.2
- 01/31/2025: Division 33 Products: Electrical manhole requirements updated.
- 01/31/2025: Division 33 Products: Chilled water bridge valve and actuator added.

- 01/31/2025: Revision Log: Reduced shown changes to those for 2024 and 2025.
- 03/23/2026: 01 14 13: Requirements for wayfinding signage on plans added.
- 03/23/2026: 01 33 00: Closeout documentation section added.
- 03/23/2026: 01 33 00: North Arrow requirement on drawings added.
- 03/23/2026: 01 33 16: All prescriptive room dimensions converted to equivalent square footages.
- 03/23/2026: 01 33 16: New University Design Guidelines referenced.
- 03/23/2026: 01 55 00: Requirement to include A/E Parking costs in Contract sum added.
- 03/23/2026: Requirement to document site changes to make onsite compliant with applicable regulations added.
- 03/23/2026: 01 74 23: Section added.
- 03/23/2026: 01 83 16: Section added.
- 03/23/2026: 01 83 16: Guardrail height requirement added for balconies, habitable roofs, etc. added.
- 03/23/2026: 01 90 00: Commissioning agent credentials added
- 03/23/2026: 01 90 00: Green Globes Commissioning method added
- 03/23/2026: 02 32 00: Geotechnical Surveys and subsurface drilling added to A/E responsibilities.
- 03/23/2026: 04 21 13: Material approvals process and allowances updated.
- 03/23/2026: 07 05 00: Current roof hatch requirements updated to require compliance from all hatches within project scope.
- 03/23/2026: 07 51 00: New Membrane Roofing Standards linked.
- 03/23/2026: 07 53 00: New Membrane Roofing Standards linked.
- 03/23/2026: 07 71 00: Impact protection requirement for gutter downspouts added.
- 03/23/2026: 08 70 00: Hardware with vertical concealed cables prohibited.
- 03/23/2026: Division 7 Products: Roof Hatch Operator added.
- 03/23/2026: 08 88 36: Requirement added to have needed tools and software for self-maintenance and updates provided to Clemson.
- 03/23/2026: 08 88 49: Section added.
- 03/23/2026: Division 08 Products: Security Glass added.
- 03/23/2026: Division 08 Products: Sargent panic hardware reduced to replacement of existing only and not allowed for new construction.
- 03/23/2026: 09 05 00: Requirement for all finishes to be submitted and approved by planning and interiors manager added.
- 03/23/2026: 09 68 00: Procurement of carpeting under an allowance removed.
- 03/23/2026: 09 68 00: Requirement for auditorium carpeting to have special consideration and all carpet selection to be approved by Planning and Design.
- 03/23/2026: 09 90 00: Campus Planning and Interiors manager added to paint color approval.
- 03/23/2026: 10 14 00: Accessible parking sign detail created and linked.
- 03/23/2026: 10 14 00: Signage design requirements and inclusion of signage in contractor scope added.
- 03/23/2026: 11 82 23: Recycling Bin Types updated
- 03/23/2026: 02 32 00: Geotechnical Surveys and subsurface drilling added to A/E responsibilities.
- 03/23/2026: Division 11 Products: Recycling and waste bins removed for office spaces.
- 03/23/2026: 12 08 00: Updated to require Campus Planning and Interiors Manager to be contacted in furniture selection and specifications.
- 03/23/2026: 12 48 00: Walk-off entrance carpeting updated.
- 03/23/2026: 12 56 00: Connection of multiwire systems to branch circuits per NEC

added.
- 03/23/2026: Division 12 Products: Section Added
- 03/23/2026: 14 20 00: Section Rewritten
- 03/23/2026: 14 21 00: Section Added.
- 03/23/2026: 14 24 00: Section Added.
- 03/23/2026: 14 28 00: Section Added.
- 03/23/2026: Division 14 Products: Section Added.
- 03/23/2026: 21 05 00: Drain piping requirements added for RPZ Backflow preventers.
- 03/23/2026: 21 10 00: Painting of concealed sprinkler piping changed to labeling.
- 03/23/2026: 21 10 00: Control valve installation and operation better defined.
- 03/23/2026: 22 05 23: Requirement to minimize number of tempering valves added.
- 03/23/2026: 22 05 23: Valve requirements updated.
- 03/23/2026: 22 05 29: Hanger requirements updated.
- 03/23/2026: 22 05 76: Removed conflicting requirement with clearances for cleanouts
- 03/23/2026: 22 11 00: Utility entry methods updated.
- 03/23/2026: 22 13 00: Utility entry methods updated.
- 03/23/2026: 22 11 13: Drain piping requirements added for RPZ Backflow preventers.
- 03/23/2026: 22 05 23: Requirement to minimize number of tempering valves added.
- 03/23/2026: 22 05 23: Valve requirements updated.
- 03/23/2026: 22 05 29: Hanger requirements updated.
- 03/23/2026: 22 05 76: Removed conflicting requirement with clearances for cleanouts.
- 03/23/2026: 22 42 16: Backsplash added to mop sinks.
- 03/23/2026: 22 42 39: Check valves for service and commercial kitchen faucets added.
- 03/23/2026: 22 42 39: Mounting requirements for electronic controls and mixing valves added.
- 03/23/2026: Division 22 Products: Models for Recessed emergency showers and eyewashes added.
- 03/23/2026: Division 22 Products: Domestic water backflow preventers updated.
- 03/23/2026: 23 05 00: Condensate prohibited from being connected to storm sewer.
- 03/23/2026: 23 05 00: Controls drawing requirements added.
- 03/23/2026: 23 05 00: Requirement for all filters to be changed at substantial completion added.
- 03/23/2026: 23 05 00: Filter requirements updated.
- 03/23/2026: 23 05 23: Use of valve stem Extension and sleeves to keep insulation intact added.
- 03/23/2026: 23 05 29: Requirements for support of insulated pipes updated.
- 03/23/2026: 23 05 93: TAB report content requirements and TAB contractor certification requirements updated.
- 03/23/2026: 23 22 23.13: Section added
- 03/23/2026: 23 22 23.23: Section added
- 03/23/2026: 23 34 00: Section Added.
- 03/23/2026: 23 35 13: Section Added.
- 03/23/2026: 23 52 00: Section Added.
- 03/23/2026: 23 73 00: requirements for auxiliary drain pans and AHU mounting pads updated.
- 03/23/2026: 23 82 19: Filter change requirements at Substantial Completion moved to 23 05 00.
- 03/23/2026: 23 82 19: Merv 8 filter requirement added.
- 03/23/2026: 23 82 19: Auxiliary pan on overhead FCU’s required to be removable.
- 03/23/2026: 23 82 19: Piping requirements updated.
- 03/23/2026: Division 23 Products: Spirax Sarco Steam Condensate Duplexes added.

- 03/23/2026: 26 05 19: Requirements for MC Cabling and conduit pathways usage clarified.
- 03/23/2026: 26 05 33: Requirement for feeders to be in GRC or IMC removed.
- 03/23/2026: 26 05 53: Updated to include link for new panel labeling standards.
- 03/23/2026: 26 05 73: Arc Flash Study criteria updated.
- 03/23/2026: 26 21 16: Section Added.
- 03/23/2026: Division 26 Products: Cover plates for wiring devices updated.
- 03/23/2026: Division 26 Products: Electrical boxes updated.
- 03/23/2026: Division 27 Products: ERCES Components added.
- 03/23/2026: Division 28 Products: Lockdown button signs added.
- 03/23/2026: 32 84 00: Added requirement for two trickle bubblers per planted tree.
- 03/23/2026: Division 32 Products: Irrigation system components updated.
- 03/23/2026: Division 32 Products: Security Bollards added.
- 03/23/2026: Division 32 Products: Traffic Marking Paint changed to S.W. Pro Mark.
- 03/23/2026: 33 05 09: Section Added.
- 03/23/2026: Division 33 Products: Steam line insulation selection changed to require consulting with Utilities.
- 03/23/2026: Division 33 Products: Romax Alpha FC restraint couplings added.
- 03/23/2026: Revision Log: Reduced shown changes to those for 2025 and 2026.