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UNIVERSITY OF CONNECTICUT

DESIGN GUIDELINES and PERFORMANCE STANDARDS Volume I

University Planning, Design and Construction
Established: May 2015

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Updates to the Design Guidelines and Performance Standards

December 2021

The following is a summary of updates made to the University of Connecticut's Design Guidelines and Performance Standards (Volumes One and Two and referenced Appendixes) since its original publication in May 2015, as last revised in September 2020.

Please review these changes with your staff and sub-consultants; they are effective immediately for all new assignments. All planning and design activities currently in progress with the University shall also make every effort to incorporate these updates.

Volume One (Sections 1-10), Volume Two (Section 11-27), substantive updates have been made to the following:

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1 Introduction

1.1 Mission Statement

As an internationally recognized institution of higher education, the University of Connecticut's Office of "University Planning, Design and Construction' (UPDC) mission is dedicated to excellence in support of the University's overall vision. In recognition of the University's mission, UPDC is dedicated to achieving the enhancement of the University campuses and environments and provide superior client service to the campus communities including faculty, students, staff, neighbors and visitors.

In support of UConn's strategic vision and master plan, our office coordinates and implements integrated, responsible planning, design and construction of capital projects that improve the University's physical environment with high quality, cost-effective, long- or short-term solutions.

Our team of architects, engineers, landscape architects, space planners, project managers and support specialists provide proactive leadership and professionally managed services that enhance the mission of the University, embrace its community partnerships, and ensure the treatment of its land has a positive impact on our environment.

1.2 Foreword

The **Design Guidelines and Performance Standards (University Design Standards)** have been created by UPDC in conjunction with other key departments within the University from experiences with materials and recommendations from consultants. They are intended to be a single source Guide of the University's criteria for Design and Construction or execution of a capital project to our consultants. The Guide reflects the planning, construction, operation and maintenance experiences of those persons responsible for the University's buildings and grounds throughout all campuses, with the exception of the Health Center. The information contained is not intended to be used as specifications, but merely to assist the design team when considering location(s), element(s), presentation, products or systems in the design that have or have not performed well for the University in recent past projects.

The University Design Standards is in two volumes with appendices. These are living documents, which will be modified from time to time to incorporate lessons learned, changes in policy, and/or changes to industry practices. Feedback is part of the continuous improvement process and therefore strongly encouraged. Should there be conflicts within various sections, it is the responsibility of the Designer and their sub-consultants to bring such inconsistency to the University's attention.

1.3 University Master Plan

The February 2015 University Master Plan and its referenced documents was approved by the University Board of Directors and is located on the UPDC website. These documents provide a general framework and vision that shall be utilized on all new project initiatives. The Designer and their Consultants shall familiarize themselves with the contents within the University Master Plan 2015 and take into account in any facet of the project designs in bringing the Campus closer to achieving the goals set forth in the Master Plan.

1.4 Capital Delivery Process

The University's process for capital projects is being updated and will be available within Appendix I: Capital Project's Delivery Process when it is complete.

Effectively, the University must accept design documents at the end of the concept, schematic, design development and construction document phases. Estimates of the construction cost must also be prepared at the end of each phase to confirm that the project is within the budget expectations established by the University. The University Representative will utilize the construction cost estimates to finalize the overall project budget. The project budget is reported to the University's Board of Trustees on three occasions: at the end of the concept,

design (Planning Phase Budget), at the end of construction documents phase (Design Phase Budget) and upon construction bidding (Final Budget). General Requirements.

2 General Requirements

2.1 Definitions

To establish a common understanding of definitions within this document including all its appendixes, the following definitions of terms shall be known:

Approval	An authorization. The Designer shall formally request and obtain in writing approval from the University Representative any authorization.
Contract Documents	Consisting of Plans, Specifications, Addenda's and AIA 101 and 201 as amended or AIA 133 and 201 as amended and any clarification document issued by the Designer to the Contractor.
Design Documents	Consisting of the Plans, Specifications, addenda's, bulletins, and architectural supplements.
Designer	Architect, Engineer, and their Consultants, responsible for following the University's Design Guidelines and Performance Standards. The Designer is the firm who the University has contracted directly or indirectly with. They are solely responsible for all communications and coordination from their sub-consultants relating to the project and the University Representative. The Designer shall work through the University Representative for all questions posed to and by Facilities Operations and Building Services, Construction Managers and other University persons or departments.
Division One	University's Division One consisting of all related instructions and requirements for performance of the work. The Designer is responsible for utilizing the University's most current standard Division One template and modifying as needed based on the demands of the project.
DUS	Division of University Safety (DUS). DUS consists of the Police Department, Fire Department, Office of Emergency Management, Fire Marshal and Building Inspector's Office and Environmental Health and Safety. The philosophy of the Division is to provide safety of the entire University community. The Division establishes guidelines on environmental health and safety, emergency management, and performs incident investigation, issues construction permitting, and provides regular code compliance inspection and consultation on matters relevant to design, construction, renovation, maintenance, and use of structures, systems, and related assets.

EHS	Environmental Health and Safety is under the DUS responsibilities. EHS is responsible for overseeing environmental compliance related to stormwater management, soil management and air discharges. They also are responsible for environmental permitting issues, Occupational Health and Safety, Regulated Waste and Food Safety and Public Health for the University.
FACP	Fire Alarm Control Panel
FMBI	Fire Marshall and Building Inspector Office was established in 2005 within the DUS responsibility for code enforcement, life safety and security systems for buildings and construction projects which are not otherwise under the jurisdiction or responsibility of other Connecticut agencies.
FO	Facilities Operations is a department within the University who is responsible for all general upgrades, minor repairs and maintenance to existing Buildings and Utilities Infrastructure for any Campus. FO has designated staff assigned as point persons for specific utilities for new or changes to existing utilities within a project scope. The University Representative is responsible to identify and communicate with the appropriate FO Representative for any information needed and any reviews to be performed. The Designer working with the University Representative is responsible for ensuring feedback has been received from all appropriate FO staff impacted by the project. The Designer shall work through the University Representative for all questions posed to FO and the End Users.
ITS	Information Technology Services is responsible for maintaining all of the University's telecommunications systems. As such, ITS shall have final approval of the design, parts, and equipment proposed or installed for the University's telecommunications infrastructure and systems.
IESNA	Illuminating Engineering Society of North America
MTG	Major traffic generators
OS	Office of Sustainability, is a department within the University responsible for focusing on and pursuing excellence in environmental performance, emphasizing sustainability initiatives ranging from climate change to water conservation and green building.
OSTA	Office of the State Traffic Administration
Shall or Must	To denote requirement(s) set forth by the University that are not negotiable or arbitrary.
Should	Used where the University strongly recommends certain products or practices.

Telecommunications	To describe voice, data, and TV services and the infrastructure to deliver them.
University	The University of Connecticut or UConn; the owner of all property and completed projects, unless otherwise specified in the project documents. As the owner, the University has the right to enforce or modify all applicable codes, standards, and University specific requirements.
University Representative	A University assigned person responsible for the overall oversight and management of the Project. The University Representative may or may not be an employee of the University and will be the assigned point person for all communication and coordination of information from the Designer to various stakeholders within the University's departments. All decision-making and communication shall be to the University Representative for direction.
University Design Standards	This Design Guidelines and Performance Standards Manual
UPDC	University Planning, Design and Construction, a department within the University responsible for all Capital Improvements to the University Campuses and responsible for maintaining the integrity of the guidelines and standards.

2.2 Guiding Principles

All projects designed for the University shall be high-quality institutional facilities with components specified to provide maximum life-cycle usefulness. Life cycle costing shall be an integral part of the design process. Most campus buildings are intended to last an indeterminate amount of time, but not less than fifty (50) years, so adaptable facilities and planned maintenance are the norm, rather than short-term solutions.

This document is a supplement to all laws, manufacturer requirements and industry best practices. The document shall not be construed as overriding, replacing or amending any code or manufacturer's requirements unless it is more stringent and/or higher quality, and in such cases, the more stringent and/or higher quality shall be followed and administered. If conditions or inconsistencies are discovered while performing the duties under these Design Standards create an inability to meet the law or manufacture requirements, the Designer shall provide such written inconsistency to the University Representative who will provide direction on the matter.

The Designer shall design the project in compliance with all applicable Federal, State and Local Codes, ordinances, laws and other regulations, which have jurisdiction over the nature of the construction, including the Americans with Disabilities Act (ADA). When specifying, adhere to all manufacturer requirements and industry standards.

These Design Standards shall not be deviated from without explicit review and approval from the University Representative in conjunction with the University Planner and Chief Architect. However, should the Designer believe deviating from any single Design Standards would provide a better quality and performance product; such suggested deviation shall be proposed in writing and presented to the University Representative in conjunction with the UPDC Director overseeing the project. Authorization to deviate from what is represented shall be made with the inclusion of QAQC and the department who has ownership of the standard.

2.3 Formulation and Administration of the Contract Documents

Delegation

The Designer is responsible for the full design of the project requirements. Design delegation shall not occur without prior written authorization from the University Representative. Assumption of delegation shall not relieve the Designer from performing the design or as justification for added services. Designer shall not refer to the University Design Standards when formulating the design and specifications for the project's construction documents.

Vested Interest

The Design Team shall not include any consultants who have a vested interest in specifying manufacturer's product. The Designer shall be responsible for any costs incurred by the University for changes required to adhere to what is represented in the current design standards at the time of formulating the design. Designer shall incorporate in their design any applicable design standard updates as reasonably can be incorporated.

Use of Project's Electronic Document Files by Others

See Appendix II Electronic Document Plan Submission Requirements for details relating to the electronic document file.

Basic Services

The University's position is any service outlined in the scope of services identified in the solicitation documents (expressed or implied) are considered basic services.

Furniture, fixtures and equipment (FFE) layouts, with specified data/telecommunications and electrical coordination are required basic services. Such services must be included in the overall program. See further details relating to data/telecommunications in Appendix IV - Telecommunications Standards

Communication

The University Representative is the Designer's point of contact. They are responsible to identify who within the appropriate user groups should be contacted for any information that is

required and to coordinate any reviews to be performed by each group. The Designer shall work through the University Representative for all questions posed to Users. The Designer working with the University Representative is responsible to ensure sufficient feedback has been received from those impacted by the project.

University's Division One

The University has a standard template of Division One that is updated periodically. The Designer is responsible for incorporating the most current draft of the University's Division One template as amended within the project's contract documents. This document is ever changing; therefore, the Designer shall not assume the use of a prior project's University Division One templates remain as the current edition. As the Designer is crafting the Division One template specific to the project, should the Designer identify errors, voids and/or clarifications that may be needed to enhance the effectiveness of the document, it is encouraged that the Designer bring those corrections to the University's attention for consideration to be incorporate into the master template. There are certain statements that are not to be removed for any reason, therefore it is the Designer's responsibility to ensure that the integrity of the University Division One template remain intact. Additions and/or changes made to the Division One by the Designer shall be submitted to the University Representative in track changes format for ease in review. Construction Managers are not to be given the Division One to craft on behalf of the Designer.

Allowances

There are two allowances utilized. Value Allowances shall be included where a scope of work cannot be fully defined but is likely necessary to complete the project. Value Allowances should not be used where it is already the contractual responsibility to fully specify a system (ie: Building Automated System, Security Systems, Metering, etc.). Value Allowance is a pre-established dollar amount in the specifications, to be carried by all bidders. Value Allowances may or may not have an associated unit price tied to it. All unit prices are subject to University acceptance, therefore no allowance (value or quantity) shall be specified to be calculated by the bidder based on a quantity times the unit price being submitted.

A Quantity Allowance is utilized when there is expected scope, but the exact quantity of the scope cannot be determined prior to construction. Examples include hazardous materials removal or underground obstructions. Quantity allowances are defined if any, in the design specifications to be included within the base scope of work bid by the contractor. Use of the Quantity Allowance is determined post-bid by the University acceptance of a proposed unit price by the Contractor or other mutually agreed upon method. The total value of the Quantity

Allowance shall not be tied to and contingent upon acceptance of a submitted unit price at the time of bid.

Example: 1) include 100 labor hours for miscellaneous painting as an allowance, 2) provide a unit price for each labor hour of painting: $100. Each bidder will have a different unit price. In this example the lowest bidder submitted a unit price of $100 per labor hour to paint, which calculates to a total value of $10,000 applied to the quantity allowance. However, the University would not accept a unit price of $100 per labor hour. See unit pricing below.

It is preferred to use Value Allowances instead of Quantity Allowances.

Unit Pricing

When establishing Unit Price's ensure that the description of what makes up the unit price clearly covers any and all costs associated with the work, including but not limited to: labor (subcontractor and prime contractor), material, equipment, testing, transportation and disposal of any kind, oversight at all levels, small tools, specialty instruments and overhead and profit.

Unit price shall not be solely for a price per labor hour. Unit price may or may not be associated with an allowance but shall not be tied to or used in calculating the value of an allowance. All unit prices proposed are subject to University acceptance and therefore may not be accepted. Unit prices shall stand alone. See Allowances section above.

Existing Conditions and Verifications

Exploratory investigation services of existing conditions are to be provided by the Designer when a renovation assignment is awarded. Prior to beginning design phase, the Designer shall investigate and determine the effects of the renovation on all surrounding infrastructure and finish conditions that are being relied upon to support the renovation assignment. Do not solely rely on any drawings that the University provides the Designer relating to the building, its space, its infrastructure or the utility infrastructure. Do not assume the use of University personnel or equipment to assist in the exploratory investigation other than providing access to the space or property. Include the costs associated with the exploratory investigation within your summary of services. Proper investigation of existing conditions includes but not limited to; building envelop systems such as façade repairs, roof replacements, roof drains and gutter systems, parapet condition, window replacements and their existing openings, lighting upgrades relating to existing locations and illumination levels, fire life safety upgrades relating to illumination levels and existing locations, upgrades or impacts to existing utility infrastructure including proper surveying and coordinate locations, survey contours of existing grading, etc.

Bidding and Negotiation Phase

The Designer is responsible for leading all scope reviews with the Contractor and taking meeting minutes for distribution. Upon receipt of bids, Designer and their sub consultants as appropriate shall perform a thorough comparison of the bids, including all alternate prices and unit costs submitted from all bidders. Such comparison shall be presented to the University Representative in an excel format and a recommendation to accept, negotiate or reject a unit cost submitted by the apparent low bidder. Should clarifications be needed on any particular unit cost presented from the apparent low bidder, the Designer shall request prior to the scheduled scope meeting, a breakdown of how the unit cost was formulated for review and comment. Unit pricing submitted by the apparent low bidder shall not be made a condition to award, unless the solicitation is being awarded based on unit cost quantities.

Construction Administration Phase

The Designer (and sub consultants when necessary) shall attend the initial pre-construction meeting with the Owner and Contractor. The University Representative chairs the pre-construction meeting and reviews the roles and responsibilities between the Contractor and Designer.

Designer is to ensure that proper communication and documentation has been performed for all change work to support the entitlement for compensation. Changes made within submittals, field clarifications, in advertently through architectural supplemental instructions, proposal requests and/or bulletins shall be maintained and recorded within the electronic contract documents file on regular intervals as a standard service regardless of who initiated the change. Such changes shall be represented in the Record Set required of the Designer at the completion of the project. See Appendix II Electronic Plan Submission Requirements for further details.

Oversight

When performing field observation or field inspections, a written formal daily report on activity, conditions, progress of the work and any verbal directives provided, shall be represented within the report, as well as who the author. Such field reports shall be signed by the author and distributed to the Contractor and Owner within 48 hours as outlined in the contract. The author is the person who has visited the site and who noted field conditions on the report. When a report is transcribed, ensure that the author's name is printed and there is a signature of that person accepting what has been transcribed.

The Designer and/or their sub-consultants shall verify the Contractor's up keep of the Field Set documenting conditions and changes in redline form in the field. The Designer shall, not certify contractors pencil draft applications for payment, if any issues relating to performance or management by the Contractor are outstanding. Refer to the University's Division One template that was utilized within the contract documents, as well as the AIA 201 General Conditions for details on decisions to withhold certification of payments.

Designer does not have the authority to direct the Contractor to perform additional cost work. Any verbal field directives shall be followed up with an ASI or Proposal Request (PR) with appropriate sketches and bulletins within 48 hours. Such ASI or PR shall be numbered and contain a detailed description of the change and any sketches or bulletins applicable for the change. Directives requiring immediate action by the Contractor, the Designer shall work with the Contractor to obtain a rough order of magnitude cost and immediately draft and issue a CCD to the Contractor and Owner for execution.

Response Time

The Designer is to familiarize themselves with response times outlined in the University's Division One for review and response to Request for Information, Submittals and Progress Payments coming from the Contractor. Time is based on a calendar day and in most cases require a seven (7) day initial review.

Managing Changes in the Work

As a basic service, the Designer is responsible for the drafting and circulation of all Construction Change Directives (CCD - AIA G714) and Change Order (CO – AIA G701) documents needed for any given project for execution by the parties. Such relevant supporting documents shall be collected and thoroughly reviewed by the AE for completeness and packaged in accordance with Owner requirements.

All correspondence and change management documents shall include the University's project name and project number clearly identified within the subject line.

In reviewing Proposed Change Orders (PCOs) from the Contractor, Designer shall ensure all supporting backup to the change management documentation has been provided. Follow the requirements identified in the University's Division One Section 01 3100 Project Management and Coordination as amended relating to these change management documents. The Designer shall provide a written response to the University Representative identifying the project name and project number, the PCO number under review, that there is backup documentation in the format required under the contract. If the PCO package is complete and whether they believe the costs represented are fair and reasonable.

When drafting AIA G714 Change Order documents; the following must be represented clearly and correctly:

1) identify the project name and project number
2) address of the building
3) Contractor firm name and address
4) Sequential change order numbering
5) current date, if change order was revised, mark the date as revised
6) the contract date should reflect the date on the Notice to Proceed (NTP) to the Contractor (obtain from the University Representative);

7) within the description field list the PCOs individually that make up the change order. Reference:
    a. the PCO identified number,
    b. any CCD number that was issued in support of the change work represented,
    c. include a brief description of the change work,
    d. include applicable proposal request or bulletin numbers issued that triggered the change work with a short description of the change;
    e. the value of the PCO being processed,
8) date of contractually recognized substantial completion must be represented on every change order. If the duration of the contract is by number of days from the NTP, calculate the number of days by calendar days and include it on the first change order;
9) Place the proper name of the Owner in the proper location for the Owner to sign. Owner shall be identified as; University of Connecticut c/o UPDC, 31 LeDoyt Road, Unit 3038, Storrs, CT 06269. Change Orders with values equal to or over $25,000 pre-print the person's name as Ms Laura A. Cruickshank, FAIA, Associate Vice President, Master Planner & Chief Architect. For values under $25,000 pre-print the person's name as the University Director assigned to the Project.

When drafting the Construction Change Directive (CCD), provide similar information as noted for change order, with the exception of what is described within the description section. The University utilizes the Construction Change Directive (CCD) as a recognition of a proposed entitlement and estimated cost from the Contractor, it is not a confirmation agreement from the University to the proposed entitlement and final cost. The Designer shall follow the identified acceptable guides that the University uses to draft and issue for execution a CCD is; 1) contractually pre-established unit prices with an allowance quantity; 2) not-to exceed (NTE) amount based on estimates or non-binding proposals; 3) Time and Material (T&M) basis, with a NTE amount.

Unacceptable ways to identify the future reconciliation of entitlement and cost in a CCD:

1) Lump Sums (since the CCD is not a firm commitment to the proposed cost);
2) Unit Prices that have not been previously established within the contract document. With some exceptions reviewed and accepted by the University and/or University's QAQC;
3) As provided under 7.3.3 of AIA 201-2007 as amended by the University, should generally not be utilized since it is non-specific about the way the CCD costs will be reconciled.
   If such 7.3.3 Section must be used; the use of item
   .1 shall not be used;
   .2 shall only be in the event of an existing Unit Price within the contract;
   .3 shall only be in rare events where the University Chief Architect has agreed to its use;
   .4 shall be fully documented and monitored.

Special Inspections

Where projects require Special Inspections, it is the responsibility of the Engineer of Record to be the primary Special Inspection Coordinator for each statement of Special Inspections. As the Engineer of Record who will sign and submit the Final Report of Special Inspections, such service is considered standard and shall be included within the base assignment.

The Designer is responsible for requiring Engineers of Record to identify all inspections and material testing they have specified within the construction documents and what is required by Code. The Engineer of Record shall assist the University in identifying all tests and inspections required by the third-party special inspector and provide a rationale number of expected tests or hours of inspections to meet the contract documents and code requirements. The University Representative will meet with the Engineers of Record to determine quantities against each line item identified test or inspection. Such outcome shall be used as a basis for obtaining competitive proposals from third party materials testing and special inspection service providers.

Application for Payment from the Contractor

The Designer shall visit the Construction site at intervals consistent with the submission of the pencil draft of the application for payment. Adhere to the requirements established within the Division One relating to contractor submission requirements for applications for payment. Payments shall not be certified without the contractor fulfilling the contract document requirements, including but not limited to; removal of any listed change orders that have not been fully executed, payment on stored material off the project site and off the supplier's site, which does not have an independent specific insurance policy covering the stored material.

Record Documents

The Designer is responsible to create, update and certify Record Drawings and Record Specifications to provide to the Owner prior to certifying Contractor's final payment. The Designer shall not transfer these responsibilities to the Contractor or subcontractor regardless if there is BIM modeling. The Designer is responsible for continually updating the documents, incorporating any sketches, bulletins, RFI response etc., during the Construction Administration phase. At the end of construction, the Designer will receive redlines from the Contractor that document changes in the field, to incorporate into the Record Set. In instances where the information is provided by the Contractor and the Designer did not personally observe and confirm the record conditions or observed it done under his/her direct supervision, the Designer is not responsible for the accuracy of the provided information by others.

Record documents and incorporation of redlined documentation into the Record Document from the Contractor are considered to be a part of basic services. See Appendix II Electronic Document Plan Submission Requirements for details relating to as-built and record documents.

2.4 Product Specifications

When specifying product, it is preferred that the specifications identify a minimum of three (3) (where practical) manufacturers product models that have been pre-determined by the Designer and accepted by the University as equal or comparable in quality, measure, function and value. Where the design standards refer to following a local utility standard, any equipment and/or materials that may be sole sourced within shall not override the State's requirements relating to sole sourcing. The Designer shall identify (where feasible) additional manufacturer's equipment and/or material that is "equal to or better than" in workmanship, compatibility and performance than what is being identified as sole sourced.

"Single Source" – Sole Source

Single sourcing denotes there is only one product make/model or company that can provide the function and/or performance required for the application and no other product make/model or company.

Should the Designer choose to specify a single source manufacturer's product model, the Designer must quantify the function and/or performance uniqueness of the product as sole source justification in a format the University's Procurement Department requires. The sole source justification must be submitted to the University Representative for review. Pre-approval must be obtained from the University Representative in conjunction with Procurement Services on all sole source products is a requirement before including such within the project specifications. Previously approved sole sources shall not be relied on, Designer shall submit their justification for the sole source with each assignment. Justification shall be in a format approved by the University Representative.

There are a few unique circumstances within the University Design Standards, where there is only one manufacturer product model or service that is identified by the University. These single sources have been determined to be the only product make/model that can provide the function and/or performance that the University requires. The Designer shall provide supporting detail of the quality level performance, functionality and value that the single source provides that no other manufacturer's product can meet in a format the University's Procurement Department requires.

Should however, the Designer know or believe there is other manufacturer's product(s) that can provide the functionality, compatibility and/or performance required without adding customization costs or changes to other areas of the design to accommodate, the Designer shall provide the product information to the University Representative's attention, who in conjunction with the University Department impacted provide direction on the matter. Such direction shall be confirmed.

"Or Approved Equal"

Where the University or the Designer has chosen to denote a single source manufacturer's product as the "basis of design" for the level of quality, warranty/guaranty, size or installation

restrictions (if any) and performance required and includes an “or approved equal” after the product being named, it is the Designer’s responsibility to outline in detail the quality level, functionality and performance criteria that must be met or exceeded to be added to the specifications. Such “basis of design” or performance specifications shall be reviewed and approved by the University Representative in conjunction with the appropriate University Department prior to including them into the project specifications for bidding.

During bidding or in the submittal process (whichever is outlined in the specifications to be submitted for consideration), a submission is received as contending to be an “equal” product, the Designer shall be responsible for reviewing the product information provided and determining if the product meets or exceeds all the performance criteria requirements set forth and does not impact the Construction Schedule or require customization costs or changes to other areas of the design. Refer to the University’s Division One for further details under “Comparable Product” and “Substitution” requirements of the Contractor and the Designer. Such review and acceptance or rejection shall be substantiated and submitted to the University Representative for review and acceptance or rejection.

Where the University has reference to “or equal” after a single source manufacturer product model or service, it implies that the University will consider other manufacturer’s product. The Designer shall review the reference single source and outline in detail the quality level, functionality and performance that must be met or exceeded as the benchmark comparison criteria. The University would prefer that the Designer propose other equal manufacturer’s product that can meet or exceed the quality level and functionality components and propose them to the University Representative who in conjunction with the appropriate University Department shall provide direction.

The Designer shall not deviate from designing, specifying product or performance criteria by incorporating an “Allowance” to cover such element of the design requirements.

2.5 Accessibility

The University is committed to achieving equal working and educational opportunities and full participation for persons with disabilities. It is the policy that no qualified person be excluded from participating in any University program or activity or otherwise be subjected to discrimination with regard to any University program or activity. This is a University policy which derives from the commitment to non-discrimination for all persons in employment, access to facilities, student programs, activities and services. To this end, the consultant is expected to demonstrate within the services that they provide equitable accessibility achievement within the design.

Within these Design Standards there are specific accessibility conformance that are beyond what is defined by American’s with Disability Act (ADA) or the American National Standards Institute (ANSI). See Appendix VII – Accessibility Guidelines for additional information.

2.6 High Performance Building Construction Standards – Compliance

By statute, all design and construction activities shall comply with the State of Connecticut High Performance Building Standards. The Architect and Engineer shall review the requirements of the High Performance Building Standards and shall provide a design that meets all of the requirements of same. In addition to the High Performance Standards, the University has also adopted green building design objectives, establishing a basis for incorporating the principles of environmental stewardship, energy efficiency and resource conservation into the design of new campus buildings and major renovation projects.

2.7 Environmental and Sustainability Framework

The University's goal is to pursue holistic, integrative and collaborative design and construction practices that significantly reduce or eliminate the negative impact of buildings on the environment and occupants.

The Designer shall provide designs that are consistent with the University's current Sustainable Design and Construction policy, current Campus Sustainable Design Guidelines and current Sustainability Master Plan. And to perform a thorough investigation and recommendation on energy incentives with any product specified.

See Section 3 Environmental Compliance and Other Permitting for additional information.

2.8 Renewable Energy Sources

The University is dedicated to the research and development of renewable energy sources on projects and providing an energy-efficient design. The Design Team shall investigate the use of renewable energy sources for each project, to include, but not be limited to, the use of solar panels, solar hot water heaters, wind turbines, geo-thermal and fuel cells. The Designer is responsible for submitting their analysis and recommendations to the University Representative for review with appropriate University departments.

2.9 Health and Safety

The health and safety of all students, faculty, staff, and visitors shall be a principal consideration in the planning and conduct of all University activities and programs, and in the design, construction, modification, or renovation of all University buildings and facilities.

2.10 Art in Public Spaces

The Public Arts committee at the University of Connecticut works in an advisory capacity to the President and offers guidance on a wide range of architectural and design elements. The committee works to ensure that artwork on all campuses reflect a commitment to quality and portray a cohesive image for the university to promote arts awareness.

The committee works with Vice Presidents, Deans, Community and University administrators to enhance the culture within the community by selecting artwork that is inspiring, engaging and aesthetically pleasing. The committee, which meets approximately four (4) times each year, is

comprised of faculty members, alumni, current students, professional staff and members of the wider community with connections to arts organizations. The University encourages the engagement of Connecticut artists and those who have a relationship, past or present, with the University.

2.11 Electronic Document and Plan Submission Requirements

The University maintains CAD, PDF and TIFF files for many buildings on campus and shares available files with consultants upon request. All files provided by the University are the "best available data" at the time of transfer and are intended for informational use only. The University does not warranty the accuracy of existing files. Prior to the commencement of any work, consultants shall be responsible for field verifying data to ensure accuracy. Should it be discovered that the file data provided is not accurate, it is the Designer's responsibility to bring it to the University Representative's attention at the end of formulating the Schematic Design Phase documents. Should the Designer fail to field verify any files that the University has provide and the discrepancy is discovered during construction, any costs to adjust the work will be the responsibility of the Designer.

See Appendix II - Electronic Document and Plan Submission Requirements for specific information concerning documents and electronic file formats.

2.12 FM Global Review

The University requires the review of all projects by FM Global in order to be in compliance with its property insurance policies. Therefore, the Designer shall schedule sufficient review time by the University and FM Global at each phase of the design process. Any comments/suggestions received from Factory Mutual shall be reviewed with the University Representative in collaboration with DUS to determine if they are to be incorporated into the final design. Any wood component(s) that are shown or specified must be pressure treated or preservation treated. All roofing systems shall have a Class A rating as listed by Underwriters Laboratories for fire resistance.

2.13 University Branding

All branding on projects shall conform with the University Branding standards. There shall be no use of any University branding, imbedded, etched, or incorporated into the building materials or campuses infrastructure without specific approval. The Designer is responsible to meet with the University Representative in conjunction with University Communications to review recommendations on branding for the project.

2.14 University Building Identification

All buildings under the ownership and/or occupancy by the University shall have a University-assigned identification number. Such numbering of a building is conducted and controlled within UPDC. When the Designer is given an assignment for a new building, the name of the project may not be the name that is eventually given to the building. The University

Representative shall provide the building number to the Designer to utilize on all correspondence and documents.

3 Environmental Compliance and Permitting

3.1 Guiding Principles

Many University projects involve at least one permit, certificate, or approval (Permits). The permitting process can have a significant impact on a project's schedule and cost, and therefore requires constant attention by the Designer throughout the design and contract document phases. Some permits are required prior to construction while others are required for operation or occupancy of the facility/equipment and therefore, have different lead times. For those permits requiring approval prior to construction, obtaining the necessary permits before a project goes to bid helps prevent change orders that may arise from unforeseen permit conditions.

For many of the larger capital improvement projects, this process can become the critical path on a project's schedule. For this reason, the Designer should include a separate permit/approval section and track the status of such approvals through their project schedule.

3.2 Connecticut Environmental Policy Act

The University's actions associated with real estate transfers and construction activities to land, water, air, historic structures/landmarks, existing housing, or other environmental resources may impact the environment short term to the disadvantage of long-term environmental goals. The Connecticut Environmental Policy Act (CEPA) requires an evaluation of environmental impacts associated with such actions and provides opportunity for public review and comment. EHS oversees institutional compliance – proving guidance and support the University for CEPA-regulated Actions. UPDC is responsible for all CEPA processes administered by the state's Office of Policy and Management when required of the University's capital program.

The Designer is responsible when formulating the design, to advise the University of any significant impacts to the environment on the short term and long term affects associated with the project.

The Generic Environmental Classification Document for State Agencies must be consulted to determine whether a CEPA study of a proposed action may be required. If the potential for significant impact exists but is indeterminate, comments must be solicited from the public and other state agencies during a 30-day "scoping process." If, after the scoping process, it is determined that the potential for significant environmental impact does exist, an Environmental Impact Evaluation (EIE) must be prepared, circulated to certain State agencies and commissions, and publicly noticed as available for at least forty-five (45) days for review and comment by any interested party.

At the close of the EIE comment period, all comments must be reviewed, and a Record of Decision is prepared with response to the substantive issues raised. The Record is submitted to OPM for it to make a determination as to whether the EIE and the process that was followed were adequate. Construction of the proposed activity is not permitted to begin until at least the OPM determination of adequacy has been issued. Further, approvals and permits required from other State agencies (e.g., DEEP, DOT Office of State Traffic Administration) are not typically issued until after OPM has completed its determination of adequacy.

The Designer shall review the requirements for CEPA and shall provide CEPA documents, as needed, which meet all of the requirements of same.

3.3 National Environmental Policy Act

University actions receiving funding, all or in part, from a federal agency must be reviewed to determine what, if anything, must be done to satisfy requirements of the National Environmental Policy Act (NEPA). Should it be determined that an Environmental Impact Statement (EIS) under NEPA must be prepared, the EIS may be submitted in lieu of an EIE required under CEPA.

3.4 Sustainable Design & Construction

The University has adopted a green building design policy, establishing a basis for incorporating the principles of environmental stewardship, energy efficiency and resource conservation into the design of new campus buildings and major renovation projects. The University wants to promote in all projects sustainable design features and be as environmentally sensitive as possible. Beyond meeting the LEED goals, the Living Building Challenge, the Second Nature Carbon Commitment and SITES Certified rating at a minimum, the project should strive to achieve carbon neutrality when possible.

3.5 Leadership in Energy and Efficient Design (LEED)

All new construction and renovations that have an estimated total project that exceeds five (5) million dollars (excluding equipment other than building systems) shall aspire to meet the highest achievable Leadership in Energy and Efficient Design (LEED) rating of Platinum, however if the scope of the project impedes our ability to achieve Platinum status, at a minimum the Designer shall strive to achieve Gold status.

3.6 Second Nature Carbon Commitment

Through its Climate Action Plan and by reaffirming its commitment to the Second Nature Carbon Commitment, the University has pledged to achieve carbon neutrality at The University's Main Campus by 2050. The University prepared a Climate Action Plan in August 2009 as the strategy towards meeting the Second Nature Carbon Commitment and amended the Plan in March 2012 to include an adaptation strategy.

3.7 Living Building Challenge

The Living Building Challenge's emphasis on net-zero energy and net-zero water can help to propel the campus forward toward its climate neutrality goals. STEM labs and residence halls with higher energy use intensity (EUI), may also benefit from ground source or air source heat pump hybrid systems. Less energy intensive buildings may benefit from variable refrigerant flow technology.

See Sections on Environmental and Sustainability Framework, Energy Conservation and Renewable Energy Sources for additional information. The Designer shall review and provide designs that are consistent with the policies, commitments, guideline and master plan.

3.8 Eagleville Brook TMDL and MOU

The University is subject to a Total Maximum Daily Load (TMDL) related to the impervious surfaces on the portion of the Storrs campus that drains to Eagleville Brook. The TMDL prescribes reductions in impervious area via disconnection from traditional storm drainage systems and area reductions.

The Eagleville Brook TMDL published by the Connecticut Department of Environmental Protection provides a detailed description of the impairments to Eagleville Brook, using percent impervious cover as a surrogate for the mix of pollutants in stormwater and specifically addresses the need to reduce impervious cover which will in turn, reduce the pollutant loading on downstream waterways. The University's Center for Land Use Education and Research has developed a Watershed Management Plan in response to the TMDL. The University's Water Quality Management Plan includes a conceptual framework and site- specific recommendations for the mitigation of stormwater impacts on Eagleville Brook using low impact development techniques.

The University is also subject to a Memorandum of Understanding with the DEEP obligating a specific reduction of volume and/or impervious area by 2021, but these thresholds do not consider NextGen CT and other additional development projects on the campus. It will be necessary for the University to implement other Low Impact Development (LID) and green infrastructure strategies throughout the watershed to mitigate the water impacts of future growth.

3.9 Flood Management

As a State agency, any University actions affecting floodplains, or natural or man-made storm drainage facilities require approval from the DEEP in the form of a Flood Management Certification (FMC). Generally, any changes in drainage, including but not limited to, increasing the amount of impervious cover, rerouting drainage to another watershed, sub-watershed or collection system, new or extended stormwater collection and conveyance systems, or alterations to existing collection and conveyance systems are activities that require FMC approval. Activities consisting solely of installation of Low Impact Development stormwater

management features that are not done as mitigation for other proposed increases in drainage do not require FMC approval.

Depending on which watershed the permitted activities are located on the Storrs campus the process varies. Below is the process for each watershed.
Cedar Swamp Watershed – This watershed requires a comparative analysis to the Discovery Drive Development as well as a full FMC.

Eagleville Brook Watershed – A watershed wide FMC has been approved by the DEEP. Any projects in this watershed require the Campus Watershed Masterplan be updated to confirm the conditions of the approval have been met. Once this is done a confirmation repot needs to be submitted to DEEP for review and comment in accordance with the approved certificate and the MOU on file.

Roberts Brook Watershed – This watershed requires that all projects complete a full FMC and update the Campus Watershed Masterplan. This FMC needs to comply with all requirements outlined in the current MOU.

The Designer shall review the requirements for FMC and shall provide a design and FMC permit application, including supporting documentation and PE certifications, which meet all of the requirements of same.

3.10 Construction Stormwater and Dewatering Wastewater

Discharges of stormwater and dewatering wastewater from construction activities which result from the disturbance of one or more total acres of land area on a site regardless of project phasing are subject to the CT DEEP General Permit for Stormwater and Dewatering Wastewaters from Construction Activities (Construction Stormwater General Permit).

As a State agency, University projects are generally locally exempt (e.g., not subject to review or approval of the local municipal authority). Therefore, University construction projects disturbing over one acre must submit a registration form and Stormwater Pollution Control Plan (SWPCP) to the CT DEEP. This registration shall include a certification by a Qualified Professional who designed the project and deemed it consistent with the requirements of the general permit.

If directed by the University Representative, the Designer shall review the requirements for the Construction Stormwater General Permit and shall provide a design and permit application, including supporting documentation and PE certifications, which meet all of the requirements of same, including post-construction site design requirements.

3.11 Wetlands and Water Resources

As a State agency, wetlands regulated activities undertaken by the University in or affecting inland wetlands or watercourses are administered under the CT DEEP Inland Wetlands and

Water Resources program. University activities exclusively within upland areas and that do not impact downstream wetlands are not subject to wetlands permitting.

Any proposed activity within a wetland, or use of a wetland or watercourse, involving the removal or deposition of material, or any obstruction, construction, alteration or pollution of such wetlands or watercourses, is subject to DEEP review. Regulated activities include, but are not limited to, filling, dredging, clearing, grubbing, grading, piping, culverting, channelizing, diverting, damming, dewatering or otherwise temporarily or permanently altering wetlands and watercourses.

Whether an activity must be authorized under an individual DEEP permit or the General Permit for Water Resources Construction Activities, and whether the activity requires authorization under an individual or general permit of the Army Corps of Engineers, is dependent on the nature of the activity and amount of regulated area that is affected.

The Designer shall review the requirements of the applicable state and federal statutes, regulations, and general permits' conditions and shall provide a design and permit application(s), including supporting documentation and certifications, which meet all of the requirements of same.

The portion of the Storrs campus that is within the watershed for the Fenton River is also within the drinking water supply watershed for the Willimantic Reservoir, the source water for Windham Waterworks. Windham Waterworks is the public water supply company for Willimantic and its surrounding area. When the University files a DEEP application for a regulated activity involving a wetland or watercourse in this portion of campus, notice of the application must be provided to Windham Waterworks and the CT Department of Public Health not later than seven days after the date of the application (CGS 22a-42f).

3.12 Air Emissions

In general, the installation of new or modification of existing fuel burning equipment with a potential to emit fifteen (15) tons or more per year may be required to obtain an individual permit to construct and operate under the CT DEEP New Source Review (NSR) program. For certain fuel burning equipment (such as emergency engines), CT DEEP provides alternatives to obtaining an individual permit provided operational restrictions are implemented.

Further, potential emissions for new equipment proposed for the Storrs campus which cause the campus's aggregated NOx emissions, as calculated by EHS using DEEP guidance, to reach or exceed 25 tons per year shall be required to obtain an individual permit to construct and operate under the CT DEEP NSR program and may be required to include emission controls as a permit condition. Subsequent equipment installations at the Storrs campus would also be subject to the same NSR permitting and emission control requirements until such time that the University can demonstrate that its aggregated NOx emissions are less than 25 tpy.

The Designer shall provide manufacturer specification and performance data sheets for any fuel burning equipment specified to the University Representative in conjunction with EHS prior to moving forward with a particular manufacturer as a basis of design.

For engines, the submission shall include emission rate data representing operations at maximum (100%) operating load conditions. The emissions data at maximum operating load should include emissions data for NOx, CO, volatile organic compounds (VOC), and particulate matter (PM10 and/or PM2.5, if available). If emissions data are available for partial load operation (e.g., 75% and 50% load), such data should also be provided. Provide a copy of the EPA emissions certificate, showing that the engine complies with EPA's non-road emission standards or with 40 CFR Part 60, Subparts IIII or JJJJ, as applicable. Emissions information representing average emission levels over a pre-defined duty cycle, such as required for EPA certification, is not sufficient.

For all other fuel burning equipment (other than engines), the submission shall include manufacturer specification data sheets with information on the type of fuel burned as well as the heat input rating of the unit. If the proposed fuel burning equipment is an oil-fired boiler, indicate if the unit is a steam boiler or hot water boiler.

3.13 Wastewater Discharges

Discharges to waters of the State, including all surface waters, ground waters and sewage treatment plants are administered by the CT DEEP wastewater discharge program.

No discharges to surface water or the storm sewer, other than rain water and snow melt, is permissible without a permit. No process wastewater, including wash water and utility pit pump-outs, can be discharged to surface water or the storm sewer without a permit. Process wastewaters that can be discharged to surface waters under General Permits include non-contact cooling water and water treatment wastewater, provided all applicable conditions of the General Permit(s) are adhered to including any (pre)approvals, pretreatment, monitoring, and record keeping.

The University Storrs and Depot campuses are served by the University's Water Pollution Control Facility. The facility operates under a National Pollutant Discharge Elimination System permit and maintains its own Sewer Rules and Regulations applicable to premises that discharge to the University sanitary sewer system. Wastewaters from regional campuses, other than the Torrington campus, discharge to a local Publicly Owned Treatment Works (POTW).

New sources of process wastewater (e.g., non-domestic wastewater) directed to the University WPCF or local POTW must be evaluated for permissibility under available DEEP General Permits, which include but are not limited to permits for food preparation or production wastewater, swimming pool wastewater, boiler blowdown, cooling tower blowdown (and other non-contact cooing water), vehicle maintenance wastewater, building maintenance wastewater, air compressor condensate, and water treatment wastewater.

Discharges to sanitary sewer that cannot be covered under a General Permit shall be required to obtain an individual permit to construct and operate under the CT DEEP State Pollutant Discharge Elimination System (SPDES) program and may be required to include pretreatment as a condition prior to discharge. New sources of wastewater and any new service connections may be subject to approval of the appropriate local water pollution control authority.

The Torrington Campus and some of the University extension centers that are located in areas without sewers maintain their own septic systems. New sources of wastewater shall be evaluated for compliance and permissibility as discharges to groundwater.

The Designer shall review the requirements of the applicable CT wastewater statutes, regulations, general permits' conditions, and local WPCA requirements and shall provide a design and prepare permit application(s), including supporting documentation and certifications, which meet all of the requirements of same.

3.14 Parking and Traffic

Major traffic generators (MTG) are regulated as to their traffic impact on the state highway system in Connecticut by the Office of the State Traffic Administration (OSTA). A MTG is defined as any development of 100,000 square feet or more of gross floor area or 200 or more parking spaces. The Storrs Campus, as a whole, is consider a MTG.

The OSTA authority under these statutes applies to new MTGs as well as expansions or land use changes to those already in existence. However, entire residential developments of 100 units or less are exempt from OSTA regulation under these statutes. The regulation of MTGs by the OSTA is accomplished via either an Administrative Decision (AD) or certification process (Certificate). Any change in parking quantities will require the certificate to be updated and reviewed and may require a permit to be submitted to OSTA for review and record.

The Designer shall review the requirements of the applicable OSTA MTG statutes, regulations, and AD and Certificate requirements and shall provide a design and prepare permit application(s), including supporting documentation and certifications, which meet all of the requirements of same.

4 Environmental Sustainability

4.1 Guiding Principles

The University is committed to a resource and energy conservation program based on continual improvement in the design and construction of new buildings and major renovations. Design to minimize life cycle costs, including the use of materials that will maximize durability and longevity. Use resources efficiently by designing buildings that minimize energy and water use and maximize use of natural daylight where appropriate and feasible. Specify environmentally preferable products, including (but not limited to) those without toxic ingredients and those

which contain recycled content and/or are recyclable, energy efficient, organic, biodegradable or plant-based, and products that are durable and easily reparable.

4.2 Site Selection

Campus growth should be planned on the most suitable sites possible, avoiding unnecessary environmental impacts to the existing campus open space and natural resources. Sites should be reviewed for consistency with the campus Master Plan and State Plan for Conservation and Development. Lands that meet the regulatory definitions of "direct recharge areas" and "aquifer protection areas" should be protected from development. Wetland areas should be preserved and protected. Vegetated buffers should be preserved, to the extent possible, when disturbance is anticipated in proximity to wetlands. Development on lands within flood plains as defined by the Federal Emergency Management Agency (FEMA) should be prevented. Development in areas that serve as habitats of species of special concern (threatened and endangered species) should be avoided.

Refer to Section 5 Site Planning Guidelines for additional requirements.

4.3 Energy Conservation

Through its Climate Action Plan and by reaffirming its commitment the American College and University Presidents' Climate Commitment (ACUPCC), the University has pledged to achieve carbon neutrality at University's Main Campus by 2050.

The Designer should provide energy modeling to optimize energy performance by way of assessing the interactions of simultaneous strategies and to determine the optimal R-values for the building envelope. Energy efficiency should be the maximum possible and a priority for the design. Most projects that must meet the High-Performance Building Requirements are required to show that the design meets at least a 21% reduction below the ASTM 90 model criteria. The University receives rebates commencing at reductions of 21% below the ASTM criteria and projects should investigate whether reaching higher levels of energy efficiency is achievable and economical.

Energy Compliance Certificates are required as proof of compliance in support of the Department of Energy, utilizing the Department of Energy's most current Comcheck program. The certificate must be signed by the design professional when the design is finished (prior to bid) and again after the construction is complete (before final payment).

Reduce Conditioning Loads

To reduce a buildings dependence on mechanical heating and cooling, the Designer should design exterior wall assemblies to be a minimum of R-19 and roof assemblies to a minimum of R-30. All glazing should incorporate double-glazed insulated glass units with a low-E coating, argon-filled with a U-factor of ≤ 0.27. Seasonal shading (e.g., deciduous trees, porches, horizontal sunshades and roof overhangs) should be provided to south facing glazing. Thermal mass should be incorporated within a building, since high mass buildings can stabilize

temperature swings by storing heat during the day and releasing it during the evening, thus reducing the building's peak cooling loads.

Increase Operational Efficiency

To increase a building's operational efficiency, the Designer should design systems that make use of the campus' Central Utility Plant (CUP) for steam or hot water and chilled water needs within buildings whenever feasible. For construction projects involving building systems that are not connected to the CUP, the Designer should consider distributed generation for the cleanest and most efficient method for heating and cooling, or combined heat and power, including renewable energy technologies. All projects shall comply at a minimum with the energy efficiency prescribed by the prevailing ASHRAE Standard. ENERGY STARR products should be specified by the Designer where applicable, including all new equipment, transformers, and kitchen appliances. A demand-controlled ventilation strategy that incorporates indoor air CO2 monitoring to reduce ventilation rates should be used in the design of classroom spaces and other spaces with large occupancy swings. Operable windows and micro-switches that control the room ventilation/cooling when the window is open should be incorporated into building design.

All new buildings shall be fully commissioned by an independent third-party commissioning agent. Commissioning agent should be involved early in the design process as part of the design team so that they can review and comment on the systems' designs. Commissioning agent should produce a manual that describes the procedures for re-commissioning the building in the future. The systems to be commissioned include but not limited to HVAC systems, building control systems, duct work and piping insulation, renewable energy and alternative energy technologies, emergency lighting, lighting controls, electrical systems, heat recovery, and automatic sensors.

4.4 Renewable Energy Sources

The University is dedicated to the research and development of clean, renewable energy sources on projects and providing an energy-efficient design. The Designer shall investigate the use of clean and renewable energy sources for each project, to include, but not be limited to, the use of solar panels, solar hot water heaters, wind turbines and fuel cells.

To meet the goals of the University's commitments and policies, on-site renewable energy systems will be required for large projects. Particularly viable technologies for the region are photovoltaics and solar hot water systems (useful for residence halls with significant domestic hot water demands). For wind to be cost-effective, it must be installed at a larger scale and located optimally. Geothermal and ground source heat pumps are also potentially viable but require further evaluation on a building-specific basis.

Examine passive solar design strategies when determining site concepts for new buildings such as orienting the building to the south, providing windows to collect winter sun, and providing

thermally massive materials inside the building to store collected heat. Minimize glazing on the east, west, and north elevations, while maximizing glazing on the south elevation.

Evaluate the economic feasibility of providing photovoltaics or wind turbines as part of new projects. Examine the implications of incorporating photovoltaics when planning and siting a new project, such as proper solar orientation, solar angle, and the size of the photovoltaic array.

If there in not a feasible means of incorporating enough building-specific energy features, then the Designer can present green power purchasing scenarios for the University's consideration. For example, the University could purchase energy generated at larger scale, off-campus installations of solar or wind plants, most likely on land owned or leased by a renewable energy developer, under a long-term purchase power agreement, and use these clean energy credits, through virtual net metering, to offset emissions from new or renovated buildings powered by the University's natural gas-fired cogeneration facility.

4.5 Water Conservation

Water conservation is a key part of the University's sustainability program and usage minimization, reclamation, and reuse will need to continue to be utilized in capital projects. With new connections to a water main extension, the University's water supply is expected to meet or exceed demand through the next 20 years, but potable water use reductions are still necessary to meet sustainability goals. The University targets a potable water use reduction of 40% below standard designs. This typically requires aerators, ultra-low flow fixtures, and process water reductions in the design of buildings.

Plumbing Fixtures and Process Water

The Designer shall specify low flow urinals (≤ 0.5 gallon per flush) in lieu of conventional urinals, and should evaluate waterless urinals provided that the maintenance requirements can be met by University operations. Dual-flushing toilets should be specified for women's and unisex facilities and in other areas specify low-flow, power-assisted toilets that use ≤1.6 gallons per flush. Use infrared sensors on faucets and include sensors as part of the building commissioning. Specify clothes washing machines in residence halls to comply with the EPA's Energy STAR program.

New buildings that will front or that will be in close proximity to the reclaimed water distribution system on the north side of the Storrs campus should be designed to use reclaimed water for toilet flushing (e.g., separate dedicated supply pluming system) and, if the building is not centrally cooled, for environmental cooling (e.g., cooling tower make-up supply).

New buildings that are too distant to reasonably connect to the reclaimed water distribution system should be designed with a separate toilet flushing supply system such that, should reclaimed be available in the future, the building can connect and use reclaimed water for flushing without renovating its plumbing system.

New buildings that will potentially house water-cooled equipment should include a dedicated closed loop cooling water supply system that exchanges its heat to the University's chilled water distribution system.

Irrigation

To reduce the amount of potable water consumption associated with landscape irrigation, the Designer should utilize drought tolerant planting and include drought tolerant turf mixes where turf grass is a landscape requirement. The Designer should consider the use of native vegetation beds and meadows that require little to no irrigation, pesticides use, or fossil fuel expenditure for mowing. When permanent irrigation is desired, high-efficiency irrigation systems should be used in lieu of conventional irrigation systems.

Buildings located in the University's Technology Park are prohibited from using potable water for irrigation by virtue of the condition included by DEEP in the North Hillside Road Extension environmental permit. Use of reclaimed water may be an option for irrigation elsewhere, confirm with University prior to proceeding with any design work relating to irrigation. Regulatory permits shall be required and shall be submitted for review to the University Representative in conjunction with EHS.

4.6 Stormwater Management

Low Impact Development (LID) and green infrastructure should be incorporated into all projects, regardless of location, and may be needed to comply with other requirements, such as the Sustainable Design and Construction Policy or the post-construction conditions of the Construction Stormwater General Permit.

At a minimum, the approach to stormwater management design should address the following goals: a) reduce peak rate and volume of stormwater runoff in alignment with the current Drainage Master Plan and MOUs and b) provide treatment of water quality to meet or exceed the latest regulations.

Reduction of impervious surfaces

The Designer should develop site designs that reduce the number of impervious surfaces that contribute most significantly to water quality degradation. These surfaces include roadways, parking lots, roofs, and to some extent pedestrian walkways and plazas. The reduction of these surfaces will reduce the volume and peak rate of runoff while limiting pollutants from tires, oils and gasses, and deicing activities.

The Designer should design site drainage to manage runoff from roof drains, parking lots, and other impervious surfaces as sheet flow directed across vegetated filters, such as areas of turf grass or woodlands, to remove suspended solids and reduce runoff velocity. The length and slope of the vegetated filter area are critical to the overall performance of this strategy.

Groundwater Recharge

The Designer should design systems that promote infiltration through the use of infiltration basins, french drains, and porous paving. These practices will reduce both the volume and peak rate of stormwater runoff, capture suspended solids and pollutants, and recharge the ground-water supply. The use of these systems or features should not occur where high groundwater or shallow bedrock exists, or in service and loading areas where spillage or leaking of petroleum products or other pollutants is likely.

Water Quality Improvements

The Designer should incorporate properly designed rain gardens or bioswale as part of an active, ecologically functioning landscape. Such features can remove up to 90% of the Total Suspended Solids from the water quality design storm, recharge groundwater, and be an aesthetic amenity on the campus. Trees, shrubs, groundcover and lawns have the ability to return a significant portion of the rainwater they take up into the atmosphere through evapotranspiration. Metals, nutrients, and hydrocarbons can be removed from runoff through chemical and biological processes within the soils and plants of a rain garden or bioswale. Systems with small footprints distributed throughout the landscape and designed to capture the first flush of a rain event function more effectively than a single large treatment area.

Maintenance Plans

A maintenance plan must be established by the Designer in tandem with the design. Without regular cleaning, clogging can occur in any infiltration feature. This leads to ponding and increased surface runoff, while limiting the water quality benefits of infiltration. Therefore, to remain effective, maintenance of an infiltration system is crucial. Maintenance of the existing landscape and storm drainage systems can play a significant factor in the quality of the stormwater runoff leaving a site.

4.7 Soil Conservation

Soil conservation is also a University goal and the Designer should plan to reuse site soils to the extent practical. Topsoil should be segregated for reused, per Section 7 of these Design Standards. Topsoil reuse should be stockpiled on the project site, if space is available, pending reuse.

Soils should be reused if environmental and geotechnical testing confirm its suitability (see Sections 5 and 7). Excess soil exported from project sites should be recycled, reused, or disposed of in a manner consistent with local, state and federal environmental regulations, as applicable.

4.8 Refrigerants

Chillers, air conditioning units and other cooling equipment within new buildings shall use refrigerants that contain no CFCs. HCFCs or alternative refrigerants used shall have the lowest possible Global Warming Potential and Ozone Depleting Potential, and the Designer shall specify chillers and other cooling equipment with the lowest feasible operating pressure in

order to prevent or minimize leaking of refrigerants, which are often potent greenhouse gases, to the atmosphere. Halons should not be used in fire suppression systems in new buildings.

5 Site Planning Design Guidelines

5.1 Guiding Principles

The University views all infrastructure components visible at-grade as design opportunities and encourages the Designer to engage in creative, timeless solutions for these opportunities.

5.2 Utilities, Landscapes, Hardscapes and Plantings

When beginning the process of site design and utility upgrades or new installations, the Designer shall reflect accurate locations of all utilities, landscapes, plantings and hardscapes conditions backgrounds when planning for new or upgrades to utilities, landscapes, plantings and hardscapes. Site plan reviews shall reflect existing and proposed utility locations, existing and proposed camera locations to ensure landscape plantings and trees at full maturity and hardscapes do not conflict with design requirements on distance and clearances, growing habits or rooting and canopy structure at maturity.

As a general rule type 1 and type 2 shade trees as well as select types of coniferous and broadleaf evergreen, as defined by the American Standard for Nursery Stock (current edition), shall not be within ten (10) horizontal feet from the center of the tree and the outermost edge of an existing or new utility structure. Utility structures shall include but are not limited to transformers, switchgear, vaults, valves, sump pits, drywells, ductbanks, storm drainage/storage structures, etc. Manholes may require as much as twenty-five (25) feet clearance to the equipment's serviceable sides.

In instances where proposed work is in the vicinity of an existing tree, the design shall incorporate into their scope of services a review by a certified arborist to determine what precautions will be needed to mitigate undue harm to the tree and root system. Precautions to be considered include pruning, feeding, protection and air spading to the roots of the existing tree.

Exceptions or deviations to the above distance limitations may occur based upon other types of trees, the type of utility, depth of cover over the utility or other contributing factors upon approval by the University Representative and in conjunction with University's Landscape Architect and FO. All utility locations and tree locations shall be staked in the field with utility mark-outs prior to installation of any plantings for final approval by the University Representative in conjunction with UPDC Landscape Architect.

Plan reviews shall be scheduled through the University Representative, who will coordinate attendance of FO, PS and the University's Landscape Architect. Finalization of utilities and security design shall be coordinated with the landscape architectural design intent.

5.3 Stormwater Management

All permanent and temporary stormwater design features, including collection systems, low impact development, and construction-related sediment and erosion controls, shall comply with the 2002 Connecticut Guidelines for Erosion and Sedimentation Control, as amended, and the 2004 Connecticut Stormwater Manual, as amended.

Regarding the aesthetics of stormwater management on campus, efforts should be made to visually integrate stormwater best management practice into the overarching design concept for that landscape space and surrounding areas. For example, the shape, size and edge definition of rain gardens or bio-retention areas should be thoughtfully designed in relationship to the adjacent buildings and landscape. The same principles that guide material choices and planting design of other types of spaces on campus should be employed and coordinated with any new designs.

5.4 Environmental Site Studies and Soils Analysis

All new buildings or additions need to have environmental studies of the site conducted. This may include soil sampling and testing for any contaminants throughout the project limits. The Designer with the University Representative shall be responsible for determining the need for Phase I Environmental Site Assessment and Phase II Environmental Site Investigation. In addition, the site should be surveyed for potential wetland areas, which should be left undisturbed, where possible.

Should soil and/or groundwater remediation be needed, the University will direct the Designer to design **a remedial action plan that will achieve post-remediation conditions that meet the CT Remediation Standard Regulations (RSRs) for soil and groundwater, regardless of whether or not the remediation must be entered into a state program that mandates conformance with the RSRs**. All remediation and investigation derived waste must be removed from campus and disposed in accordance with all applicable laws, regulations and permit conditions.

Soils Analyses and Soil Management Plans

After consultation with the University Representative, soils testing shall be conducted within the areas of all proposed disturbance. The soil testing program will include analyses for organic content and contaminants of concern (per Phase I and II results/conclusions), for the purpose of worker safety and for proper soil management and/or disposal. Tests results will be submitted to the University for review, and a soil management plan will be developed by the Designer that indicates how clean and environmentally impacted materials will be excavated, handled, stored, and disposed of during the project. The University Representative in conjunction with EHS will review the soil management plan for consistency with University policies.

Topsoil should not be tested for environmental parameters if it is going to be stockpiled on-site and reused. If topsoil is to be exported for recycling/disposal, it should be tested for a suite of analytical parameters required by the designated receiving facility. Designer will confirm that soil exported from University projects is disposed of in an environmentally responsible manner.

Most project sites have limited laydown area to store topsoil, if the Design assumes it will be stockpiled on site, the Designer must clearly state such and reflect planned stockpile locations on the site logistics plan.

Material (which does not include topsoil, asphalt paving, or base gravel below pavement) that is to be excavated for off-site recycling/disposal will be laboratory analyzed for environmental parameters required by the designated (and University approved) receiving facility. All material will be tested separately from topsoil, road-base materials, and natural soils.

As part of preparing the soil management plan, the Designer will need to identify soil-boring locations that will be used to pre-characterize material that will be excavated as part of the project. At each soil boring location where fill materials are encountered, a composite sample of the fill will be prepared. The composite sample will consist of a mixture of subsamples collected at one to two-foot intervals from the full thickness of the fill layer. Separate grab samples will be collected from within the fill layer, if analytical parameters required by the receiving facility include volatile organic compounds (VOCs). Samples will be collected in clean, laboratory provided sample jars suitable for the intended analyses. If multiple, distinct, fill layers (inferring distinct historical fill sources) are observed during soil sampling, then a composite sample of each distinct fill layer will be collected. A minimum of one composite sample for every 500 cubic yards of fill that is to be exported will be collected.

Samples of natural soil, if present below fill (or below topsoil, if fill is not observed), will be collected and field screened for evidence of contaminants (odors, staining, oily sheens, organic vapors). If no evidence of contaminants is detected by field screening and soils are to be reused on the project site, then no laboratory analyses of natural soils is required. If natural soils will be exported during the project, then composite samples of the natural soils that will be excavated during the project will be collected and laboratory analyzed for parameters required by the receiving facility. A minimum of one composite sample for every 1,000 cubic yards of natural soils that will be exported should be collected and analyzed.

The Designer will confirm with the University the number of samples that will be laboratory analyzed and the analytical parameters planned for each type of material (topsoil, fill, natural soil). Not all samples that are collected during soil investigation will be laboratory analyzed. Fill samples should be placed on hold at the laboratory pending University approval of the number of samples to be analyzed and analytical parameters selected, if a sampling and analysis plan was not previously approved by the University.

Soil testing should also include geotechnical analyses for structural and infiltration capacity considerations (when applicable to the project) and shall include an analysis of the cathodic influence on, and potential reaction to, all materials to be installed subsurface. The Designer shall be responsible for ensuring that there is no negative reaction with any subsurface materials specified and the soil conditions.

Existing Soil Materials

It is the desire that any existing soils disturbed during the course of construction are to be reused and remain on site within the project limits. Require through the specifications that the Contractor must adhere to all staging and storage requirements outlined within the contract documents.

Should conditions not allow for full reuse of residual soils, the Contractor must be required to formally submit for approval by the University prior to the removal, the location of where the residual soils will be disposed.

New Soil Materials

Should project site conditions require all new imported material be brought onto University property, the Designer must specify any new materials are free of deleterious materials (metal scraps, concrete, brick, or other building debris), and prior tested to confirm materials do not contain elevated concentrations of chemical constituents. Natural soils free of chemical constituents, other than metals at naturally occurring concentrations, are preferred as fill.

However, new materials that contain trace chemical constituents at concentrations less than 30% of the Residential Direct Exposure Criteria (R-DEC) and/or GA-Pollutant Mobility Criteria (GA-PMC) listed in the CTDEEP Remediation Standard Regulations (RSRs) will be acceptable for use on University projects, provided such material has not been obtained from a contaminated site (a property where a petroleum or chemical release has occurred that is subject to compliance with the RSRs), and such new material is used at locations that are not subject to erosion, are not placed below the water table, and are not placed in an environmentally sensitive area (e.g., in close proximity to a wetland, water course or aquifer protection area). All analytical results must meet the above criteria.

Through the submittal process, Designer will confirm document the geotechnical suitability and environmental quality of new material brought onto the site and confirm the new material's location of origin. The Designer will ensure the Contractor hires an independent testing agent to test the new material for geotechnical parameters and environmental contaminants, consistent with these guidelines and the project-specific specifications and require any test sampling and analysis time (minimum 2 weeks) be factored into the Contractors submittal and construction schedule.

The Designer will ensure the University has adequate opportunity to review and approve analytical results for new materials prior to the Contractor bringing them onto University property.

Refer to Section 7 – Landscape Design Guidelines for additional requirements on imported material that is to be brought onto University property.

5.5 Connection between Inside and Outside

It is important to the University that buildings are sited such that they take advantage of the natural contours and characteristics of the site. The Designer should survey the site and trees and attempt to minimize the reduction in trees. The University's Arboretum Committee shall be consulted to limit the disruption of trees and vegetation according to the University's tree protection guidelines. The University encourages windows that create a connection between the inside and outside of the buildings and promotes views of both natural settings and green roofs where possible.

5.6 Building Orientation

Buildings should be oriented such that they are in relation to other buildings, structures and streets in the area. They should not be orthogonal or unusually shaped but should respect the adjacencies. It is desirable that the buildings be oriented to take advantage of any sun and natural light exposure.

5.7 Spaces Between & Behind Buildings

The University promotes open space between and behind buildings. It is important to create open congregational spaces with each building that will promote both formal use and social gatherings. Additionally, exterior space should be included and programmed for athletic use.

5.8 Open Space & Recreation

For all buildings, provide outdoor congregational spaces and seating spaces to allow students, staff and faculty to experience both active and quiet areas. Outdoor recreational spaces are required near buildings that house large populations and residence halls.

5.9 Roads, Paths and Accesses

The goal of site design is to promote pedestrian and bike movements to the building and through the site. Roads through the center of campus are discouraged, so transportation of materials and services to the building needs careful consideration and design. Roads shall have travel lanes no less than 11' wide, whereas service drives and emergency access lanes may differ. Pedestrian paths should be identifiable by their purpose and use. Paths should be identifiable as either main thoroughfares (minimum 16' wide), primary paths (minimum 12' wide) or secondary paths (6' wide).

5.10 Construction Logistic Guidance

Mitigating impacts to campus access and appearance, maintaining safety during to construction activity, and communicating any disruption to the daily routines of our students, faculty, staff and guests, is important to the University. By considering and discussing potential impacts during the design phases, temporary facilities and controls can be identified and included in the contract documents prior to the bidding phase.

The Designer with direction from the University's Representative and when applicable advice from the Construction Manager, shall develop a "Site Logistics Guidance Plan" concurrently with the design to incorporate the logistics on constructability and staging has been thought out. Such plan will be part of the final bid documents.

Design Development through 50% Construction Documents

The Designer shall review Specification 01 1500 and meet with the University Representative to initiate discussion on a Draft Logistics Guidance Plan no later than 90 days prior to completion of 50% Construction Documents. If there is a Construction Manager on the team, at this stage the Designer shall include recommendations by the Construction Manage on updates to the Logistics Guidance Plan

During that time – as the Plans and Specifications are prepared for design milestones – the Designer shall meet with the University Representative and campus stakeholders to review drafts of the Construction Logistics Guidance Plan. The University Representative and the Designer shall ensure the draft site logistics plans address all typical logistical issues, identify significant anticipated impacts from the project, record input received from campus stakeholders, and that the project logistics are coordinated with other projects in the area.

In addition to representatives from UPDC, key campus stakeholders should include those who are specifically participating in design milestone reviews and may include, but are not limited to, the following departments:

- Facilities Operations
- Parking and Transportation Services
- Division of University Safety - Fire Marshall and Building Inspector's Office
- Division of University Safety - Police
- Environmental Health & Safety
- Information Technology Services
- Office of Institutional Equity
- University Communications
- Other departments when applicable

Topics for discussion when establishing the draft Site Logistics Guidance Plan include, but are not limited to:

- Coordination with other projects to assess global impacts
- Road closures and probable detours
- Emergency access points and through routes
- Special needs for cranes or heavy equipment

- Critical building access points
- Sidewalk closures, coverings and probable detours
- Impacts on universal access
- Utility shutdowns
- Event or service disruption, including parking and buses
- Areas to receive temporary lighting
- Preferred construction route(s) and entrance(s)
- Limits of construction fence, use of portable fencing, and probable gate locations
- Inclusion of owner-provided scrim or banners
- Trees to be protected and preserved
- Preferred locations for field offices, toilets, laydown and staging
- Areas to be maintained, including landscaping and snow/ice removal

The Designer shall present the information to the University Representative for consultation with the AVP of UPDC and University Landscape Architect for review and approval of an initial draft.

90% Construction Documents

At 90% Construction Documents, the Designer shall submit a Final Logistics Guidance Plan and Division One Specifications to the University's Representative for review and approval in consultation with the AVP of UPDC and University Landscape Architect.

Pre-Construction

The Designer and primary design team members shall attend the pre-construction meeting with the University Representative and Contractor.

The Designer shall ensure the Contractor's Site Logistics Plan incorporates all elements of the Logistics Guidance Plan included in the contract documents. The Designer shall identify any discrepancies and submit to the University Representative for final approval prior to Contractor mobilization.

Construction

During Construction. the University Representative and Designer shall monitor the Contractor's performance and compliance with the approved Site Logistics Plan. When modifications are necessary, the Plan shall be revised and resubmitted by the Contractor to the Designer and University Representative for approval before initiating any changes.

Construction Fence

The University has specific requirements for construction fence types, materials and performance measures in its Division I Specifications for temporary facilities and controls. The

Designer is responsible to ensure the specification is included in the design documents and approved by the University Representative.

Construction Fence Scrim

All construction sites shall be screened for privacy and dust control by using a commercial-grade scrim provided by the Contractor as detailed in 01 5000 of the University's Division One specifications.

The University may provide additional scrim or banners with written or illustrative information about the project for the Contractor to install between other scrim segments.

The use of integrated scrim may be permitted for ballasted portable fence systems as approved by the University Representative during design. The Designer is responsible for coordination with the University Representative and when applicable the Construction Manager on the logistics of perimeter fencing and scrim during formulation of the Site Logistics Guidance Plan.

6 Building Planning Guidelines

6.1 Guiding Principles

The Designer should work with the University Representative to clearly define the program and vision for the project. It is critically important that the Designer be familiar with the University's Master Plan and understand the University's goals and objectives in locating new buildings on the campus.

6.2 Space Planning Guidelines

The Designer shall review and comply with the University Space Planning Guidelines in Appendix III when designing new or renovated space at the University.

6.3 Heights of Structures

The tallest building on the campus is the Wilbur Cross Building, with its tower at a height of approximately 110 feet. New buildings should not exceed this height without prior approval by the University. Most buildings on the campus are in the range of three to five (5) stories, and the height of new buildings should generally be in the same range as other buildings in the area and district. When proposing a tall building, the Designer shall review limitations of the University's existing fire safety equipment and abilities.

6.4 Exterior Cladding Materials

Buildings should be designed with a 50-year horizon and utilize only durable materials. It is important to consider long-term maintenance in the selection of materials.

Brick is a prominent exterior material on the campus however it should not be assumed that all buildings are to be solely brick. Any suggested exterior cladding should be selected in consultation with the University Representative. The building setting should be considered and be in harmony with other buildings in the area and district of the project.

6.5 Exterior Building Lighting

Most buildings are not lit on campus. Feature elements, like towers, may be lit, but the prominent exterior of the building should not be lit. The University conforms to "dark skies" provisions and all lighting (whether building or site) shall be down lighting only.

Lighting is required at all entrances and exits to the building. Lighting shall also be required at all crosswalks, on both sides of any streets.

6.6 Stairs and Ramps

Stairs should be located such that they are intuitive and easy to find. The University promotes walking-upstairs and use of stairwells, so all stairs (even fire enclosed stairs) should be finished as communicating stairs. Security, both on the interior and from the exterior, should be considered in the design.

The preferred material for exterior stairs on primary paths and entryways shall be granite on a concrete foundation. A latex bonding agent shall be used in the mortar to increase its salt resistance. Granite shall be from a New England source, light gray in color and exposed faces shall be thermal finished. The University has determined the following quarry to be of acceptable quality and color of the granite material: Fletcher Granite Company or approved equal.

With prior approval from the University, specification of concrete exit stairs is preferred over metal at exterior applications. All flat areas or stairs that are exposed to water or weather shall utilize epoxy rebar reinforcing and all epoxy coated components shall be used.

The proportion of treads to risers shall be determined on the basis of specific site conditions, however a generally acceptable proportion shall be fifteen (15) inch treads and 7" risers. However, existing conditions may warrant varying the proportions, so review proposed configurations with the University Representative prior to finalizing.

Ramps

Where conditions necessitate, design for ramps to always slope away from the building. Ensure that any landings pitch away from the building to the ramp as well.

6.7 Handrails and Pedestrian Guardrails

Handrails shall be stainless steel tube 304 or 316 welded with a rectangular, square or circular cross section and shall comply with load rating conditions. Ensure that stainless steel fittings 304 or 316 are specified in all applications. Finishes for pipe and tubing shall be #6 polished and

for fittings #8 polished. Intermediate posts and rails, where required, shall meet structural requirements and applicable standards, but should be kept to a minimum to create a simple profile. Custom bronze handrails may also be used if more aesthetically compatible with the design of adjacent buildings. Simple rails are preferred over ornamental guardrails. Should conditions dictate the need for painted rails, the University requires that the railings be powder coated.

Handrails shall be installed into the body cast of the stairs, where the rail is set into a cylindrical mortar set. Cores, sleeves, or cups should not be made of ferrous metal and shall be over filled with a slight taper at the base of the rail with non-shrink hydraulic cement. The Designer is responsible to ensure during the punch list phase, that the rails cylindrical setting is completely filled leaving a slight crown to shed water away from the post. The University consistently finds that this finish process is overlooked and has become a regular maintenance issue.

6.8 Corridors

MEP piping and ductwork should be run within the corridor ceilings, if possible, and not run in the ceilings of programmed space. MEP rooms should be directly accessible from corridors and not through secondary rooms.
Power clusters should be provided at spacing no greater than every 50' in the corridors. This power is for both building service and student charging use, so it should be visible and within the general congregating areas around benches. Academic corridors should have Wi-Fi service in all areas.

Corridor finishes should be durable, and maintenance should be emphasized. Generally, corridor walls should have a chair rail, base and 4' high of protection board. Ceilings should be accessible and have easily removal panels or tiles.

6.9 Restrooms

The location of restrooms in public, academic and operationally occupied buildings should be intuitive and easy to find with a minimum of one set of restrooms per floor. Men's restrooms, women's restrooms, transgender and special needs restrooms are required in each grouping and should be located contiguous to each other. In public buildings, at least one set of restrooms should be provided for each large congregational space or room.

Floor drains should be provided in all restrooms. Floors in restrooms should generally be recessed so that a water membrane can be provided below the floor tile and all floors shall have positive slope to drain. A separate hose bib, with a special key for the valve, should be provided in all restrooms for the janitorial staff.

6.10 Wellness Room

At least one completely private room that can be secured shall be provided in every new building and significant renovation to an existing building. The design of the room should be a comfortable setting with a surface for baby changing, comfortable chair and close access to

running water. Such room shall be designated for lactating mothers, meditators and ill persons. The Designer is responsible to work with the designated University Representative to ensure private space is accounted for such needs.

6.11 Custodial Closets and General Trash Storage Room

At least one wet custodial closet should be provided on each floor of a building, and should generally be provided adjacent to the restrooms, but with access from the corridor, not through the restroom. Custodial closets are considered part of the building infrastructure, not part of the programmable space of the building. Access to these facilities should be separately keyed and reserved to the appropriate staff from FO.

Wet custodial closets should be a minimum of 30 square feet. In addition to the one wet closet per floor minimum, the building should have one additional wet custodial closet for every 25,000 square feet of gross building area. All custodial closets should contain a raised floor sink with laminate walls 4' high minimum and a raised spigot to allow buckets to be filled in same. The space should also contain adequate storage shelving to hold a supply of paper products, cleaning supplies, chemicals and equipment. Exhaust and ventilation should be provided for all custodial closets.

A trash storage room shall be located nearest the loading dock or service entrance of each building. This room shall include sufficient space for janitorial supplies and equipment, paper goods and floor wet sink for large and small container cleaning and central trash holding for the entire building. Shelving for a back stock of paper products, chemicals, supplies and equipment should be included. The storage room should be dedicated strictly for janitorial usage so that the space can be secured and is not shared with any electrical, mechanical or communications functions.

6.12 Facilities Building Storage Room

Include in the design a lockable storage room for building supplies. It is preferred that the storage room be adjacent to the electrical and mechanical rooms, however the building materials storage shall not be incorporated or assumed into the mechanical or electrical rooms or attic space.

6.13 Electrical Room

Electrical rooms are to be designed to be accessible directly off corridors, and not through other rooms. Electrical rooms shall be dedicated to electrical services only and shall not also serve as a telecommunications room. No plumbing shall pass through electrical rooms. The minimum size of an electric room shall be a minimum of 90 square feet. In addition to the electrical panels in the room, the room layout must accommodate a minimum of one 36" x 84" x 20" storage cabinet located up against a clear unobstructed wall. Refer to the Electrical Section for additional requirements when medium voltage (> 1000 Volts) is present.

Similar to transformer requirements, the main switchgear room shall have available filtered outside air and should be heated, but not air conditioned. A dry fire protection should be installed with high temperature heads.

6.14 Telecommunications Room

Telecommunication rooms are preferred to be adjacent (but separate) to the Electrical rooms. Typical room size shall be between 130 – 150 square feet however, a telecommunication room shall be no less than 80 square feet. Final size shall be reviewed and approved by the University Representative in conjunction with ITS. It is the Designers responsibility to adhere to the industry and manufacturer standards for distance limitations when locating rooms.

See Appendix IV - Telecommunications Design Guidelines and Performance Standards for additional details and requirements.

6.15 Mechanical Room

The Designer shall verify the requirements of this space with the University Representative in conjunction with FO and follow ASHRAE Standards 15 and 34. Appropriate sound separation, lighting, heating and ventilation air must be incorporated into the design of these spaces. General lighting for space may be derive from a common lighting panel outside the mechanical room. The air movement of the space shall sweep the entire space. Open louver ventilation is not acceptable due to freezing conditions, and all louvers shall be operated by a power open, spring close operator. Make the main mechanical room large enough to accommodate a standup plan table, stool and at least one 36” x 84” x 20” storage cabinet located up against a clear unobstructed wall. Access to the mechanical rooms should be directly off a corridor and the door and corridor widths should be adequate to allow replacement of the largest-sized piece of equipment through the opening (one double door minimum). Access hatches with ladders to mechanical rooms are not acceptable. Concrete slab floors shall be pitched away from all equipment and shall include a floor drain with a trap primer or a trap guard that can be serviceable. Walls and floors shall be painted epoxy and shall have circulation guidelines incorporated to establish clear paths for egress.

6.16 Loading Docks and Service Areas

Buildings that are being programmed to have full kitchen and/or serveries, warehouse stock requirements, intense research, and regular deliveries shall have a loading dock as part of the program. These building programs require dumpsters and compacters. For programs that include kitchens/serveries, grease tanks shall be easily accessible for ease in servicing.

Buildings that are being programmed for residential, general office and classroom use shall have a designated service area to accept deliveries and general receiving areas, as opposed to a loading dock. Designer should attempt to make service areas pedestrian friendly and multi-functional if possible. Service areas are for vehicle access to a building for load/unload and shall be a designated area distinct from a drive or parking space.

Loading docks and service areas should be approached from the rear of the building wherever possible, with ample screening from main thoroughfares and circulation paths while providing unobstructed access.

When designing for loading docks and service areas sufficient space and power shall be incorporated to support 2 compactors (one for recycling and one for trash). Un-obstructive access to the loading dock or service area shall be maintained, with compacters located adjacent to the loading dock for ease in disposal and to minimize workplace injuries. Exterior grade spot lighting shall be incorporated to shine both on the dock surface and directed out to the edge of the dock to illuminate the area just within the truck for ease in deliveries at night.

All concrete used for the complete loading dock or service area shall be treated with salt-guard and shall have a drain with an oil and grease interceptor for run off from vehicles. All landings shall be designed to pitch away from the building.

In service yards and loading docks in particular, it is preferable to direct stormwater into landscape areas rather than to infiltrate storm water directly through the pavement because of the likelihood of oil and other pollutants from vehicles in these areas. When pervious pavements are selected for such a location, catch basins with a sump and oil separator hood should be used.

Standard Dock height shall be 48”AFF. In general, all loading docks shall be designed to require at least one hydraulic lift plate. Regardless of location, all lifts and dock levelers shall be exterior grade. All components on the lift or leveler shall be powder coated steel. For loading docks with more than two bays, at least one shall have a dock leveler.

Design of these areas should be coordinated with Section 7 Landscape Design Guidelines, and Section 8 Civil and Utilities Infrastructure Design Guidelines and Section 18 Elevator/Lifts Design Guidelines.

6.17 Trash and Recycling Requirements

The University has a trash and recycling program where the goal is to minimize the number of dumpsters and eliminate barrel bins on the various campuses. On the Storrs campus, within and just outside any general academic or office occupancy building, trash and recycling shall be disposed of in compacters . For buildings where there is regular food service being performed, the design shall incorporate sufficient space for several dumpsters, trash compactor and a loading dock with un-obstructive access. Such an area shall be screened as much as possible from view by the general public.

Designated trash room(s) shall be incorporated into any new building or major renovation. Such trash rooms shall be located near the back of the building where delivery and building services access. The room shall have proper ventilation, epoxy concrete floor, masonry block or cement board walls with water protective material, appropriate lighting, and that the room be

large enough to accommodate bulk general cleaning and paper good products and temporary storage of trash. Within the space, there shall be space allocated for a floor slop sink to clean trash containers and a nearby floor drain for any water over spray or flow.

Design shall incorporate ergonomics to reduce workplace injuries. Located the dumpsters and compactors nearest the loading dock for ease in disposing of trash into the containers, but shall not impede easy access to the loading dock .

The Designer should also consider the efficacy of designing separate built-in recycling stations in public areas with separate collection portals for both mixed recycling and trash, utilizing the University's standard design for labels, or lid openings, and other methods used to prevent commingling of trash and recyclables, to the extent practicable. In such cases, the receptacle space for recycling shall be coupled with trash, and recycling receptacle space shall be at least a 2:1 ratio over space allocated for trash receptacles.

All new construction and major renovation designs shall incorporate trash rooms. The design shall be reviewed and approved by the University Representative in conjunction with FO prior to the completion of the design development phase. Any proposed changes to the original approval of the trash room shall be resubmitted for consideration to FO prior to being implemented into the final construction documents.

7 Landscape Design Guidelines

7.1 Guiding Principles

Three overarching principles guide landscape design:

1. Create a sense of place
2. Define campus precincts
3. Improve ecosystem health

As a first and foremost principle, the University seeks to re-integrate the campus with its unique natural and cultural setting. These settings have been unintentionally marginalized because of rapid growth; however, the University is committed to reintroduce these unique natural and cultural setting to strengthen sense of place and campus identity. Multiple initiatives should be undertaken to make the rich mosaic of forests, fields, hilltops, and ravines that characterize the Connecticut landscape more present in the campus landscape.

The second principle recommends a more comprehensive approach to organizing campus precincts around landscape experience. While loving attention has been given to landscape spaces that are contained by buildings, large portions of the existing landscape are underutilized and do not contribute to the social vitality or the experience of the campus. New landscapes operating at the scale of campus neighborhoods would help to extend the experiential and recreational value of the campus landscape.

The third design principle is to utilize existing topography and natural systems to carve out new places for green infrastructure on campus, thus improving the quality of the water that University discharges into the region's rivers and streams and contributing to ecological performance at multiple scales.

In addition to the guiding principle, the Designer shall follow the intent of sustainable design principles outlined in the Sustainable Sites Initiative (SITES™) for Water, Soil and Vegetation. The University has also adopted the Crime Prevention through Environmental Design (CPTED) philosophy and requires the Designer to take into account such philosophy in the landscape design.

Wherever possible, sustainable material choices shall be made by the Designer such as the use of pervious pavement, concrete and/ or brick pavers. The Designer shall have sufficient knowledge when evaluating, recommending, and designing all aspects associated with the maintenance of these outside elements listed hereto as they relate to the climate zone that the University is located in.

7.2 Roadways and Driveways

The University owns and/or is responsible for maintaining the majority of roads throughout the Storrs and Regional Campuses. Major roadways are defined as the primary vehicular routes around and through the campuses. The University believes in incorporating more traffic calming methods within its designs and encourage more bike lanes and other alternative transportation methods within the road shoulders or immediate adjacent to the road.

When designing paving overlays, ensure that existing catch basins, manholes and control valves are reset or extension rings added to meet the finish grade of the pavement overlay. The Designer should follow the Department of Transportation guidelines for roadway or sidewalk impact repairs.

For all road and parking additions or replacement projects, an evaluation of alternative methods of reducing stormwater sediments and pollutants shall be undertaken. The evaluation shall determine preferred water quality improvement techniques for the specific project in its larger watershed context. Pervious pavement should be considered as one alternative technique, along with other methods such as vortex catch basins, vegetated swales, and sheet flow into vegetated and bio-retention areas. Factors to be weighed in the selection of pervious pavement should include subsurface soil conditions, maintenance implications and cost effectiveness versus other available stormwater improvement methods.

7.3 Transit Routes and Shelters

The University has a robust transit system at the Storrs Campus. The Designer shall ensure that the University Representative in conjunction with the University's Logistic Administration review any and all aspects associated with vehicular circulation on any of the campuses.

Campus buildings located on any of the campus roadways shall have a transit stop within 150 feet of the building's main entrance or parking area. Bus pull-offs shall be designed to include ample room for two buses, shelter(s) for waiting rider's protection from weather, and adequate lighting.

Currently the University is installing CEMUSA manufactured shelters, however the University's desire is to include more solar voltaic opportunities and will consider other alternatives.

7.4 Parking Areas

The University limits the amount of parking spaces within the Storrs core campus to service and handicap parking. There are a limited number of metered spaces provided for short term parking and limited on-street parking. There are several parking garages and parking lots located on the periphery of the campus.

Whenever possible, design parking lots to maximize efficient circulation, provide ease in maintenance and snow removal, be appropriately lit to increase safety and provide easy pedestrian access to and from the parking area. Snow accumulation areas with pervious materials for optimal draining are required in all new parking area designs.

Parking spaces shall be 9'x18' in size with a 24' wide drive aisle. No parking spaces shall be smaller or designated for specific uses without prior authorization to do so prior to designing the parking area.

Scooters are becoming more prevalent on campus. If a parking area is included in the project, scooter parking spaces should be designated and have an ability for the scooter to be secured to a rack. If there is no parking area included in the project, an area must be designed to accommodate the securing of the scooter outside of sidewalks and exterior building perimeters. Preferably adjacent to bike racks.

Surface parking should explore the potential for solar canopies or the use of shade trees to limit the heat island effect. Trees planted should have an aspirational goal of shading as much as half of the paved areas at 10 years of maturity.

Careful planning of parking area layouts must demonstrate clear accessibility for emergency vehicles, fire trucks and snowplows in relations to a fully occupied parking area. Designer must obtain prior approval from the University's Representative in conjunction with the PS and FO on the layout prior to completion of the design development phase.

As part of the design for any parking area, an electric vehicle charging station shall be determined on a project-by-project basis. Charging stations shall be installed to have universal access and be designed for future growth. Charging stations require data connections to be managed remotely. Refer to the Volume II for additional information on charging stations.

Any development of 200 or more new parking spaces is considered a Major Traffic Generator regulated as an impact to the state highway system in Connecticut by the Office of the State Traffic Administration (OSTA). All changes in parking volume regardless of the quantity may require an update to the permit coordinated through UPDC.

7.5 Pavement Markings

The University prefers the use of white and yellow epoxy resin pavement markings with reflectivity additive for new construction of roads and parking facilities.

Water-based painted pavement markings may be permitted for temporary applications and pavements nearing the end of their useful life. Preformed tapes may also be allowed during construction and for other temporary needs. Blackout of markings may be permitted on a temporary or permanent basis subject to approval by University Representative.

The University defers to the current Manual of Uniform Traffic Control Devices (MUTCD, and as referenced by the CTDOT) for all pavement markings, symbols and legends. However, there may be instances where custom templates are provided where such custom plates shall be reviewed with the University Representative prior to their use.

For crosswalk yield arrows for applicable crossings, symbol shall contain 5 triangles as dimensioned in MUTCD.

The Designer shall refer to best practices consistent with the Connecticut Department of Transportation's Standard Specifications for Roads, Bridges and Incidental Construction, current edition, for review and approval by the University Representative.

7.6 Curbs

All curbing shall match existing granite curbing throughout the campus, being hard and durable, fundamentally of light color, of general uniform texture, of smooth splitting appearance, free from seams or imperfections that would impair its structural reliability and containing only such color variations as in the opinion of the Engineer would reasonably be characteristic of the material source.

All curbs shall be New England quarried granite, 18" in height, beveled not sloped and installed 2/3rds in ground. Typical granite curbs shall have a split face and sawn top. The Designer is responsible for confirming the type/style of adjacent curbing within the immediate area.

In low visibility areas where budget constraints exist, precast concrete curbs may be used with prior approval from the University Representative in conjunction with the University's Landscape Architect. Use of cast in place concrete and bituminous curbs shall be avoided.

Where emergency access vehicles are expected to mount curbs in an emergency to get to a building, consider mountable curbs in those areas.

7.7 Curb Cuts, Crosswalks and Sidewalks

All exterior concrete walks, curb cuts, and exterior stairs made from concrete shall be salt guard treated.

Curb Cuts

Curb cuts and curb ramps shall be provided along all barrier free routes as required and shall conform to ADA and ABA standards. Where feasible, curb ramps shall have a wide gradual apron; ramp width shall be determined on a case by case basis considering factors such as pedestrian safety, width of connecting sidewalks, ease of snow removal, and utility pole locations. Curb ramps shall use cast iron detectable warning plates with truncated domes manufactured by East Jordan Ironworks or approved equal in a black asphalt dip finish. These plates are low maintenance, very durable, and made from recycled materials.

Crosswalks

In general, crosswalks shall be demarcated with white painted stripes (not epoxy). Crosswalk widths shall match the widths of connecting sidewalks and adhere to all requirements in accordance with the Uniform Traffic Guidance Manual. Where specific design conditions and pedestrian volumes warrant, crosswalks may be raised to the curb level to create a speed "table." The table approach ramps should be made visible by white paint or a material change (such as white concrete to contrast with the bituminous concrete road). The table tops may utilize brick pavers. Tables should only be used in areas of very high pedestrian cross traffic and where a combination of traffic calming techniques can successfully be employed to alert drivers in advance of the table.

Campus standard pole mounted pedestrian or street light fixtures should be located in the tree lawn or sidewalk close enough to the crosswalk to make crossing pedestrians visible to drivers at night. Light fixtures adjacent to crosswalks should be part of a regular spacing of lighting along the length of the street.

Sidewalks

The preferred material for campus sidewalks is cast-in-place concrete. Sidewalk intersections shall be designed with corner radii that reasonably accommodates the turning movements of snow removal equipment, service vehicles, and the natural flow of pedestrian traffic. Minimum corner radius shall be five (5) feet. Sidewalks placed at building entrances shall not only be doweled into the foundation of the building but should be designed to accommodate a haunch that extends to frost to protect the door from becoming jammed during winter months. The extent of sidewalk to be replaced shall be coordinated with the University Representative in conjunction with the University Landscape Architect during the SD phase of the project. Dependent on the overall project, if 50% of an existing sidewalk is being impacted by the proposed work consideration shall be given in the replacement of additional length of sidewalk to the nearest sidewalk intersection. The color of adjacent sidewalks shall also be evaluated to see if the new walks can match in color and finish. This shall be reviewed with the University

Representative in conjunction with the University Landscape Architect during the SD Phase of the project.

Cast in place concrete shall be 4,500 psi, with a maximum water cement ratio of 0.45, slump limit of 4 inches +/- 1.0 inch and an air content of 6 percent +/- 1.5 percent. Concrete retarding materials shall be utilized when weather has an adverse effect on placement, all sidewalk placement shall take place between April 15th and October 15th unless previously requested and approved by the University. Contraction joints shall be placed parallel to length of walk. Joint spacing shall be included in design drawings and not left up to the Contractor. Jointing pattern shall not allow for joints at radius that create a "zero" edge. Expansion joints shall utilize a full depth asphalt saturated cellulosic fiber strip. Steel diamond shape load plates shall be utilized at all expansion joints in lieu of round dowels with the exception of areas where sidewalk ties into existing walks. Load plates, dowels and expansion joints shall be utilized at all locations where concrete is poured up against stationary objects. Contraction Joints shall be ¼ of the overall depth of the concrete pour to ensure contraction of the material takes place at these locations. Concrete shall utilize 6-inch square wire mesh, wire mesh shall have a minimum twelve-inch overlap. Wire mesh shall be placed on chairs spaced no more than eighteen inches on center.

Ensure within the specifications to the Contractor that a slump test be performed by an independent testing lab and testing results provided to the Designer for review and acceptance of the installation. All projects requiring more than 10 cubic yards of concrete shall receive onsite testing. Require in the specifications that the concrete installer hold a current ACI flatwork certification. Concrete sidewalk shall be placed utilizing a mechanically vibratory screed to ensure proper densification of the concrete.

Concrete sidewalk shall be hard troweled prior to receiving a medium broom finish with ¼ inch tooled joints and edging. Tooling shall be completed after the surface finish. No additional water shall be added to the surface to aid in finishing. If finishing aid is required, it shall be similar to Eucobar.

Concrete sidewalk wet cure shall commence immediately or no longer than 30 minutes after finishing and continue uninterrupted for a period of 7 days, 5 days minimum. Wet cure shall utilize a non-marking curing paper or other curing cover similar to Hydra Cure Cover S16. Upon approval the contractor shall utilize a dissipating curing compound only if moisture curing is not feasible. Upon proper curing concrete sidewalks shall have joints filled with self-leveling sealer that matches the color of the concrete. Sidewalks shall be treated with salt guard sealer in accordance with manufactures instructions. Placement shall be witnessed by construction engineer, owner or architect.

Asphalt paving may only be used for temporary (30 days) walkways on campus. The intersections of sidewalks should be designed with corner radii that reasonably accommodate

the turning movements of snow removal equipment, service vehicles, and the natural flow lines of pedestrian traffic. Minimum corner radius shall be five (5) feet.

Handicap access ramps shall be constructed in cast in place concrete or adjacent materials and shall conform to ADA and ABA standards. For all cast in place ramps and landings near building entries, radiant heat shall be specified.

Sidewalk width shall vary with the volume of pedestrian traffic, with six (6) feet being the minimum and used only in very low volume areas yet service vehicles may go over them; eight (8) feet being the preferred standard where occasional service vehicle use is anticipated; ten (10) to twelve (12) feet width shall be used for most service collector pathways, and sixteen (16) feet shall be used for major corridors, such as Fairfield Mall and the Academic Way. Pavement thickness on all walks eight (8) feet wide and larger shall be designed to carry vehicles including a fire truck. Minimum concrete pavement thickness shall be six (6) inches with a minimum six (6) inch gravel base, all expansion joints shall receive a 10-inch-thick by 12-inch-wide minimum haunch. There shall be no vertical impediments such as signs located within the sidewalks. At the end of any sidewalk greater than eight (8) feet wide, the Designer shall include controlled structures, such as removable bollards to restrict non-service vehicles.

Special Walkways

At major pedestrian walkways, such as the Academic Way and Fairfield Mall, special pavement shall be designed. Other appropriate applications should be considered for service areas that double as pedestrian routes, streetscape margins such as former tree lawns converted to pavement, campus gathering spaces and plazas, areas associated with building terraces and entrances, and street crosswalks at raised tables such as those existing along Gilbert Road. In service and loading areas that double as pedestrian routes, vehicular concrete unit pavers shall be used.

Special pavements shall consist of high-quality material such as brick, stone, or concrete pavers. Stone that is subject to damage from deicing salts or freeze-thaw damage, such as bluestone, shall not be used. Pavers shall be selected to be compatible with adjacent landscape and architectural materials and setting methods. The preferred brick for campus wide use shall match the brick used in the Fairfield Mall. The preferred setting method for special pavements shall be in a bituminous setting bed on a concrete slab, as shown in the detail below. The slab thickness and base course depth shall vary according to the pavement load requirements and subsurface conditions.

Pervious special pavers should be considered as a means of infiltrating stormwater. Factors to be weighed in the decision to use pervious pavers should include subsurface soil conditions, maintenance implications and cost effectiveness versus other available stormwater management methods. Special pervious pavers shall be of high-quality material and shall be selected to be compatible with adjacent landscape and architectural materials. The preferred pervious clay brick paver special paver shall be 4” x 8” x 2.25” in size in a random standard color

mix. The University has determined the following Manufacturer(s) to be of acceptable quality and color for pervious clay brick; Whiteacre Greer's antique, dark antique and red sunset colors, Pine Hall or approved equal.

7.8 Site Stairs

The preferred material for exterior stairs on primary paths and entryways shall be granite on a concrete foundation. Cheek walls should be evaluated with the surrounding landscape and grade requirements. The materials used, finishes and method of installation should be proven in Connecticut and having a high level of salt resistance. Granite sources should match adjacent installation on campus and reviewed with the university.

With prior approval from the University, specification of concrete exit stairs is preferred over metal at exterior applications. All flat areas or stairs that are exposed to water or weather shall utilize epoxy rebar reinforcing and all epoxy coated components shall be used.

The proportion of treads to risers shall be determined on the basis of specific site conditions. Generally acceptable proportion is 14" treads and 7.25" risers, however existing conditions may warrant differently. The Designer is to review proposed configurations with the University Representative prior to finalizing.

7.9 Handrails and Pedestrian Guardrails

Handrails shall be stainless steel tube 304 or 316 welded with a rectangular, square or circular cross section and shall comply with load rating conditions. Ensure that stainless steel fittings 304 or 316 are specified in all applications. Finishes for pipe and tubing shall be #6 polished and for fittings #8 polished. Intermediate posts and rails, where required, shall meet structural requirements and applicable standards, but should be kept to a minimum to create a simple profile. Custom bronze handrails may also be used if more aesthetically compatible with the design of adjacent buildings. Simple rails are preferred over ornamental guardrails. Should conditions dictate the need for painted rails, the University requires that the railings be powder coated.

Handrails shall be installed into a cylindrical mortar set. Cores, sleeves or cups should not be made of ferrous metal and shall be over filled with a slight taper at the base of the rail with non-shrink hydraulic cement. The Designer is responsible to ensure during the punch list phase, that the rails cylindrical setting is completely filled leaving a slight crown to shed water away from the post. The University consistently finds that this finish process is overlooked and has become a regular maintenance issue.

7.10 Service and Emergency Access

Service Access

Service access routes allow campus vehicles and outside venders to access campus buildings for deliveries and service, as well as temporary short term (15 minute) parking spaces. Service access should be typically one location per building or two for large buildings.

At service streets and service yards that double as pedestrian routes, unit pavers shall be used to create a more pedestrian-friendly scale and quality. Selection of unit paver size, pattern, color and finish shall be coordinated with the University Representative in conjunction with Landscape Architect Representative.

In service yards and loading docks in particular, it is preferable to direct stormwater into landscape areas rather than to infiltrate storm water directly through the pavement because of the likelihood of oil and other pollutants from vehicles in these areas. When pervious pavements are selected for such a location, catch basins with a sump and oil separator hood should be used.

See Section 6 - Building Design Guidelines for further details on Loading Docks

Emergency Access

Emergency access must be planned for the complete perimeter of the building, whereever possible. Pervious brick pavers that allow for a hard surface for emergency vehicle access not limited to a fire truck, while allowing for water filtration and grass growth.

7.11 Site Walls

In general, any wall shall be constructed of durable high-quality masonry materials. All walls 30" or more shall be designed by a structural engineer and shall have footings and proper drainage for the application that the wall is performing. The materials and workmanship of site walls built in association with buildings should closely match the quality and finishes of the building walls. The use of rustic or inferior site wall materials, such as concrete masonry units, in close association with the architecturally finished walls of campus buildings should be avoided.

Design for the growth of flowering vines to cover bare concrete walls in cases where soil is available for planting and solar exposure is favorable. The example of a most effective hardy vine for covering site walls is Boston Ivy, but other possible solutions should be explored.

Seat Walls

Seat walls are encouraged as a way to create informal meeting and gathering places at locations that naturally attract people, such as building entrances and intersections of major walks. Seat walls should be generously sized to allow for comfortable, informal use. Design with minimum joints. The minimum depth for seat walls shall be eighteen (18) inches. Copings shall be designed in proportion to each wall and shall be counter flashed to withstand weather impacts over time. Coping material shall be a natural stone material.

Retaining Walls

The preferred material for retaining walls is a natural stone veneer with fully raked or dry stacked joint grout lines with air space and weep holes both top and bottom, counter flashing under the coping cap, and a drainage system behind the fascia.

If cheek walls are necessary leading into exterior steps, the cheek walls should be treated the same as the retaining wall.

Screenings

Architecturally compatible site walls rather than fences should be used to visually screen utility, trash and service areas. Walls that screen must integrate itself with the building. Similarly, compatible walls should be used for screening service and utility areas throughout the campus. Such screening walls shall be engineered, conform to the surrounding building types and shall be lattice design in nature. Decorative effects should be avoided.

7.12 Bollards, Post and Chain, Fencing and Vehicular Guide Rails

Bollards

The use of simple granite bollards and blocks may be considered for use in applications where permanent bollards are required. In situations where unauthorized vehicular traffic on campus walkways and service drives requires control, card gates or removable bollards should be employed.

Install protective bollards around outdoor fuel tanks and fill pipes in locations where damage from normal vehicular traffic and snowplows can occur. These bollards shall typically be no greater than 6" in diameter, filled with concrete, secured to withstand a vehicle impact and have a polymer weatherproof coated sleeve.

Post and Chain

The University utilizes post and chain in areas where accommodation of all desire lines would result in excessive expanses of paving and fragmentation of the landscape. Lawns and tree root zones that currently show signs of pedestrian and vehicular impacts should be protected with post-and-chain. When street trees occur in tree lawns, the campus standard post and chain detail shall be used on the sidewalk side of the tree lawn to protect the lawn and trees from cut across pedestrian traffic where necessary.

The campus standard for post and chain barriers is the PSU aluminum Fence Post and 1/4" grade 30 proof coil chain in black powder coated finish. The posts shall be 3" diameter cylindrical cast aluminum posts, with cast aluminum ball-top cap, and cast aluminum D-ring. Posts shall be set plumb in PVC sleeves cast inside of concrete foundations. Concrete post foundations shall be held 6" below grade, but the PVC sleeve shall come up to finished grade. Posts shall be 60" tall, with 36" exposed above finished grade, spaced 9' on center. Low points of each chain between posts shall be set at 22" above grade.

The University has determined the following Manufacturer(s) to be of acceptable quality for a post and chain style and system is Quality Machining, Inc. Model # 14424 or approved equal.

Fencing

The University does not have many applications for permanent fencing since it prefers site walls. However, where there would be a need, the fence shall be high quality ornamental metal picket three rail with a black powder coated finish. There are applications for chain link

fencing for athletic fields, where all components of the fence shall be vinyl coated black. Simple fencing is preferred over ornamental fencing. Where budget does not allow for site walls, simple fencing, designed to match the scale, color and directionality of adjacent architectural materials may be considered and shall be presented to the University Representative for review and acceptance prior to detailing the fencing requirements. Decorative effects should be avoided. In the Agricultural Area, extruded cellular PVC pasture fencing is recommended. All agricultural fencing along public roads should be visually consistent to create a unified campus image.

Vehicular Guiderails

The University would prefer to have guiderails that are unobtrusive with a maintenance free finish. Vehicular guardrails shall be either corten steel box beam guide rails attached to corten steel posts or wood posts and rails per prior approval from the University's Landscape Architect. Typical post spacing shall be six feet.

Although the desire is to have unobtrusive guiderails, the Designer must take into account that there are state roads that run through some of our campuses that require specific DOT requirements.

7.13 Roadway & Site Lighting

Generally, the lighting fixture and the pole specified shall match those of the surrounding area, after confirmation with the University Representative and University Landscape Architect. Lamps shall be LED and dark sky compliant. Poles shall have a transformer base, hand hole and welded bungs sized appropriately to support security cameras and electrical needs. A break away box shall be specified and located at the pole base at each pole location. If other services are intended for the pole other than electrical, there shall be one quazite box per service. Do not specify split bases.

Include in the specifications the requirement for the Contractor to use waterproofed gel filled splicing connections. Acceptable gel filled connections: Raychem, CelCap or approved equal.

The Designer shall confirm with the University Representative if security cameras will be required on the site lighting poles or in the area. Include the locations of required security cameras and include raceways and other required components, as outlined within Appendix IV Telecommunications Design Standards.

Site Lighting

Currently the Storrs campus standard for a post-top style pedestrian light fixture for use along campus walks and certain campus streets is the Parklane, Model No. F9AL-GX935 prismatic acrylic Globe with an overall height of 39"and 25" diameter with a 60W LED type V (matech) light engine and an aluminum dome and canopy in black 1003X PT finish. The pole and base are a P649-W1N21-4000 Washington 6" fluted diameter Post with an overall 12' height including a 20" diameter by 24" high base, all aluminum in black 1003X PT finish, both manufactured by Pennsylvania Globe Gaslight Company or approved

equal. This fixture employs a partial cut-off shield that directs light downward to reduce nighttime light pollution. Other manufacturers of comparable product is Spectra Lighting from Sternberg Lighting.

All exterior light fixtures shall comply with “dark sky” provisions. Lamps shall be LED.

Lighting that is provided for sidewalks should be no shorter than thirteen (13) feet and no taller than twenty (20) feet, with a spacing of no greater than fifty (50) feet apart. Height and spacing shall ultimately be driven by a photometric study. Although a minimum of 1.0 ft.-candles is required on all sidewalks in all locations, this lighting criteria shall also apply to five (5) feet on either side of the sidewalk.

Lighting shall be provided at all exterior crosswalks. Any alternative site lighting should meet the light levels and uniformity ratios recommended by the Illuminating Engineering Society of North America (IESNA) Recommended Practice Manual: Lighting for Exterior Environments and should be designed exterior with shielding to prevent light spillage to the night sky per the following standards: exterior fixtures with output greater than 3500 lumens shall be full cutoff; exterior fixtures with output less than 3500 lumens shall be Cutoff or Full Cutoff; and locate, aim, and shield all exterior light fixtures to minimize light trespass across campus boundaries.

Roadway Lighting
Currently the Storrs campus vehicular light fixture is the Sterner-Executive Series shoebox light on a metal pole with black finish or approved equal. Pole height, light spacing, and lamp watt- age shall be determined by the specific application. Lamps shall be LED rather than metal halide or high-pressure sodium.

7.14 Site Furnishings and Accessories

Benches

Simple architectural benches or seat walls may be used in association with buildings if they are part of a unified architectural ensemble of entry walls, stairs, paving etc. The Scarborough bench (horizontal strap seat) manufactured by Landscape Forms or approved equal shall be used as the standard campus bench. Teak benches may be used in park and garden settings, Landscape Forms Wellspring bench, seventy-two (72) inch length, nineteen (19) inch height, without intermediate arms in sustainably farmed teak or approved equivalent shall be used. Simple stone benches are integrated with the architecture. Benches shall always be mounted on level concrete or other paving with sufficient space provided for convenient lawn mowing and snow plowing. When replacing in kind, replace with like bench.

Bike Racks

All buildings must have exterior bike storage in a designated area. The bike racks shall be simple, two point of contact, stainless steel or powder coated black and set in concrete. For residential projects, the exterior bike racks should be covered, and an interior area should be designated for bike storage.

If a bicycle rack layout includes two or more aisles, the design should assume a bike length of 72 inches and allow a minimum of 48 inches for aisle space. Aisle width should be increased to 72

inches in high traffic bicycle parking areas where many racks might be located, such as the Student Union and Library. These large parking areas should also have at least two entrances to ease congestion during times of high turnover.

Bike racks on campus shall be the Bike Rib 2.0 by Function First, Inc. or approved equal in black finish or equivalent. These racks allow for equal access at each point of attachment along the rack, so that the entire rack may be used at one time, with access required only from one side. This rack also allows for easy lock-up of both bike frame and wheels. The number of racks at each location will depend on the projected amount of use for each building. All bicycle racks shall be mounted on concrete paving with adequate space allowed for bicycle access. Bike racks should be placed a minimum of 30" from walls or other objects. Bike parking areas shall be contiguous to walkways or plazas rather than floating in lawn areas. In order to promote bicycle, use on campus, bicycle parking areas should be located as close to bike routes as possible, as well as adjacent to building entrances.

Trash and Recycling Receptacles

Wherever practical, the University prefers trash receptacles indoors. Currently the Storrs campus standard is a vertical strap receptacle powder coated black for trash or ivy for recycle. The receptacle has a covered top, which prevents the receptacle bag within from filling with water during storms, and a side opening, which allows for easy removal of trash bags.

Each trash receptacle is to be accompanied by an equivalent recycling receptacle that follows the same design standard as the trash receptacle except that it shall be green color. Each green recycling receptacle shall be labeled with a white label that represents the universal "recycling symbol" and the word "recyclable" in black. Such label shall be place on the side of the receptacle centered under the opening for disposal. Black trash receptacles shall not have any label.

Tables and Chairs

In areas where tables will be left outdoors all year round, anchor type table with integrated chairs anchored powder coated black shall be used or equivalent. In areas where tables and chairs can be movable and stored indoors, café style armless metal grid chairs and 30" round tables in various finishes shall be used or equivalent.

7.15 Site Grading Considerations

Site grading should take the existing topography and adjacent buildings into account. Creating flat terraced areas alongside buildings and structures are desirable, however the site should be sculptural and have smooth transitions between spaces.

7.16 Landscape Adjacent to Buildings

Within thirty feet of a particular building, site furnishings and lighting may take of the style of the building, but further afield from the building, the furnishings and lighting should be consistent with the campus-wide standards. Plantings should not be installed within four feet of a building so that maintenance has access between the landscaped areas and the building.

7.17 Soils

Planting/Top Soils

When specifying new soils, the composition of the soil must be compatible with the plant type needs. Therefore, soils testing on existing soils is the responsibility of the Designer to ensure that the proper specification for treatment of the soil is compatible with the plant type being specified. Underdrainage shall be provided to avoid any ponding of water at the surface. The Designer should specify that the contractor shall submit copies of the soil characteristics for approval prior to installing same.

Any top soil that is brought onto any campus shall be sandy loom with a PH 6-7, organic content of no less than 6% and free of high contents of contaminants as outlined by the residential exposure limits and free from weed and invasive seed material. Specify that any new soils being brought onto any campus (whether specified or not) must be tested not only for the organics but also for contaminants and the results to be submitted for review and acceptance prior to bringing soils on to University property. Treating the material on site to obtain desired mix of organics may be an acceptable solution, however the specifications must state that any pre-emergent treatment must be submitted for review and acceptance prior to placement.

Use of existing top soil for plantings is preferred should the type and organics be of a quality suitable for the plant type. Planting soils shall be sandy loom type. Minor treatment of the existing soil on site is acceptable.

Placement of planting/top soil shall be no less than six (6) inches and existing subgrade shall be scarified to a depth of six (6) inches for lawn applications. Planting beds shall be continuous top soil material no less than eighteen (18) inches.

Regardless if existing planting soil is intended to be reused, the planting/topsoil that is placed on University property shall be of sandy loam type (with required organics based on the design conditions), not loamy sand (see USDA Soil Texture Triangle, USDA-Natural Resources Conservation Service website). Designer shall require the Contractor to submit a current independent test result a minimum of two weeks prior to the planting soil reuse, that such planting soil meets the required texture and organic content specified.

Fill Material

Use of existing fill excavated from the project site is preferred, therefore the designer will specify that existing fill will be utilized to the extent practical, if it meets requirements for the particular use (i.e., geotechnical requirements identified in project specifications). Further include that should the Contractor wish to replace existing fill with new fill brought from offsite (at their own expense), the Contractor must have independent tests performed for contaminants (within the immediate past 20 days from pickup) on the new soil that will be imported to University property. Such tests shall fall within acceptable limits as outlined in Section 5 of these Design Standards. The Contractor shall also be required to identify, and submit for University approval, testing results for existing site soils that Contractor intends to

remove for off-site recycling/disposal. The name, location, and permit status of disposal facilities that will be accepting exported soils must be reviewed and approved by the Designer and University Representative in conjunction with OEP/EHS-S at least 20 days prior to soil export.

Refer to Section 5 Site Planning Guidelines for additional requirements on Environmental Site Studies and Soils Analysis.

7.18 Trees, Shrubs and Plantings

Plants such as trees, shrubs and groundcover can dramatically improve the appearance of a facility and help control erosion while reducing the regular maintenance required of lawn areas. Plant material that is long-lived, non-invasive, indigenous to southern New England and well-adapted to the specific exposures, moisture conditions, climate and soils of the campus shall be used. The University's Landscape Architect, Tree Warden, FO and Arboretum Committee will assist the Designer with creating a plant palette for each Project.

The Designer shall identify potential conflicts between proposed plantings and utilities including future impact to those services from its growing habit or rooting structure.

Refer to Section 5 Site Planning Guidelines for additional requirements.

The University has a responsibility to protect, promote, catalogue and manage its trees as physical assets that create economic, educational and social benefits for the campus community. Any Project that proposes the removal or relocation of trees or shrubs shall be reviewed by the University Representative in conjunction with the University Landscape Architect and Tree Warden. Prior to the completion of the Design Development phase, the University's Arboretum Committee shall also review the proposal for comment and acceptance.

All plant material shall conform to the American Standard for Nursery Stock, published by the American Association of Nurserymen, Inc., current edition. Prior to delivery, the Designer shall inspect and select (tag) all plant material at their respective nurseries. Upon delivery to campus and prior to installation, the Designer, in conjunction with the University Representative and Landscape Architect, shall also provide final approval and confirmation that all plant material is in conformance with the Project's specifications.

The University supports natural surveillance, access control and territorial reinforcement in the built environment as outlined by Crime Prevention through Environmental Design (CPTED) strategies. The Designer shall select and locate plant material to promote campus safety.

Trees

Trees shall be native species and shall be located based on what their mature growth size will be. Trees are to be preselected and purchased at a nursery, specify tree size to be selected on the planting schedule that is required at the time of digging and installation. The Designer and

University Representative shall both be responsible for the selection of plantings. The Designer shall be responsible to ensure that the tree's root flares are flush with grade so that there is no crowning prior to mulch installation.

When design calls for trees along a street or walkway, the campus standard post and chain detail shall be used on the sidewalk side of the tree lawn to protect the lawn and trees from cut across pedestrian traffic where necessary.

Areas where site grades, soils, and subsurface utilities allow, tree lawns may be depressed below the level of the sidewalk to create simple bio-retention areas of lawn and trees. In such cases, trees should be chosen that can accommodate intermittent flooding, such as Red Maple.

In new street tree planting conditions, the preferred tree sizes are three and half (3 ½) inch caliper to four and half (4 ½) inch caliper. This size will insure that the tree will have reasonable visual effect at planting, be large enough to overcome the vulnerability to damage that smaller trees would experience and be small enough not to require extensive excavation and shipping cost that larger caliper sizes would cause.

Refer to Section 5 Site Guidelines for additional design conditions pertaining to placement of trees, plantings and hardscapes.

For general landscape tree plantings, the installation sizes may typically vary from one and half (1 ½) inch caliper trees to six (6) inch caliper trees depending upon the location, project budget, and species of tree being planted. For high use areas such as Sundial Plaza and the Pharmacy Quad, where the landscape is being created from scratch, the largest size trees that budgets will allow should be planned. Specify proper measures to ensure that large trees will be appropriately cared for during a two to three-year acclimation period after planting. For tree plantings in other areas, where new trees are being used to supplement or renew existing plantings, smaller size trees should be used with preference given to one and half (1 ½) inch caliper sizes where adequate protection can be afforded by location and buffering from mechanical damage and pedestrian impacts. The advantages of planting small trees are lower material and planting costs, better plant acclimation, and lower initial maintenance requirements.

For street tree planting conditions, the preferred tree sizes are three and half (3 ½) inch caliper to four and half (4 ½) inch caliper. The intent is the size will insure that the tree will have reasonable visual effect at planting, be large enough to overcome the vulnerability to damage that smaller trees would experience and be small enough not to require extensive excavation and shipping cost that larger caliper sizes would cause.

At a minimum, specify an eighteen months' warranty period (after substantial completion of the plant material) where the plant material must remain in good health as the condition to accept.

When design calls for removal of trees, the Designer shall obtain approval prior to designating the removal of the tree(s). Designer shall submit a request for tree removal in the format required by the University Representative in conjunction with the University Landscape Architecture department.
When under construction, should conditions arise that may require consideration for removal of a tree(s), the Designer must submit for review the request for tree removal to the University Representative. Designer shall not direct any tree removal without prior written approval from the University. Ensure that all trees and shrubs or hedges shall be flagged by the Contractor for final field review with the University Representative in conjunction with University Landscape Architecture department.

Designer shall take into consideration when designing/specifying the removal of any tree, the University prefers that the tree(s) be taken down sectionally and directionally dropped to minimize damage to adjacent tree canopies or root systems. Consider root protection matting to prevent rutting and compaction within the tree canopy zone. It is preferred that all work be specified to be done by hand, bucket truck or crane operated equipment. The use of equipment should operate on existing pavement where practical. Ensure that any wood debris is to be removed each day. Only trees with stumps within deep excavation shall allow for excavator removal. All others, stumps are to be ground to 8" below grade and grindings raked and removed from site; with the holes backfilled with pre-approved topsoil and mulch or seed per project. The removal must be performed by a qualified Contract Arborist.

As a general rule type 1 and type 2 shade trees as well as select types of coniferous and broadleaf evergreen, as defined by the American Standard for Nursery Stock (current edition), shall not be within ten (10) horizontal feet from the center of the tree and the outermost edge of an existing or new utility structure. Utility structures shall include but are not limited to transformers, switchgear, vaults, valves, sump pits, drywells, ductbanks, storm drainage/storage structures, etc. Manholes may require as much as twenty-five (25) feet clearance to the equipment's serviceable sides.

Exceptions or deviations to the above distance limitations may occur based upon other types of trees, the type of utility, depth of cover over the utility or other contributing factors upon approval by the University Representative and in with conjunction with University's Landscape Architect and FO. All utility locations and tree locations shall be staked in the field with utility mark-outs prior to installation of any plantings for final approval by the University Representative in conjunction with the Landscape Architect.

Tree Tags
Designer shall specify tree identification tags, numbering and securing methods, as coordinated with the University Representative and approved by the University Landscape Architect. Approved specification shall require the Contractor to procure and install such tags in the

manner identified for all new or relocated trees that are planted as part of the Contract. Installation to be inspected by the University Representative prior to final acceptance.

7.19 Turfgrass

The University will accept varying materials and methods for establishing turfgrass in accordance with specific site conditions and scheduling constraints, however its preference is to use seed over sod. Sod may be specified only upon approval by the University Representative, in coordination with the project Landscape Architect.

The following grass seed blends have been developed in collaboration with its Plant Science department for use on campus. Substitutions may be proposed through completion of the design development phase and final selection will be approved by the University Representative prior to completion of the construction document phase.

Full Sun

- 30% Creeping red fescue (2 improved varieties)
- 30% Perennial ryegrass (2 improved, grey leaf spot resistant varieties)
- 20% Kentucky bluegrass (1 improved, mid-Atlantic type)
- 20% Kentucky bluegrass (1 improved elite type)

Partial Sun

- 30% Hard fescue (2 improved varieties)
- 20% Kentucky bluegrass (2 improved, shade tolerant varieties)
- 20% Creeping red fescue (2 improved varieties)
- 20% Chewings fescue (2 improved varieties)
- 10% Perennial ryegrass (improved, grey leaf spot resistant varieties)

Temporary Stabilization

- 40% Perennial ryegrass (2 improved, grey leaf spot resistant varieties)
- 40% Tall fescue (2 improved varieties, turf type)
- 20% Creeping red fescue (2 improved varieties)

Specific Blends for Special Areas:

Signature or Event Lawns (irrigated, heavy traffic)

- 30% Lacrosse Chewings fescue
- 20% Excursion Kentucky bluegrass
- 20% Shamrock Kentucky bluegrass
- 15% Diva Kentucky bluegrass
- 15% Sudden Impact Kentucky bluegrass

Waysides or Dry Areas

- 25% Shamrock Kentucky Bluegrass
- 25% Midnight Kentucky Bluegrass
- 25% Shadow II Chewings fescue
- 25% Gotham Hard fescue

The Contractor shall submit the following for approval by the University Representative:

- Watering or irrigation plan and schedule, including source of water and methods for encouraging drought tolerance, prior to installation
- Maintenance plan through Final Acceptance, prior to installation
- Biweekly reports monitoring performance and corrective actions, after installation

A minimum of 30-60 days of maintenance shall be specified at the discretion of the University Representative to ensure proper establishment and performance. Specific activities and standards of care for maintenance shall be determined during the Design Development phase between the University Representative and project Landscape Architect for incorporation in the Project Manual.

All areas receiving seed or sod shall include an application of pre-emergent, selective herbicide for controlling broadleaf weeds. When specified, erosion control mats shall be 100% natural and biodegradable, staked at regular intervals to prohibit movement, and not contain any synthetic netting or fibers. Turfgrass shall only be accepted upon completion of the maintenance period with healthy rooting and void of bare spots larger than 6” x 6” in any 10’ x 10’ area.

All projects should specify and include unit prices for the following:

Seeding

Seed establishment shall be installed on a properly prepared and amended topsoil via slit or drill seeding (6-8 lbs. per 1000 sf) followed by a heavy cover of hydro-mulch. This method provides good seed to soil contact improving germination and turf growth. All hydro-mulch be green in color; blue, teal or blue-green hydro-mulch will not be accepted.

Terraseeding may also be approved by the University Representative upon review of specified materials and methods.

Sodding

Sod shall be installed on a properly prepared and amended topsoil utilizing as wide a roll of sod as practical to minimize the number of joints and accelerate installation. Sod shall be installed on soil that has been watered prior to placement and shall utilize sod stakes on slopes greater than 3:1.

Where sod meets an existing turfgrass area, fine grading of soil shall be executed to allow smooth transitions from new to existing turfgrass areas. Changes in elevation, differential settlement, and visible joints between sod panels will not be accepted.

Turf Restoration

Turf restoration shall be performed in areas of the project that sustained light damage or disturbance but still has a viable stand of existing turfgrass. Prior to restoration the University shall review materials and methods for the restoration process, including but not limited to:

- Mowing
- Dethatching
- Core aeration
- Top dressings
- Pre-emergents
- Application rates for seeding

7.20 Mulched Areas

The type, color, texture, and depth of mulched areas should be reviewed with the University Representative prior to completing the design. Trees planted in lawn areas shall be planted with mulch rings. Brown double shredded pine bark mulch is preferred.

7.21 Irrigation

Given the constraints imposed by limited local water supplies, it is preferred that all planted landscape areas be designed to succeed without supplementary irrigation after the establishment period. With an annual rain- fall amount of over 40 inches, distributed relatively evenly throughout the year, it is reasonable to design the campus landscape without supplementary irrigation. It is recommended that all lawn and planting areas be supplied with planting soils designed with adequate moisture retention capacity, and that plant selection and grass seed mixes be suitable for non-irrigated landscapes. During the establishment period of all plantings, it is preferred that a watering program be implemented as part of the landscape installation contract. Designer shall review with the University Representative to determine a period of time suitable that will help guard against serious stress injuries during the establishment period when root systems are not fully balanced with top growth.

7.22 Grounds / Roads Maintenance Affects

When specifying plantings or hardscapes, low impact design should be considered. When project demands require grass or plantings to be installed outside the planting season and/or require a higher level of care and attention for establishment; consider alternate ways for the initial care of them such as “gator bags” for new trees or installation of an 8’ walkway to reduce snow blowing for snow plowing, or heated sidewalks at building entrances. Avoid 90-degree sidewalk intersections, choose a radius connection that assists in grass maintenance and minimizes foot traffic shortcuts. For areas where a mower is not able to access, consider other means of filling the space, design for good “mow flow”.

Design for snow clearing of all hard surface areas with a designated pervious area for snow storage.

The Designer shall provide with each project that impacts any University grounds, roads, and parking lots; a resource and cost loaded schedule for maintenance. Lineal and square footage of areas impacted shall be provided within the calculations for cost impact to the changes or additional areas. The staffing levels should be developed for various levels of attention utilizing the APPA Operational Guidelines for Educational Facilities. The levels of attention will be a 1-5 ranking with 1 being of the highest level of attention and 5 being total neglect of the property. Most of the property will be maintained at a level 1 through 3. Note that the lawns during peak times are mowed every four days. Annual gardens and pots are changed out no less than three times a year and 25% are four times a year.

7.23 Exterior Signage

The University limits the amount of banners, lawn signs and building signs that are allowed on the campuses. Any desired banners or temporary signs must be preapproved by the Sign Committee prior to final design and fabrication. Signs and banners that are fabricated and installed that have not been preapproved by the sign committee, will be immediately removed.

The University has approved seasonable banners for light poles in certain areas of the campus. When designing a new roadway or walking paths, review if seasonable banners will be required with the lighting. The desire for additional style banners shall have prior approval by the University Sign Committee.

The University's primary color palette is:

Navy Blue	Pantone 289C	C10	M75	Y12	K70	RO	G14	B47
White	Opaque White	CO	MO	YO	KO	R255	G255	B255
Grey	Pantone 430C	C33	M18	Y13	K40	R124	G135	B142

Construction Banners

University Communications has established the requirement of informational Project Construction Banners to be strategically placed on the perimeter construction fencing and scrim for each highly visible construction project. The background and graphics are determined by University Communications and the banners are the responsibility of the University. Include in the design specifications relating to the construction perimeter fence, the requirements for the Contractors are to install these banners. The Designer during the Site Logistics plan review should inquire as to the use of such banners on the project, which would be in addition to the basic green scrim.

Typical banner size is five (5) feet in height x twenty (20) feet in length or five (5) feet in height x thirty (30) feet in length and fabricated with Ultra Mesh Plus 8oz coated polyester scrim mesh, 4/0 color process, reinforced webbing on all sides with silver nickel grommets every 20" with 8" cable zip ties per grommet or pocket sleeve for cable wire for installation. Graphics shall be supplied by the University Representative in conjunction with University Communications.

Construction Project Signs

The Designer shall confirm with the University Representative if a Construction Project Sign is required. Such a sign is typically required for highly visible construction project. Such signs shall be forty-two (42) inch in height x seventy-eight (78) inch in length single sided, premium cast vinyl lettering or image mounted to MDO board; clamps for mounting to black paint wood posts with flat cap. Depending on the length of the perimeter fence will depend on how many of the signs will be required. The Designer is responsible for ensuring within the Construction Documents the location and information for the sign is included as part of the base bid. The Designer shall work through the University Representative to obtain specific information for the sign and how many shall be determined prior to 50% completion of the construction

documents. Such sign(s) shall be supplied and installed by the Contractor prior to commencing construction.

Wayfinding
Refer to Appendix IX Wayfinding Guidelines for details on building, gateway, secondary and regulatory signs.

8 Civil and Utilities Infrastructure Design Guidelines

8.1 Guiding Principles

The University has adopted a Master Plan for the Storrs and Depot Campuses. It is the responsibility of the Designer to review the Master Plan and consult with the appropriate University Representatives when approaching any design requirements for current and future demands on the utility's infrastructure. Designs must take into account future requirements and demands identified within the Master Plan that would impact any particular System whenever feasible.

Although these standards are generally for all campuses, the University's regional campuses have very different subsurface and environmental conditions, and therefore, an individual analysis of these conditions will be required. For example, the Avery Point campus has significant exposure to seawater and salts, and therefore all underground piping will need particular protection from corrosion. The Designer should identify and coordinate any changes to these standards with the University prior to any implementation of same.

The main campus is located in Storrs, Connecticut consisting of over 300 buildings situated on a 420-acre campus. Approximately 156 of these buildings receive heating steam and/or chilled water from underground distribution systems emanating from the central and south campus utility plants. There is a high-water table in a fair amount of the Campus, therefore proper due diligence should be performed when locating and designing for underground structures and duct banks.

The University has contracted with a Framework consultant whose responsibilities are to investigate, map and model the University's existing utility infrastructure. Any project that requires an increase demand on the existing utility infrastructure shall submit the full load demands of the building including the increase to the Framework consultant, who in turn will provide direction if the existing utility infrastructure can support the added demand. Should upgrades to the existing utility infrastructure be required, the Framework consultant shall be responsible to design those upgrades and identify the appropriate location for which any new service connections need to be made. Such connection designs shall be brought within 5' (five feet) of the intended building service entrance, and the design of the services from the connection points to the project, shall be the responsibility of the Designer.

Where possible, all utilities should come into one quadrant of the building. Distinction between all existing and new utility runs shall be shown on one composite drawing to make apparent any potential interferences. Such interferences and connections to existing shall be detailed on profile drawings for individual and common utilities to show elevations for construction and clearances from other utilities. The Designer shall model utility runs and connections to ensure proper coordination and clash avoidance has been performed. Assumptions must be brought to the University's attention to allow for further investigation prior to completing the design development phase documents. See Appendix II - Electronic Document and Plan Submission Requirements for additional information on document requirements.

In support of any utility upgrade/replacement, the Designer shall be responsible for test pits wherever necessary to confirm existing conditions, size and coordinate locations of the piping systems being impacted. Data information provided by the University shall not be assumed or solely relied upon as an accurate representation of existing conditions. Performing such investigation prior to formulating the design should greatly reduce the chances of change order work from the Contractor.

Survey and grading/excavation plans shall indicate all underground utilities and the effects of new grading. Existing topsoil and fill shall be planned for reuse wherever possible. Designer shall include detailed requirements relating to providing new or use of existing or disposal of existing soils. Refer to Section 5 on Site Planning for further details relating to Soils Analysis.

Full coordination of existing and proposed utilities and other appurtenances with proposed grading shall maintain the required depth and cover. Maintain appropriate distance from existing trees and proposed locations for new. Do not assume existing trees will be sacrificed. Refer to Section 5 on Site Planning for further details relating to tress and planting locations.

Where existing steam lines are running through the project limits, the Designer must ensure that any new utilities planned are to be a safe distance from the steam line. Where project constraints require a utility to cross over or under a steam line, the material specified for the pipe must not be PVC for that section of pipe crossing the steam line.

Where new steam lines are planned to be installed, the Designer is responsible for investigating the location and pipe materials of all existing utilities within the vicinity of the planned steam pipe run. Designer must include within the design documents replacement of any existing utilities PVC pipe materials that will be crossed by the installation of the new steam line. Each existing utility's pipe material shall be noted on the utilities design documents with the new steam line route for review with the University Representative in conjunction with FO. Refer to Section 5 on Site Planning for further details relating to utility runs.

The preference is to run utility piping within a paved area. All surface components of the utility system shall be located entirely within paved surfaces to the greatest extent possible. If

conditions do not permit such routing or locating components within paved areas, obtain approval from the University Representative in conjunction with the University's Landscape Architect to run the utilities piping under a landscape area. Follow the requirements of State of Connecticut Department of Transportation and these Design Standards for road and sidewalk repair requirements in these situations.

The University prefers not to abandon any piping or other structures underground. Should conditions identify existing piping or structures to be of an asbestos-containing material (ACM), where feasible it shall be removed before back filling upon prior inspection and approval from DEEP and University's Office of Environmental Policy. The Designer shall seek approval from the University's Representative in conjunction with the Office of Environmental Policy prior to assuming any abandonment of piping. If such removal is a hardship and the regulatory authorities approve the abandonment, the Designer shall have the pipe or structure located and coordinates documented on a separate CAD layer for abandoned material as an as-built for the University to register.

It is the Designer's responsibility to coordinate all proposed underground piping locations with existing and proposed landscaping to ensure that no tree or large plantings will be affected.

Refer to Section 5 for additional requirements for Utilities, Landscapes, Hardscapes and Plantings

All connections to the campus steam, condensate, and chilled water systems shall be coordinated with the University Representative in conjunction with FO for that campus. The Designer shall be responsible for providing within their Design Schedule and requiring that of the Contractor's Construction Schedule, the anticipated milestone of at least 14 days' advance of any tie-ins or shutdowns required to facilitate a tie-in. The University Representative in conjunction with FO has final authority on any and all scheduling of shutdowns, outages, etc., for connections and tie-ins. In many instances, connections can only be made during a planned outage or shutdown such as the University's standard shut down for maintenance of the steam and condensate lines in May of every year. For this reason, connections are only typically made when weather conditions permit such work.

It is the responsibility of the Designer to ensure that specified piping and their submittals provide a Certificate of Compliance verification to ensure quality assurance and controls are being performed.

Design to ensure backfill with clean stone a minimum of twelve (12) inch below all underground piping and eighteen (18) inch minimum on either side of the piping. If piping is designed to cross wherein the amount of stone would be less than these standards, obtain direction from the University Representative for deviations to the standard.

Refer to Section 5 Site Planning Guidelines for more detailed requirements relating to utility locations.

The Designer shall include within each specification section that involves underground utility work, that the Contractor must take digital photos to capture seventy-five (75) percent of the progress of the underground work. Contractor must take finish conditions of the work prior to back filling. Should the Contractor fail to take photos of the condition of the work, the Designer and/or Owner reserves the right to require the Contractor to uncover the work for inspection at the Contractor's expense.

The University has an Environmental Title V air permit that will need to be updated for all projects, Designer shall provide the necessary updates by working with the University Representative in conjunction with the EHS Representative.

8.2 Manholes and Sump Pits

Any below ground enclosure shall have a four-receptacle electrical outlet and an IP68 2G enclosure (or equivalent).

8.3 Utility Service Metering

Utilities supplied by the University shall be metered and monitored utilizing the preferred electronic
software which will be compatible with what electronic monitoring that already exists in the building or within the vicinity around a new building. The Designer is responsible for obtaining approval from the University Representative in conjunction with FO on the most appropriate monitoring software for
the project application, prior to finalizing the Design Development Phase.

All primary meters shall be located and installed at the building service entrance.

All campus buildings larger than 20,000 gross square feet (Electric, Steam with Condensate Return,
Chilled Water, Domestic Water, Reclaimed Water and Natural Gas) shall be equipped with utility service metering. Utility service meter data shall be logged into the University's GE IFIX Supervisory Control and Data Acquisition (SCADA) metering platform and stored in the PI Historian data server. For buildings smaller than 20,000 GSF, if existing utility service sub-meters are present, the Design is responsible for obtaining verification from The University Representative in conjunction with FO on whether the equipment should be retained or improved upon.

Under no circumstances shall the Building Management System (BMS) be assumed or utilized as a conduit for sub-metering data. Some of our existing BMS interfaces have become obsolete and can no longer being supported by the vendor resulting in continued security issues. In all cases, meters shall be accessible via Modbus/TCP with gateways suitable for use in a multi-master topology. Baud rates shall not necessarily use the minimal default 9,600 bits per second

(bps) but be as fast as possible given the physical layout of the system not to exceed 57,600 bps. Serial links shall use 8-bit no parity and 1-stop bit frames (8N1 serial) and, when possible, 4-wire full duplex serial communications. This topology shall provide access to direct reads of the meter registers. Under no circumstance shall in-direct measurements (i.e., pulse meters to integrators when the registers can be read directly if properly specified) be taken that will not directly reconcile the display to the internal registers on the meter unless prior approval ahs been obtained by FO.

The peripheral areas of the Storrs campus mostly do not have chilled water, steam, and potable water supplied by the Central Utility Plant (CUP) and Cogeneration Facility (Cogen). In those instances, the private utilities will be responsible for any metering. Buildings larger than 20,000 GSF serviced by the local utility, an output device to the University metering network may be required. The Designer is responsible for confirming with FO if the remote property will be serviced by the local utility company. In these instances, follow the metering requirements of that local utility. A separate raceway shall be specified to support phone lines for meter reading transmission on time of use rates service provided by Eversource to the University. All meters shall be installed exterior to the building unless pre-approved by FO for third party access to equipment via key provided to the utility company; this key shall not be a general-purpose University mechanical key.

Refer to specific utility sections to obtain specifics on metering.

8.4 Marking Requirements

The University requires all new and replacement utilities piping installations to provide marking tape that follows the AWPA standard color recommendations for various utilities. Such marking tape shall be minimum 4" wide and detectable magnetic plastic tape manufactured specifically for warning and identification of underground piping. As an example, the tape could contain the words "CAUTION - steam distribution piping" or similar wording dependent on the utility being identified. This tape shall be installed no more than 12 inches below finished grade.

8.5 Utility Quality Control

As part of the submittal requirements, require that a certification is provided by the manufacturer of the piping system to include the following; 1) from the manufacturer recognizing who the Contractor or Subcontractor is who will be installing the system and that they are a certified installer for their manufactured system, and 2) that the manufacturer provides the name and contact information of a knowledgeable technically trained Manufacturer's Representative who shall be assigned to witness/oversee the project's installation of the system and that such representative is a recognized agent of the manufacturer who has the authority to provide an unconditional certification which shall ensure an warrantee/guarantee of the installation. Daily logs of the installation shall be required from the manufacturer's representative inspecting and witnessing the delivery, trench preparation/fill, installation of the piping, connectivity and any issues and/or discrepancies with

the installation. Note any corrective actions, if any, given on the installer, follow-up to the corrective action given and date the correction was performed to the satisfactory of the Manufacturer's Representative or if no corrective action was taken, such information shall be immediately reported (in writing) to the University's Representative regardless if corrective action has been performed.

Include testing of all pre-insulated conduits by a pneumatic pressure test at 10psig for a minimum of one hour. Note that if the Contractor fails to provide sufficient notice for testing to be arranged and performed, all cost associated with obtaining confirmation testing shall be borne by the Contractor. Additionally, incorporate that the Contractor must take sufficient steps to prevent pre-insulated pipe from getting wet. If pre-insulated pipe does get wet, remove affected sections shall be removed and disposed of at the Contractors expense. Contractor shall provide a final dryness acceptance test acceptable to the manufacturer's authorized agent (by written acknowledgement) and submit the procedure for verification for dryness to the Designer for acceptance.

Design for backfill to be placed at a minimum of a 6-inch layer of sand or pea gravel, tamped in the trench to provide uniform bedding for the conduit and the entire trench be similar to the bedding in 6-inch compacted layers to a minimum height of 6 inches above the top of the conduit. Require the bedding and backfill materials be a submittal for approval by the designer and manufacturer. The composition of backfill and compaction are extremely important to prevent settling and shifting of conduit, disruption of link seals, etc. therefore require that confirmation of approved material and compaction tests are performed by an independent testing agency on length of trenches of twenty (20) feet before additional backfilling is performed. Note that if the Contractor fails to provide sufficient notice for testing to be arranged and performed or if the compaction tests fail, all cost associated with obtaining confirmation testing shall be borne by the Contractor.

Hot taps are typically discouraged, however may be acceptable under certain conditions when allowed by the University Representative in conjunction with FO, EHS and DPiS. To ensure a quality installation, the Designer shall include within the specifications that at least 20% of the field welds shall be x-rayed by an independent qualified testing agency. Such test locations shall be identified with the testing agency in the field by the Designer. Any tests that fail shall be repaired and retested at the expense of the Contractor. Any welder that fails three weld tests shall be removed from the job and the welds that were performed by the welder, shall all be tested, repaired and retested at the Contractor's expense.

8.6 Potable Water

Potable water originates at the University's owned wellfields along the Willimantic and Fenton Rivers where it is treated and pumped to a 5.4-million-gallon reservoir located on the North end of campus. From there, it is pumped via the high-head pump house to a water distribution system serving the University and portions of the surrounding community. The potable water distribution system includes all mains and service laterals plus the iconic water towers

(standpipes) emblazoned with the husky logo on the North end of campus. It also includes a 1 MGD interconnection with Connecticut Water prior to the 5.4MG reservoir. This connection normally provides the water being delivered to the surrounding community but is available to supply more the University should one or more of the wells become inoperable.

The University has retained the services of New England Water Utility Services (NEWUS), a subsidiary of Connecticut Water (CTW) as its water system operator. New installations as well as all changes to the University water distribution system shall comply with these standards and specifications. Any deviations shall be submitted to the University Representative in conjunction with FO for approval.

New designs shall provide for redundancy for potable water mains and adhere to all State of Connecticut, Department of Public Health Regulations related to the design and installation of potable water systems.

Fire water service does not require a separate line from the potable water service; however, the fire service must branch off before entering the building and must have a backflow preventer. Where feasible and for buildings exceeding 250,000 square feet, redundancy fire service shall be included. Water piping should be ductile iron Class 54 double cement lined with mechanical restraints on all joints. Cover pipes per Factory Mutual requirements.

Water Metering

It is the Designer's responsibility to design the metering system based on the parameters set forth. Domestic and reclaimed water sub-meters shall be in-line meters installed at the building service entrance on the primary line and shall utilize either positive displacement, differential pressure or velocity technology. Meters are not to be install on secondary lines. Insertion type meters are not acceptable for metering of utility services at the building service entrance. These meters shall monitor domestic or reclaimed water flow rate (GPM) and accumulated flow (gallons) for high and low flow conditions. Single meters with two registers for high and low flow are acceptable. Meters shall utilize solid state absolute encoder Automatic Meter Reading / Advanced Metering Infrastructure (AMR/AMI used interchangeably herein) style meters with integral accumulators and hardwired communications using proprietary serial format. AMR style registers using FCC licensed or unlicensed radio communications shall not be specified, however in some cases the antennae can be removed to get the required serial link. Pulse meters connected to BMS components are not acceptable. However, pulse meters connected to manufacturer external accumulators with modus communications are acceptable provided suitable enclosures and Modbus gateways are provided to provide Modbus/TCP. Meter registers shall follow AMR/AMI Standard C707-05 for remote hardwired reads of 8-digit resolution minimally and shall be installed with C707-05 compatible Modbus/TCP interfaces reporting the accumulator and reporting flow. Flow may be derived from the accumulator but the accumulator in general shall not be derived from the flow. Registers shall require no external power to operate but may include integral batteries having a nominal life of 10 years minimally.

Acceptable manufacturers for meters and registers are as follows:

Neptune utilizing E-Coder Plus compatible register, 8-digit serial remote read, Ethermeter for accumulator and flow Modbus/TCP reporting. Note one Ethermeter supports two-meter registers for high/low flow. Contact manufacturer for other compatible gateways to the Scadametrics Ethermeter. SCADA gateway must support AWWA C707-05 communications and 8-digit minimal read resolution.

ISTEC using Modbus RTU #9503M remote head for flow and accumulator and project provided Modbus gateway. Not preferred as many do not contain an integral read display on the register.

Sensus Omni T2 series, or similar AWWA C707-05 compatible AMR meter register, with Ethermeter SCADA gateway like the Neptune meters described above.

Utility Grade AMR meter with C707-05 compatible serial AMR read registers having 8-digit resolution minimally may be acceptable.

Include within the specifications that the installation and setup of meters shall comply with the manufacturer's instructions. It is the Designer's responsibility to ensure minimum pipe diameters before and after the meter are specified. Combined low flow and high flow meters with corresponding registers shall be designed for larger volumes that are highly variable. Other water meter configurations may only require a single meter and register; these meters shall be selected and sized to meet the minimum turndown ratio of 15:1 relative to the building's domestic or reclaimed water design capacity. Isolation valves shall be specified upstream and downstream of the meter for maintenance purposes. For velocity turbine-type high flow meter installations, a strainer shall be specified ahead of the meter location to prevent damage to the meter. Strainers are not required for other water meter technologies. Designer to require the meters to be installed before the backflow preventers and meter registers installed in an upright position and maintain its accessible and adequate clearance for meter assemblies as required by the meter manufacturer instructions. The location shall not exceed 6 feet above the finished floor as measured at the top of the meter assembly.

All domestic or reclaimed water meter devices shall communicate with the campus network via Modbus/TCP. Specify a data drop (confirm type with the University ITS) and power source (120 VAC) near the meter location for Modbus/TCP communications and include within the specifications the software systems technical representative to program the meters into the University's GE IFIX SCADA metering platform and PI Historian data server. Specify the device to be contained within an enclosure mounted on the wall near the meter, data drop and power source location. The device will require a surge protection device also contained within the enclosure. The 120 VAC power source shall have a disconnect switch installed on the outside of the enclosure. Should a disconnect switch cannot be readily and easily accessible to the meter location, a lockage disconnect switch shall be specified. All wall mounted enclosures and meter peripherals are to be specified to be mounted at approximately 6 feet from floor or as close as possible for serviceability. Ensure proper coordination on location of

equipment, power and data sources and enclosures with other surrounding existing equipment or intended new installations.

The University has determined that the following manufacturers provide the performance criteria desired from a hydronic meter: Flexim, Rosemount and Yokagawa.

Water Piping

Carrier pipe for potable water shall be ductile-iron, Class 52 double cement, double mortar lined with double bituminous seal coating inside, with push on style joints. If flanged pipe is required, it shall be Special Class 53 with ductile iron with threaded flanges.

Pipe of various sizes shall have a minimum wall thickness as follows:

Pipe Diameter	Class of Pipe minimum thickness		
inches	52	53	54
4	0.29	0.32	0.35
6	0.31	0.34	0.37
8	0.33	0.36	0.39
10	0.35	0.38	0.41
12	0.37	0.40	0.43
14	0.39	0.42	0.45
16	0.40	0.43	0.46
18	0.41	0.44	0.47
20	0.42	0.45	0.48
24	0.44	0.47	0.50
30	0.47	0.51	0.55
36	0.53	0.58	0.63

Cement mortar lining minimum thickness shall be as follows:

Pipe Size (inches)	Minimum Lining Thickness (inches)
3-12	1/8
14-24	3/16
30-54	1/4

The University has determined the following Manufacturer(s) to be of acceptable quality of Ductile Iron Pipe; Atlantic States Cast Iron Pipe Company, American Cast Iron Pipe Company, Clow Water Systems Corporation or Griffin Pipe Products Company

The University has determined the following Manufacturer(s) to be of acceptable quality of restrained Joint Ductile Iron Pipe: United States Pipe & Foundry Company (TR Flex) or Clow Water Systems Corporation (Super-Lock)

Installation of Ductile Iron Pipe

The Designer shall incorporate into the specifications, careful examination of the pipe for defects before and during installation. Under no circumstances shall defective pipe be installed which is known to be defective. If any defective piece is discovered after having been installed. All pipes and fittings shall be thoroughly cleaned before they are installed and shall be kept clean until they have been accepted in the completed work.

Each piece of pipe and each fitting shall be installed upon blocking set at no less than two (2) different points along its length. The blocking shall be sound timber two (2) inches thick, twelve (12) inches wide and of a length equal to the diameter of the pipe. Wedges twelve (12) inches long, of four (4) inch by four (4) inch sound timber, shall be placed on the blocking to hold the pipes and special castings in position.

Require that blocks shall be firmly bedded on the trench bottom slightly below the grade of the finished pipe before the pipes are placed. After the pipes have been lowered into the trench, the wedges shall be placed and adjusted so as to bring the pipe to proper alignment and grade.

Joints

The Designer shall require all pipe joints be push-on type rubber gasket unless conditions dictate otherwise and employing a single, elongated grooved rubber gasket to affect the joint seal. All fittings and valves shall be of the mechanical joint type unless conditions dictate otherwise. Ensure all joints shall conform to the applicable ANSI requirements.

Acceptable quality of push-on locking or mechanical joint locking gaskets: "Field Lok" by U.S. Pipe, "Sure Stop 350" by Mc Wane, Griffin Talon RJ Gasket or approved equal.

Rubber Gasket Joints

The Designer shall require rubber gasket joints of the compressed rubber ring gasket type. Ensure the joints shall be thoroughly cleaned, prepared and installed in strict accordance with manufacturer’s recommendations.

Only rubber gaskets furnished by the manufacturer of the pipe shall be used. Gaskets which have become damaged or which are defective in any way shall not be used in the work. Include that gaskets shall be stored in a cool, dark and dry place and shall be kept warm prior to their use in cold weather. Jointing materials shall fully comply with and be installed in accordance with the manufacturer’s requirements.

Encasements

Design to include polyethylene encasement installed around the water main in accordance with AAWA C105-99, whenever the following conditions exist:

- A water main crosses above or below a gas main (includes metallic natural gas, jet fuel, fuel oil, and any other lines employing the use of a cathodic protection system). Encasement shall extend a minimum of 10 feet to either side of the crossing.
- A water main runs parallel to a gas main and is within ten feed of the gas main.
- A water main is installed in corrosive soil, i.e. cinders, swamp, meadow mud, area of salt water intrusion, etc., therefore the piping system shall be wrapped the entire length.
- A water main installed within 100 feet of an impressed current cathodic protection anode bed, it shall be wrapped the entire length.

Ensure the encasements be installed in accordance with AWWA standard C105-99 method "A", or latest revision. Direct the Contractor to cut to a length approximately 2 feet longer than that of the pipe section and have a 1-foot overlap of the tube around the pipe, provided at each end. Lower the pipe into the trench and make up the pipe joint, overlapping the wrap at the joint.

Valves and Valve Boxes

Valves shall be provided as necessary to facilitate normal operation, future work, and to mitigate the effects of a pipe break. Valves shall be provided with valve boxes brought to the surface with a lockable cover and located in planting beds or green landscaped areas with plantings to camouflage. To the extent that is not possible, valves shall be located under sidewalks. Valve boxes for valves under sidewalks shall be equipped with access rings and plates made of stainless steel. To the extent possible, avoid installing piping and valves under roadways and great lawns.

Valve boxes shall include an adjustable collar and have a “right to close” (Clockwise) handle.

Check valves shall be cast iron, with flanged ends suitable for potable water. Acceptable manufactures include Val-Matic Surge Buster, Stocholm or Crane.

Ensure that valves are set with their stems truly vertical. Valve boxes shall be carefully placed to insure the free and proper operation of the valves.

Non-rising stem shall be resilient wedge. The University has determined the following Manufacturer(s) to be of acceptable quality of isolation valves: Mueler, Stocholm or Crane.

If a Watts backflow preventer is specified, a 909 model shall be specified.

Trenching

The Designer shall ensure test holes shall be excavated in advance of pipe laying where directed by the Company to determine the occurrence, location and dimensions of existing sub-surface structures and

character of foundation material. They shall be backfilled in the same manner and with material similar to that specified for the upper portion of pipe trenches.

Backfill

Backfilling material for at least one (1) foot above the top of the pipe shall consist of selected fine material containing no stones larger than one-half inch in size. Backfill of the fine selected material shall be carefully and thoroughly tamped with approved tools in such a manner as to prevent settlement. Special care shall be taken to place the best sandy or gravelly material under the pipe on the quarters and to bring it up solidly so as to furnish a hard bed for the whole of the lower part of the pipe.

The required backfill above the one-foot layer of fine selected material may be placed in one layer provided it is compacted by means of a hoe-pack to achieve a 95% modified proctor density. If a hoe-pack is not used, the backfill shall be spread in layers not exceeding twelve (12) inches in depth prior to compaction. Each layer shall be carefully and thoroughly tamped with approved tools in such a manner as to prevent settlement after the backfill has been completed and to achieve a 95% modified proctor density. If in the opinion of the "Engineer or Inspector" the compaction of the backfilled trench is not suitable, compaction tests will be required to verify that proper compaction was achieved. All costs for compaction tests will be borne by the Contractor.

Blue marking tape reading "Caution - Water Line Below" shall be placed a minimum of 24" above the top of the water main.

The use of frozen material will not be permitted. The excavated paving, either bituminous or other, shall not be placed in the trench as backfill.

All settlement in backfill shall be repaired by the Contractor at his expense.

Prior to placement of permanent pavement all trenches shall have sufficient compaction to achieve a 95% modified proctor density.

Bank Run Gravel

Bank run gravel shall have a gradation within the limits given below. It shall be obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted. It shall not contain vegetation, masses of roots, or individual roots more than 18 inches long or more than 1/2 inch in diameter. It shall be substantially free from loam and other organic matter, clay, and other fine or harmful substances.

Sieve Size	Percentage by Weight Passing
6 inch	100

3-1/2 inch	90-100
1-1/2 inch	55-95
¼ inch	25-60
No. 10	15-45
No. 40	5-25
No. 100	0-10
No. 200	0-5

Select Gravel

Select gravel shall have a gradation within the limits given below. It shall be obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted. It shall not contain vegetation. It shall be free from loam and other organic matter, clay, and other fine or harmful substances.

Sieve Size	Percentage by Weight Passing
3 inch	100
½ inch	80-100
No. 4	60-80
No. 200	0-10

Handling

Proper and suitable tools for safe and convenient handling and installation of pipes, fittings and valves shall be used. Great care shall be taken to prevent damage to the protective coating. Minor damage to exterior coating may be patched with asphaltum. Excessively damaged material shall be removed.

Cutting Pipe

Pipe shall be cut by means of a pipe saw or other approved method in accordance with the manufacturer's operating instructions for the equipment to produce a clean true cut, free from irregularities and leave a smooth end at right angles to the axis of the pipe. All bevels shall be made with appropriate grinding equipment

Quality Assurance and Control

Ensure that the Contractor has been fully informed of exercising care in planning the work to arrange for the proper setting of all fittings, valves and other appurtenances required in the completed pipelines. Fittings shall be properly supported with additional blocking if required to maintain the pipelines in alignment. All bends and tees shall be securely anchored by poured concrete blocking. After installation, all friction clamps, thrust rods and miscellaneous exposed metal threads are to be coated with asphaltum.

Valves shall be adequately supported (blocked), but accessible during construction.

Ensure requirements within the specifications for proper testing of the pipe once installed and prior to being backfilled.

- **Pressure Test**:
  All newly installed pipe shall be subjected to a hydrostatic pressure test equal to 1.5 times the working (system) pressure at the point of testing, but in no case less than 1.25 times the working pressure at the highest point along the test section. Under no circumstances shall the test pressure exceed pipe or thrust restraint design limits or be over two times the rated pressure of closed valves or hydrants located within the test area, or the rated pressure of closed resilient-seated gate or butterfly valves. Unless otherwise specified, the test pressure shall be maintained for a minimum of two hours with no more than a 5-psi pressure drop.

  Before applying the specified test pressure, all air shall be expelled from the pipe. If hydrants or blow offs are not available at high places, the Contractor shall make the necessary taps at points of highest elevation before the test is made and insert the plugs, if desired, after the test has been completed. The section to be tested shall be closed by valves, temporary flanges, plugs or bulkheads as required.

- **Leakage Test:**
  The leakage test will be conducted at the same time as the pressure test. Leakage is the quantity of water required to maintain the pressure within 5-psi of the specified test pressure, it is not the measured drop in pressure. Leakage shall not exceed the number of gallons per hour as determined by the engineer.

  Each valve section of pipe shall be slowly filled with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the inspector. The pipe connection and all necessary apparatus including pump and testing gauge shall be furnished. The Contractor shall notify the Designer when testing will be performed for witnessing.

  If leakage is either visible or indicated by the above test procedure, the Contractor shall do whatever is necessary to locate and replace the pipe at his own expense. Upon completion of the replacement the pipeline shall be retested.

- **Disinfection:**
  Before any section of pipeline is put into service, it shall be thoroughly disinfected in accordance with AWWA Standard C651-99, Section 4.4.2.

  Chlorine tablets (5 G calcium hypochlorite) shall be supplied and placed by the Contractor on the inside top of each length of main as it is laid using Permatex No. 2 adhesive or equal. The number of tablets used per length of pipe shall be as is indicated in Table 2 of the above specified AWWA Section (one for 6", two for 8", four for 12", etc.).

  The completed line shall be slowly filled with water and allowed to stand under pressure for at least 24 hours before being thoroughly flushed. A sample of water from the section shall be collected for analysis in a sterilized bottle by CWC.

  Should the analysis be unsatisfactory, the section shall be disinfected again and retested until an analysis satisfactory to CWC is obtained. All costs for additional disinfection and retesting shall be borne by the Contractor.

8.7 Steam and Condensate Systems

On the Storrs campus, steam is generated at the CUP and is distributed throughout the Storrs campus through a piping distribution system. And condensate return water is brought back to the CUP. The pressure is reduced for the steam distribution to 65 psig and a design temperature of 350°F. Condensate is returned to the power plant using gravity or pumped condensate return piping systems at temperatures ranging from 125ºF – 180º F.

Where it is economical, it is preferred that all condensate and steam piping shall be installed in either a central utility tunnel or a dedicated steam tunnel. All tunnels shall have a mechanical ventilation system to allow non-permit confined space entry, LED lighting along the full length, and 120-volt convenience outlets at no greater than a fifty (50) foot intervals.

When a tunnel is not feasible, pre-Insulated (pipe in conduit) piping systems shall be used. Pre-insulated piping systems are used for steam, pumped condensate and high-pressure condensate (trap) lines and include all pipe, fittings, anchors, transitions, expansion loops, field joints, etc., to a point designated on the drawings inside a building, tunnel, or manhole wall. Carrier pipe insulation shall be aerogel. Mineral wool is not allowed. Pipe and conduit shall be factory coated with high solids, inorganic, zinc rich coating, 4 mils thick. Welds shall be touched up with a cold galvanizing compound before being insulated and covered with a pressure testable field joint. Exposed ferrous piping (inside of vaults) shall be coated with a two-part epoxy rated for 450F, similar to Sherwin Williams Core Cote, HT, FF, 10 mils prior to being insulated with calcium silicate and covered with aluminum jacketing.

Valves and traps should not be coated with the epoxy. They shall be insulated with removable thermal blankets similar to Insultech by Shannon Industries or approved equal. Insulation thickness in accordance with manufacturer standards for 125 psig steam.

Steam Piping

Carrier pipe for steam shall be domestic carbon steel, schedule 40, ASTM A106, Grade B, seamless. Fittings for steam shall be domestic carbon steel, standard weight, ASTM A106, Grade B, seamless. Certified Mill Test Reports for the steel used in the piping must be submitted for approval prior to installation. Steam piping must be produced and supplied by providers who are ASME certified installer for Pressure Vessels. Include in the requirements that the installing contractor must be manufacturer certified installers of the system at the time of bid and that they must provide an updated manufacturer's installation certification recognizing their firm as the certified installers for the system.
Include within the bid form, the Contractor must identify the manufacturer of the piping system to which their bid is based on and identify the firm's name who is a recognized certified installer of the manufactured system identified.

Pre-insulated piping systems shall be supplied with an HDPE outer jacket. Thickness shall be per manufacturer's specs but not less than 150 mils (for condITS < 15-in.) or 175 mils (condITS > 15-in.).

The system shall have vault water level monitoring and low point detection capability that is compatible with the University's Andover Continuum monitoring program. Break detection cables shall be within the outer insulation jacket of the pipe systems. All exposed pipe, thread-o-lets, end-seals, etc. shall be coated with an epoxy, inorganic zinc, or other corrosion prevention coating designed to protect ferrous materials in a salt spray environment. Where possible, provide a spring assisted soft seat check valve in casing vent lines, in lieu of a swing check (flapper style). Vaults shall have gravity feed to sanitary system where possible.

Wherever possible, design straight sections of forty (40) foot lengths to minimize the number of field welds. All fittings, anchors, and accessories shall be designed and prefabricated to job dimensions to minimize the number of field welds. All field joints shall have a heat shrink sleeve applied.

Steam Pipe Metering

It is the Designer's responsibility to design the metering system based on the parameters set forth. Steam utility service sub-meters shall be designed to enter at the building service entrance and will utilize either vortex shedding or differential pressure technology at a serviceable location not to exceed 6 feet above the ground as measured from the top of the meter assembly. If multiple service entrances or multiple steam sub-meters are required in a single building, the multiple sub-meters will be summed together to obtain a building level steam measurement. If more than one building steam service is included with the steam service entrance for a given building, the other buildings' steam service will be subtracted to obtain the individual building service measurement. Installations may require modification of the steam pipe to allow for metering of this utility service.

In-line meters shall be designed to enter at the building service entrance locations. Insertion type meters are not acceptable for steam metering of utility services at the building service entrance. Specify for horizontal steam pipe configurations, meter transmitter shall be installed below the steam line. For vertical steam pipe configurations, specify meter transmitter can be mounted in any location around the circumference of the pipe. Include in the specifications, transmitters should be direct mounted to the meter location. Transmitter remote mounts may be used with 316 stainless steel tubing. Specify the selected meter location must be accessible and allow for adequate clearance for the manifold and transmitter as required by the meter manufacturer instructions.

Steam meters shall be selected and sized to meet the minimum required turndown ratio of 15:1 relative to a building's steam design capacity. Steam meter specifications shall comply with the manufacturer's instructions, including minimum pipe diameters before and after the meter, as required. Steam meters shall be provided with compensating temperature (deg. F) and pressure (psi) sensors. A removable insulation jacket shall be specified to wrapped around the steam meter location after installation is complete for maintenance purposes.

Isolation valves shall be specified upstream, in the same room, and downstream of the steam meter and with full incoming pipe diameter bypass with isolation valve installed around the steam meter for maintenance purposes. A local 1/2-inch Weldolet (an economical butt-weld

branch connection) with a 0-100 PSI pressure gauge with a siphon and snubber must be specified before the first isolation valve on the incoming steam header. A shutoff valve shall be specified to allow the pressure gauge to be serviced. Blowdown provisions shall not be designed above sensitive equipment that could be damaged by bursts of steam.

The University has determined that the following manufacturers provide the performance criteria desired for steam meters: Veris (Differential Pressure – Accelabar), Rosemount (Vortex Shedding or Differential Pressure – Conditioning Orifice) or Yokogawa (Vortex Shedding).

The University has determined that the following manufacturers provide the performance criteria desired for transmitters are as follows: Rosemount, Autrol or Siemens.

A steam flow computer shall be installed with the steam meter to calculate steam mass flow rate (lbs/hour) and accumulated thermal energy (Unless otherwise directed, accumulated thermal energy units will be in lbs). The steam flow computer will be programmed by the manufacturer based on a building's steam design capacity and steam pipe size.

The University has determined that the following manufacturers provide the performance criteria desired for steam flow computer manufacturers are as follows: KEP (Model ES762), Rosemount or Yokogawa.

All steam meter devices shall communicate with the campus network via Modbus/TCP. Designer shall coordinate with the University Representative in conjunction with ITS will be required to install a data drop near the meter location for Modbus/TCP communications. Steam meter instrumentation and communication devices will require the installation of 120 VAC power source near the meter location. Close coordinate with the University's Representative in conjunction with FO will be required for the installation of the power source and to program the meters into the University's GE IFIX SCADA metering platform and PI Historian data server. The communication device and flow computer shall be contained within an enclosure mounted on the wall near the meter, data drop and power source location. The communication device and steam flow computer will require a surge protection device also contained within the enclosure. The 120 VAC power source will have a disconnect switch installed on the outside of the enclosure. If the 120 VAC disconnect switch is not readily and easily accessible to the meter location, a lockage disconnect switch must be installed. All wall mounted enclosures and meter peripherals should be mounted at approximately 6 feet from floor, or as close as possible, for serviceability.

Steam Valves

Steam valves should be accompanied by an appropriately sized warm up bypass valve with a blowdown drain valve behind it, ideally located so that the entry into the steam vault is not required to operate. Class 3 carbon Steel flanged, triple offset butterfly valves with nickel plated steel disc and stainless steel/graphic seal shall be used. Manufacturer(s) with acceptable quality of steam valves are; Zwick, Crane, or Quadax.

Steam Traps

The Designer shall be aware of the danger of injury or death that might occur due to condensate induced water hammer (CIWH). Steam traps should be provided for the removal of condensate at collection points in the steam piping systems, at drip legs and at terminal ends of companion piping. All low points in steam lines and the ends of long headers should be provided with drip legs and traps. On headers with long sections, drip legs should be installed at intermediate points in addition to those at low points and at the ends. Steam traps should be installed to be accessible for periodic inspection. Each trap should serve only one collection point and shall be properly sized for both flow rate and ANSI pressure rating. Steam trap discharge lines shall be sloped for drainage. The Designer shall apply the trap manufacturer's recommended safety factor when sizing traps but in no case shall a safety factor of less than 3 be used. Isolation valves shall be before the strainers but after the trap. Isolation valves shall be carbon steel 150 lb ball vale design. Strainers with blow down valves shall be located ahead of each float and thermostatic (F&T) trap.

Trap lines (Schedule 80) shall run separate independent pre-insulated steam conduit to a flash tank located outside of a building, vault, man-safe culvert, or manhole. Do not run it in the annular space.

Steam Seals

Gland seals shall be used whenever there is a penetration to a vault or building to prevent the influx of moisture into the conduit. End seals shall not be used. Sub-assemblies shall be designed to allow for complete draining and drying of the conduit system. In a vault, insulation shall be split rigid held in place by stainless steel bands installed on at least eighteen (18) inch centers with aluminum jacket.

It is important that the specifications call for the Supplier to analyze the layouts for stress and thermal movement of the carrier pipe and design accordingly and design to allow for complete draining and drying of the conduit system. The Supplier must certify that their field representative is experienced in the installation of the system and that they will be present and conduct inspections of the work at certain but not limited intervals such as; unloading and staging of the material, preparation of the trench, installation of expansion loops, anchors, field joints, hydrostatic testing of the pipe, pneumatic testing of the outer jacket field joints, repair of any patch work and the back filling of the system. Include that the Contractor shall coordinate with the System's Representative their inspection at each interval and provide a daily report to the Designer the activities noting any issues or discrepancies whole inspecting. Include that should the Contractor fail to coordinate with the Supplier's field representative and Supplier's field representative cannot attest and certify the entire installation is in accordance with manufacturer's installation requirements, the Contractor shall be required to uncover any portion of the installation of the system for proper inspection by the Supplier's field representative.

All steam piping shall have a seventy-five (75) year service life.

Condensate Piping

The condensate minimum design pressure shall be 125 psig saturated steam. The condensate operating system pressure is approximately 25 psig liquid and a design temperature of 190°F. Certified Mill Test Reports for the steel used in the piping must be submitted for approval prior to installation. Steam piping must be produced and supplied by providers who are ASME certified for Condensate Piping installation. Ensure proof of certification must be submitted for approval prior to installation.

Carrier pipe for condensate shall be domestic carbon steel, schedule 80, ASTM A106, Grade B, seamless. Fittings for Condensate piping shall be domestic carbon steel, schedule 80 (extra strong), ASTM A106, Grade B, seamless.

The University has determined the following Manufacturer(s) to be of acceptable quality for steam and condensate piping include Rovanco (Insul-800 High Temp Conduit), Perma Pipe (Multi-Therm 500), and Thermacor (Duo-Therm 505).

Require that conduits be pressure tested and field enclosures be electric thermo fusion.

Condensate Pipe Metering

It is the Designer's responsibility to design the metering system based on the parameters set forth. All campus buildings with steam utility service have corresponding condensate return to the Central Utility Plant and Cogeneration Facility. Condensate return is currently metered at the CUP and Cogen. Sub-metering of condensate return is not required at building locations at this time. However, future considerations to meter condensate return for larger energy and water-intensive buildings should be confirmed in writing from the University Representative in conjunction with FO.

If it is determined by the University to install condensate return sub-meters, they should be installed at the building service entrance/exit on the primary loop and shall utilize either magnetic or ultrasonic technology and not exceed an elevation of 6 feet off the finished floor as measured at the top of the meter assembly. These meters shall not be specified to be installed on secondary loops. When magnetic meters are selected, the meter shall be installed in-line with the condensate return line. Insertion meters are not acceptable for metering of utility services at the building service entrance/exit. This type of installation would require modification of the condensate return line pipe to allow for metering of this utility service. When possible, isolation valves shall be specified just upstream and downstream of the meter with bypasses installed around the meter for maintenance purposes. Ensure the selected meter location is accessible and allow for adequate clearance for meter assemblies (meter, flow transmitter, temperature probe and flow computer) as required by the meter manufacturer instructions. The entire contact surface of the temperature probe must always rest on the condensate return pipe. The meter and temperature probe must be sufficiently protected from the surrounding environment.

When ultrasonic meters are selected, the meter flow transducer will be installed on the outside of the pipe. Ultrasonic meter installations do not require isolation valves or meter bypass. For horizontal condensate return pipe configurations, select a measuring point where transducers can be mounted on the side of the pipe allowing the sound waves to propagate in the pipe horizontally. For vertical condensate return pipe configurations, select the measuring location where the medium flows upward. Ensure the selected meter location is accessible and allow for adequate clearance for meter assemblies (meter, flow transducer, temperature probe and flow transmitter) as required by the meter manufacturer instructions. The entire contact surface of the temperature probe must always rest on the condensate return pipe. The flow transducer and temperature probe must be sufficiently insulated from the surrounding environment.

These meters shall monitor and transmit flow (GPM), temperature (deg. F) and accumulated thermal energy (BTU). A removable insulation jacket shall be provided and wrapped around the condensate return meter sensors after installation is complete for maintenance purposes.

The University has determined that the following manufacturers provide the performance criteria desired for chilled water metering:

Flexim (Ultrasonic: Fluxus 721 with temperature compensated BTU measurement with matched pair 1,000-ohm RTD's with system accuracy no less than 1%)
Rosemount (Magnetic: 8750W with wall mount and calibration certification (Option Q4)
Siemens (Magnetic)
Toshiba (Magnetic: LF654)

For magnetic meter installations, the following manufacturers provide the performance criteria desired flow computer manufacturers are as follows: KEP (Model ES762), Rosemount or Yokogawa

Installation and setup of meters shall comply with the manufacturer's instructions, including minimum pipe diameters before and after the meter, as required.

All condensate return meter devices shall communicate with the campus network via Modbus/TCP. The Designer shall coordinate with the University Representative in conjunction with ITS to install a data drop near the meter location for Modbus/TCP communications. Condensate return meter instrumentation and communication devices will require the installation of 120 VAC power source near the meter location. For magnetic meter installations, the communication device and flow computer shall be contained within an enclosure mounted on the wall near the meter, data drop and power source location. The communication device and flow computer will require a surge protection device also contained within the enclosure. The 120 VAC power source will have a disconnect switch installed on the outside of the enclosure. If the 120 VAC disconnect switch is not readily and easily accessible to the meter location, a lockage disconnect switch must be installed. All wall mounted enclosures and meter

peripherals should be mounted at approximately 6 feet from floor, or as close as possible, for serviceability. The Designer shall coordinate with the University Representative in conjunction with FO for the installation of the power source and to program the meters into the University's GE IFIX SCADA metering platform and PI Historian data server.

Condensate Shut-off Valves

For low pressure condensate, Ball type to two (2) inches shall be carbon steel full bore, 150psi WSP rates complete with chrome plated forged brass ball, PTFE seat and gland packing, screwed ends with a carbon steel handle. Where pipe is insulated provide stem extensions to clear insulation.

Ball type two and one half inches and larger, carbon steel, flanged, (150 psi) WSP rated ball valve with a cast iron Teflon fused ball or stainless steel ball, blow-out proof stainless steel stem, reinforced Teflon seats, and steel handle which is lockable in fully open and fully closed positions.

Manufacturer(s) with acceptable quality of condensate ball valves are; Conbraco, Neles-Jamesbury, Worchester, Apollo.

If Expansion Loops and Elbows are specified to be prefabricated, the Designer must confirm and allow for adequate thermal expansion.

All condensate piping shall have a seventy-five (75) year service life.

8.8 Chilled Water

Chilled water is generally supplied from the plant at a temperature of 45 °F with a pressure (65 psig) ranging from a minimum of 50 psi and a maximum of 100 psi. Preferably chilled water coils should be designed with a delta –T no greater than 12°F for greater and therefore should return at 57°F or higher. The University has determined the following Manufacturer(s) to be of acceptable quality for smart control valves is Belimo or approved equal.

Underground distribution systems shall be rated for 150 psig at fluid temperatures ranging from 34-140°F. Design temperature of 40°F with operating temperature of 42°F.

Pipe

The University prefers the carrier pipe to be domestic carbon steel, schedule 40, ASTM A53, Grade B, ERW. Fittings for Chilled Water shall be domestic carbon steel, schedule 40, ASTM A53, Grade B, ERW.

Certified Mill Test Reports for the steel used in the piping must be submitted for approval prior to installation. Chilled water piping must be produced and supplied by providers who are ASME certified. Include in the requirements that the installing contractor must be manufacturer certified installers of the system at the time of bid and that they must provide an updated

manufacturer's installation certification recognizing their firm as the certified installers for the system.

Require fittings, anchors, link seal and accessories are to be prefabricated to job dimensions to minimize the number of field welds and prevent the influx of moisture. The Designer shall specify that all field joints shall be pressure testable with an additional heat applied shrink wrap in accordance with the manufacturer's recommendations.

The University has determined the following Manufacturer(s) to be of acceptable quality for chilled water pipe include Polytherm by PermaPipe, Chill-therm by Thermacor, and Steel System by Rovanco.

Expansion loops and elbows are to be determined by the Designer in accordance with thermal stress analysis. All pressure testing ports shall be plugged and sealed via heat applied shrink wrap applied to entire circumference of pipe and marked as to where the test port was located.

The University prefers that all penetrations shall be sealed utilizing a water tight sleeve such as "Link Seal" or approved equal. Ensure that the specifications require the water tight sleeve be installed so it can be accessed from the inside of the structure (building, manhole, vault, etc.). The pipe alignment to the structure wall shall be perpendicular to accommodate installation of the water tight sleeve and sealing device. The penetration hole shall either be made utilizing a smooth sleeve during the casting of the wall or by core boring. All space between the back of the water tight sleeve and the exterior face of the structure shall be filled with waterproof polyurethane foam insulation. In areas below the water table, the space between the back of the water tight sleeve and the exterior face of the structure shall be filled with waterproofing grout. The exterior structure waterproofing system shall overlap the foam insulation or grout sealing to the outside of the piping system. If a membrane is used for waterproofing, the membrane shall overlap onto the penetrating pipe and be clamped with a stainless-steel band clamp.

All piping shall have a seventy-five (75) year service life.

Chilled Water Pipe Metering

It is the Designer's responsibility to design the metering system based on the parameters set forth. Chilled water utility service sub-meters shall be installed at the building service entrance on the primary loop and shall utilize ultrasonic technology at an elevation not to exceed 6 feet off the finished floor as measured to the top of the meter assembly. In-line magnetic meters may be proposed as an alternate solution in areas where ultrasonic technology is impractical such as excessively noisy environments. Meter shall not be installed on secondary loops. When ultrasonic meters are selected, specify the meter flow transducer to be installed on the outside of the pipe.

When magnetic meters are selected, specify the meter shall be installed in-line with the chilled water supply line. Insertion meters are not acceptable for metering of utility services at the building service entrance. This type of installation would require modification of the chilled water supply line pipe to allow for metering of this utility service. Specify where possible, isolation valves shall be installed just upstream and downstream of the meter with bypasses installed around the meter for maintenance purposes.

For horizontal chilled water pipe configurations, specify a measuring point where transducers can be mounted on the side of the pipe allowing the sound waves to propagate in the pipe horizontally. For vertical chilled water pipe configurations, specify the measuring location where the medium flows upward. Specify the entire contact surface of the temperature probes must rest on the chilled water supply and return pipes and include sufficient insulation of the meter and temperature probes are to be sufficiently insulated from the surrounding environment.

Ensure the specified meter location is accessible and allow for adequate clearance for meter assemblies (meter, flow transmitter, temperature probes and flow computer) as required by the meter manufacturer instructions. Specify the Contractor must provide coordination drawings of meter assemblies (meter, flow transmitter, temperature probes and flow computer) location with any surrounding other existing and/or new equipment to ensure acceptable clearances per the meter manufacturer instructions. Specify the entire contact surface of the temperature probes rest completely on the chilled water pipe and the flow transducer and temperature probes be insulated from the surrounding environment.

These meters shall monitor and transmit flow (GPM), supply and return line temperature (deg. F), cooling demand (Tons) and accumulated thermal energy (ton-hrs). A removable insulation jacket shall be specified and wrapped around the chilled water meter sensors after installation is complete for maintenance purposes.

The University has determined that the following manufacturers provide the performance criteria desired for chilled water metering:
Flexim (Ultrasonic: Fluxus 721 with temperature compensated BTU measurement with matched pair 1,000-ohm RTD's with system accuracy no less than 1%)
Rosemount (Magnetic: 8750W with wall mount and calibration certification (Option Q4)
Siemens (Magnetic)
Toshiba (Magnetic: LF654)

For magnetic meter installations, the following manufacturers provide the performance criteria desired flow computer manufacturers are as follows: KEP (Model ES762), Rosemount or Yokogawa

Installation and setup of meters shall comply with the manufacturer's instructions, including minimum pipe diameters before and after the meter, as required.

All domestic or reclaimed water meter devices shall communicate with the campus network via Modbus/TCP. Specify a data drop (confirm type with the University ITS) and power source (120 VAC) near the meter location for Modbus/TCP communications and include within the specifications the software systems technical representative to program the meters into the University's GE IFIX SCADA metering platform and PI Historian data server. Specify the device to be contained within an enclosure mounted on the wall near the meter, data drop and power source location. The device will require a surge protection device also contained within the enclosure. The 120 VAC power source shall have a disconnect switch installed on the outside of the enclosure. Should a disconnect switch cannot be readily and easily accessible to the meter location, a lockage disconnect switch shall be specified. All wall mounted enclosures and meter peripherals are to be specified to be mounted at approximately 6 feet from floor or as close as possible for serviceability. Ensure proper coordination on location of equipment, power, data sources and enclosures with other surrounding existing and/or intended new installations. Require coordination with the University Representative in conjunction with FO for the coordinated layout of the installations and required programing of the meter into the University's GE IFIX SCADA metering platform and PI Historian data server by an authorized manufacturer's technician.

The University has determined that the following manufacturers provide the performance criteria desired from a hydronic meter: Flexim, Rosemount and Yokagawa

8.9 Sanitary Sewer System

Sanitary sewers are connected to a central sewer system leading to the University sewerage treatment plant. Storm water is run separately into a central storm system leading to the rivers.

All force main piping shall be utility grade and designed for corrosive internal and external conditions.

Gravity piping may be fiberglass Grade SDR 35 or Ductile Iron, with bell and spigot ends for gasketed joints, unless the piping is crossing other piping underground, at which locations the sanitary piping shall be changed to ductile iron.

Valves

Valve boxes must be specified with an adjustable collar, stainless steel with epoxy coated paint.

Check valves (one per pump) shall be a cast iron valve body with replaceable reinforced rubber internal component. An acceptable Manufacture for check valves is Val-Matic Surge Buster, Stocholm or Crane.

Pump Isolation valves shall be all bronze (ball valves) or cast-iron body with bronze internals, utility grade materials and construction. Valve operators (everything but actual pump isolation bronze valves) shall be constructed of 316 Stainless and shall be installed to allow the

submersible pumps to be isolated and control levers to be accessible/operable at the wet well access elevation.

Non-rising stem shall be resilient wedge. An acceptable quality of isolation valves is Mueler, Stocholm or Crane.

8.10 Lift Stations

The University has an existing lift station PLC monitoring system that was manufactured by Allen Bradley. Prior to 2014, the suite of PLC's utilized the Micrologix 1200 processors. Since 2014, Micrologix 1100 has been utilized. All new lift station monitoring systems shall be compatible with the existing systems and software (i.e. EZWarePLus by Maple Systems for the Human Machine Interface and RSLogix 500 Version 9 for the Programmable Logic Controller).

The Designer should confirm at the outset of the design of a lift station whether an annunciator or strobe warnings are required for pump failures or other critical alarms, which is dependent on the location and proximity of the station. If an annunciator is required, a push button on the inside of the lift station shall be provided to silence the alarm.

Human Machine Interface (HMI)

Each lift station shall have installed a human machine interface (HMI) that is a touchscreen showing graphically the status of all processors and allows operators to make set-point changes. The HMI is required to be wired to the processors through a dedicated cable. The HMI shall also display any alarms and shall indicate the time of the alarms. Operators should be able to acknowledge and reset the alarms from the HMI. The University has had success using Maple Systems HMI5000 series cable, however the Designer may specify other HMI manufacturer's capable of equal quality and characteristics.

Programmable Logic Controller (PLC)

The PLC shall be programmed to stop and start pumps based off the wet well level and connect to the SCADA system at the University's Water Pollution Control center, where readings, status and alarms are required to be graphically represented. The connection should be by Ethernet and utilize standard MODBUS protocol to communicate. Local to the lift station, the PLC shall also transfer data to the HMI, where operators can view the same data as at the SCADA. On the front of each control panel, there shall be pilot lights to indicate the pump status (green), pump failure (red), control by float (yellow), and high and low wet well levels (red). A three-position selector switch should also be provided with "hand", "off" and "auto" settings for all pumps.

The PLC shall have an analog input module to read both the wet well level and pump amperage draws, a memory module for program back-up transport, and a real-time clock module. The enclosure housing the PLC should be at least NEMA 12 to withstand environmental conditions. A surge suppressor is required to protect the HMI and PLC from voltage surges. If voltages exceed 150VAC, the surge suppressor should fault and should indicate the fault locally with a lit red LED. It is preferred to install these where a transformer is installed that step downs the line voltage (typically 480VAC or 208 VAC around campus) to control voltage (120 VAC).

Level Transmitter and Floats

A level transmitter is a submersible hydrostatic transducer that is specifically designed to meet the rigorous environment of lift stations. The transducer shall be submersed to the bottom of the wet well where it will measure the pressure of liquid inside the well to atmospheric pressure. Each transducer shall be custom made of one (1) inch Schedule 80 PVC and attached firmly at the bottom of the wet well. A vent filter should be provided to prevent moisture from entering vented cable.

The University has determined the following Manufacturer(s) to be of acceptable quality for level transmitters are the Measurement Specialties Series 700, Rosemont/Mobrey transmitter or an approved equal.

Each lift station shall be equipped with a high float and a low float to operate pumps in case of a failure with the PLC or level transmitter. The floats shall be able to operate the pumps, but the PLC should control the pumps under normal operations. The high float is typically installed to be hanging at or just below the inlet pipe and the low float is installed to be hanging around the middle of the pump, to keep a level in the well to prevent the pumps from sucking air and burning out.

Functions and Relays

An alternating relay is required to alternate between the pumps each time the high float is activated. The alternating relay shall be hardwired into the "backup" float circuitry, meaning the PLC will not control/effect its operation. The alternating relay shall have a local selector to allow the automatic alternating pump to be overridden to take a pump out of service.

The timed delay relay should be activated each time the high float is activated. Should the low-level float not be activated by the time the timer is finished, the "lag" pump should be commended to start to assist the "lead" pump. The timed delay relay timer should be adjustable to both seconds and minutes. The timed delay relay shall be hardwired into the "backup" float circuitry.

Intrinsic barriers limit the energy in a signal to prevent ignition or spark. These barriers are used in areas with dangerous concentrations of flammable gases or dust, such as enclosed wet wells of lift stations. Analog intrinsic barriers are used for the level transducer and is wired directly to the PLC's analog input module. Digital intrinsic barriers are used in conjunction with floats and shall have two channels. Low float should be wired to channel one (1) and the high float should be wired to channel two (2).

A seal fail detection relay if required by pump manufacturer, shall be provided to measure the resistance of oil in the seal chamber and uses two probes. The pump should be allowed to operate if there is a seal failure. Operator is to be notified via SCADA and take all necessary precautions.

Power Supply

If lift station is only served by 208/480 VAC, then a transformer is required to step down the power feed to the control panel to 120 VAC. The 120 VAC is used to power components within the control cabinet only. An internal 24VDC converter is required to step down the power for analog signals, intrinsic barriers and network modules. A power disconnect is required on all cabinets.

A starter and VFD (if available) and a current transducer are required on all pumps. The starter shall have a heating element, which will trip if too much current is being drawn. The current transducer will provide accurate load trending information to the PLC. An over-temperature detection relay shall be installed on the motor as a safeguard, if required by the size of the pump.

The University has determined the following Manufacturer(s) to be of acceptable quality for motor starters by Square D or approved equal. The University has determined the following Manufacturer(s) to be of acceptable quality for current transducers by Veris Industries or approved equal.

8.11 Storm Drainage

The consultants should review all surface drains for compliance with ADA regulations in pedestrian areas and evaluate the use of atrium grates in landscaped areas.

Piping

All storm water piping shall be HDPE Type S or PVC SDR 35 material unless conditions require concrete/ductile iron in cases where the storm piping is in close proximity or crossing a steam pipe. All catch basin structures shall be precast concrete (5,000psi min) with oil separator hoods where required in vehicle parking areas and all catch basin grating shall be galvanized steel. Yard drains shall preferably be cast iron; however, they may also be PVC with bronze covers.

Detention Systems and Underground Tanks

Detention systems and underground tanks are preferable to be exterior to the building and below grade. Covers and locations of entry shall be easily identifiable from the surface. All water detention tanks shall be provided with a mixer and a chemical treatment system to control microbial growth.

All detention system and underground tank pumps shall have lift out devices so that they can be removed from the entry location without having to go into the tank.

Underground tanks that contain oil, grease or other potentially hazardous materials shall have a double-walled containment system, as well as, an alarm to the SCADA system for any breach of the interior tank.

Retention ponds and systems shall have a clay liner twelve (12) inches below the top and shall be planted with native grasses. Generally, the storm water system shall be designed to accommodate a fifty (50) year storm.

8.12 Reclaim Water

The University's Storrs Campus has a Reclaim Water Facility that feeds water to the Central Utility Plant, subsequently feeding the northern half of campus. Standard pressure of the pipes is 65-75 psi. Water quality standards are published monthly and can be obtained through the authorized FO Representative. The reclaimed water system at the Storrs's campus is used for cooling towers, steam, toilets and irrigation.

8.13 Natural Gas

Natural Gas is taken from a 65-psi maximum medium pressure system available on the Storr's campus.

Natural gas meters, piping to the meters and gas regulators are provided and maintained by Connecticut Natural Gas (CNG). Recorded natural gas data is provided by CNG through monthly billings for several hundred building accounts throughout campus. Bills include monthly usage and cost of natural gas provided by CNG. Designer shall request in writing if any additional work shall be done with the particular project.

Exceptionally large uses for large Boilers or CoGen units may require Utility meters with special communications to the University metering system. Obtain written direction from the University Representative in conjunction with FO on how to handle for sites over 200,000 CCF estimated annual usage.

The Designer shall specify and provide all protection of any above-grade piping, meters or structures, including bollards or enclosures as required. All exterior valves or meters on the natural gas service shall be visible and shall be labeled as part of the project.

8.14 Electric Distribution

Refer to Section 15 Electrical Guidelines for details on Electric Distribution

8.15 Duct banks

Service running from existing and new manholes, buildings, transformers, switchgear pads shall be run in underground concrete encased duct bank(s). Where possible, organize conduits in such a manner as to provide "in-line" or "pull-through" cable installations. Provide for expansion between duct runs and fixed points. Include bonding jumpers and sufficient cable slack for any required movement. Cement all non-metallic conduit joints using a PVC primer and solvent cement.

The University owns and manages the majority of the electrical infrastructure system at Storrs and Eversource owns and operates the balance. Regardless of the ownership, all duct bank and electric utility work shall be done to Eversource standards and shall be approved by the University Representative prior to installation.

Electric Duct Bank

Duct bank shall be constructed with NEC 310.60 in mind, be five (5) inch Schedule 40 PVC minimum, not less than seven and half (7.5) inch on center. The as-builts shall calculate the final derating of duct bank based on the installed condition using a computer calculation solution following IEEE guidelines and true thermodynamic heat transfer calculations due to depth and/or proximity to other utilities. The designed derating shall be established and approved with the remaining duct bank system.

Manhole systems shall be as utilized by Eversource, with training racks, 4/0 copper ring bus, and not fewer than two ground rods, refer to Eversource design manuals for more information. At points within the electrical distribution systems conduit for fiber communications shall be introduced for SCADA monitoring. Coordinate points with ITS and FO during design review.

Install rigid galvanized steel conduit encased in concrete under driveway, walkway and roadway. All empty conduits are to be installed with a minimum of 200-lb test noncorrosive pull wire.

Duct bank runs shall be no greater than three hundred (300) feet long, unless otherwise approved, and run into manholes as needed to serve the facility and install no more than the equivalent of two (2) 90° bends between the manholes. Terminations shall have sloped duct runs into manholes to drain but shall slope away from buildings.

Service runs to outdoor or indoor building unit substations shall be through underground conduits. Provide a minimum of two (2) 5" but ideally four (4) 5"duct banks to the medium voltage disconnects/pull section entrance. Runs between manhole to manhole shall be minimally (6) 5" conduits. Low voltage service runs to buildings shall be sized per load being services and shall include a minimum of one (1) spare conduits.

Ducts shall be run below gas lines and where ducts cross high temperature water lines a minimum separation of 3 feet shall be maintained, and a minimum of six (6) inch thick foam glass type insulation extending at least four (4) feet in both directions of crossing shall be used.

Telecommunications Duct Banks

The University is the service provider for voice, data, and TV to the Storrs Campus and as such, ITS provides the outside plant media to deliver these services. However, the Designer must include within the project's scope and budget the pathways necessary to deliver these services to the building. Typically, all pathways are underground duct banks; ITS requires a minimum of six trade size 4 conduits for feeder and distribution ducts, ducts that run from vault to vault, and two trade size 4 conduits for the service laterals, ducts that run from vault to building. Feeder and distribution ducts are organized in a three-over three fashion. All underground duct banks shall be encased in concrete. Manholes shall be spaced so that the duct banks between them do not exceed 300 feet in length and the sum of all bends shall not exceed 180°. Service laterals shall not exceed 300 feet in length. However, conditions may vary and these requirements may need to be modified. The Designer shall coordinate with ITS through the University Representative to ensure these pathways are of adequate size and configuration or if other pathway solutions or cabling requirements are needed.

All duct banks shall be constructed of concrete encased non-metallic conduit. All bends shall have a minimum radius of 48 inches. Utilize manufactured bends wherever possible. Where bends are performed in the field, protect conduits against kinks or distortion of shape.

Feeder and distribution ducts shall enter on the narrow walls of the vault. Ducts providing Service Laterals to buildings may enter on the long walls. Ducts shall not enter the manhole in the cover chimney. Conduits shall enter manholes perpendicular to the wall

Utilize installed Terma ducts for all conduits entering the vault wherever possible. Populate the lowest knock-outs available to allow for future expansion. Conduits shall be installed flush with the interior wall of the vault and shall not protrude into the interior space.

Splay all conduits entering the narrow wall of Telecommunication vault. Equally separate duct banks so that half the conduits will enter near the left corner of the narrow wall and the other half will enter near

the right corner of the same narrow wall. The splaying of the conduits should start at least 20' from the manhole. Service lateral ducts are not required to be splayed.

Provide #6 X 12" steel reinforcing bars inserted into vault walls prior to concrete encasement of duct bank for grounding (TMGB).

At all road and driveway crossings the duct bank concrete shall be reinforced with engineer designed steel reinforcement.

Provide rigid metal conduit at the entrance to each building starting at 10' (min.) outside the foundation wall to termination in the equipment room. Bond the conduits to the TMGB with a #6 AWG copper ground wire and bonding bushings.

Patch walls around conduit entrances with hydraulic cement or watertight grout to prevent water infiltration. Seal all conduit entrances into a below grade building space with a mechanical modular sealing system (Link Seal® or equal).

Seal all conduit ends with blank duct plugs. Secure Muletape to duct plug.

The following are minimum clearances from any Telecommunications duct banks:

Utility	Crossing	Parallel
Gas Main	12”	30”
Gas Service	12”	12”
Water	12”	18”
Steam	18”	48”
Electric	12”	12”
Storm & Sanitary	12”	12”

Unless otherwise noted, maintain the following minimum buried depths. Measure from the top of the structure to the nearest portion of finished grade:

Structure	Depth
Duct Bank	30”
Manhole	12”

Materials for Telecommunications duct banks and vaults

Manholes/vaults shall be 38Y (Splay), “J”-type, made of precast concrete with the minimum interior dimensions of 6’W X 12’L X 7’ H. Provide cast iron rings and manhole covers; load rated H-20 with a minimum diameter of thirty-two (32) inch. Vault covers shall be labeled “TELEPHONE” or “COMMUNICATIONS”.

Non-metallic conduit shall be rigid polyvinyl chloride conduit (PVC). Telephone duct Type-C, designed for direct burial or concrete encasement applications; RUS listed, meets or exceeds the requirements of NEMA TC-10 and Bellcore CAO 8546. Fittings shall match requirements for conduit.

Metallic conduit shall be rigid metal conduit. Steel, ANSI C80.1, hot dipped galvanized interior and exterior, NPT threads, ANSI B1.20.1. Fittings shall match requirements for conduit.

Conduit Spacers shall be Carlon "SNAP-N-STACK" SP4W20-2 or approved equal. Spacers shall maintain a minimum two (2) inch wall-to-wall separation of conduits in all directions and elevate bottom conduits a minimum three (3) inch above trench floor. Maximum spacing between spacers shall be seven (7) feet.

Encase conduits in concrete having nominal compression strength of 2500 psi, with 3/8" maximum aggregate crush stone or washed gravel. Concrete slump shall be between 6" and 8" maximum.

Tracer Wire shall be minimum of #12AWG solid copper conductor insulation type UL listed THWN (Gas & Oil Resistant).

Provide grade level access to each end of the tracer wire. ABS tubular valve box with cast iron cover, color orange, accessible via standard pentagonal key. Tracer wire access box lug attached to underside of cover shall be rated for road surface applications. When the utility vault covers end up in roadways, install the tracer wire access box in the nearest sidewalk or snow skirt. Install per manufacturer's instructions in close proximity to manhole cover with a maximum separation not to exceed three hundred (300) feet between boxes (i.e. Copperhead Industries, LLC "Snake Pit Magnetized Tracer Box" series or approved equal)

Require the use of rod and mandrel for each conduit and provide a muletape like product. Muletape shall be flat, woven, polyester tape pre-lubricated with a pulling strength of 1250 lbs. for easy pulling and durably printed with sequential footage markings. Acceptable manufacturer of muletape: Neptco, Dottie or Ideal

Provide blank duct plugs made of corrosion resistant high-impact plastic. Center washer expanders are required when tightened to prevent water and sediment infiltration. Provide with eyelets to secure the pull rope, which shall be Tyco Electronics "Jack Moon" or approved equal.

Require the first twelve (12) inch of backfill to be sand or other granular material, tamped using lightweight equipment such as pneumatic or vibrating tampers. Backfill shall be free from large stones, frozen materials, wood, and other extraneous materials. Place backfill in layers not exceed six (6) inch. Include marking tape above the duct bank and twelve (12) inches below finished grade. The plastic tape shall be durable and orange in color clearly indicating that there is a buried Telecommunications utility structure below.

Designer shall provide a Telecommunications specific set of plans for any new or repairs to any telecommunications duct banks.

Testing documentation requirements for Telecommunications duct banks and manholes

After backfill is complete, require the duct bank's path be located and documented utilizing a 3M "Dynatel" or similar tracing tool, to identify the tracer wire system . Ensure that the locating of the duct banks and manholes by tracing tool must be witnessed by the Owner's ITS Representative to ensure the required muletape has been installed and properly functioning.

See Appendix IV – Telecommunications Design Guidelines and Performance Standards for additional information on telecommunication requirements

8.16 Manhole and Vault Covers

Where possible the University would prefer to minimize the number of manholes/vaults. To the extent possible, manholes/vaults shall be made in single units with integral corners. If too large to be cast in a single unit, manholes/vaults shall be gasketed at all connections and shall be waterproofed on the exterior side and inspected prior to backfilling (with waterproofing having a minimum seventy-five (75) year service life). Manholes/vaults shall be cast with 5,000 psi concrete minimum. Drain pipes shall not be added. All ladders shall be specified as composite or non-corrosive.

All manhole/vault Covers, regardless of location, shall be designed for HS20 truck loading and shall be cast iron. All manholes shall be labeled with the appropriate utility it services and numbered and cast into the cover of the manhole. Designer must review with the University Representative in conjunction with FO in schematic design for numbering sequence. All manhole covers shall be watertight.

Electrical– The preferred size of manholes shall be 8'x12'x7' with a thirty-eight (38) inch diameter opening. Manhole numbering shall be identified in schematic design for review by the University Representative in conjunction with FO.

8.17 Pads and Precast Electrical Vaults

All transformers or other exterior electric service equipment shall be protected and mounted on concrete pads extending twelve (12) inch minimum beyond the dimensions of the equipment and have a thickness no less than six (6) inch with welded wire mesh minimum (or other reinforcement as required per the geotechnical report for the project).

8.18 Grease Traps and Oil Separators

Grease Traps shall be incorporated in any project that requires the installation of a commercial kitchen sink or an installation of a sink or three (3) bay kitchen sink where the likelihood of grease or oil cleanup would be performed. Such structure shall be located outside of the building with cleanouts on each line coming to and from the trap. Ensure that the location of the trap must be accessible by a service vehicle on a service path.

Trap shall conform with the requirements of the General Permit for the Discharge of Wastewater Associated with Food Preparation Establishments That Discharge to Sanitary Sewer.

All hydraulic elevator pits with sump pumps shall have oil separators designed within the pit.

9 Structural Components Guidelines

9.1 Block and Plank Construction

Camber shall be reviewed in plank design. Grout shall be installed where differences between planks occur. Floor leveler shall be provided where camber exceeds ½" at the midspan.

Where plank is to be exposed to view, all joints shall be caulked, taped and finished. Undersize of plank shall be smooth and free from holes or pitting.

Always review the location and size of bearing plates and plank embeds to assure that they are not exposed to view after completed installation.

Electrical wiring may be run in empty cores, however always in conduit or with MC cable.

Load bearing CMU block shall never be less than 6" in width.

9.2 Concrete Construction

For concrete exposed to the exterior, provide epoxy-coated rebar or welded wire mesh in all applications.

For parking garage structures, provide a concrete sealer or traffic coating on all horizontal surfaces.

Where concrete is exposed to view, all surfaces shall be smooth, free from holes or pitting, and free from depressions or other indications of formwork.

Waffle slabs or lift form slabs shall only be utilized with advance written approval of the University.

9.3 Steel Construction

All steel exposed to the exterior shall be galvanized. Zinc oxide painting shall only be utilized when approved in advance by the University.

Horizontal deflection shall be limited at the highest point to L/750 or One (1) inch maximum.

9.4 Seismic Considerations

All structures shall consider seismic forces in their design. Expansion joints at walls, ceilings and floors with finished covers shall be provided at all locations where expansion is required.

9.5 Fireproofing

Cementitious and spray-on fireproofing are acceptable in non-exposed areas. Spray-on fireproofing is recommended at interior locations and steps should be taken during construction to avoid the fireproofing from getting wet. Cementitious fireproofing is recommended at exterior locations and where fireproofing is exposed to weather during construction. Fireproof paint is acceptable where interior steel is exposed to view.

9.6 Footings & Foundations

Design spread footings to the bearing values indicated in the geotechnical investigations for the site, but never less than 2 tons/square foot.

Perimeter grade beams at least 36" deep shall be provided around the perimeter of any structure greater than 100 square feet. Provide footing drains for all grade beams and footings.

10 Building Exterior Guidelines

10.1 Guiding Principles

The first level of importance for the University as it relates to an outside of the building is that the exterior is watertight and easy to maintain. Horizontal elements are susceptible to water infiltration over time and particular care should be taken in choosing appropriate systems that will be durable and long-lasting. The design should pay particular attention to flashing details, interaction between materials and joints, and proper overlapping of materials. The design should attempt to specify systems and materials that have a history of success and that can be easily maintained by the University.

Refer to Section 5 Site Planning Guidelines for additional requirements for soils.

10.2 Exterior Material

Specify no products that contain asbestos. It is up to the Designer when selecting finish materials, equipment and fixtures that they review the SDS (Safety Data Sheet) for disclosure of any asbestos containing materials for each product specified. The Designer shall provide a statement that no asbestos products were specified. Note that many products may still contain asbestos because they were not included in the EPA's 1989 ban and phase-out and these include pipeline wrap, vinyl composite tile, millboard, corrugated and flat cementitious sheets, roofing felt, cementitious shingles, roofing and non-roofing adhesives, sealants, and coatings. The Consumer Product Safety Commission requires manufacturers to label products that contain asbestos, if a product. Include as a requirement of all submittals, an SDS with every submittal.

The aesthetic design of the building shall always be reviewed with the University during the concept design phase of the project. Generally, brick, architectural precast, metal and stone are acceptable building exterior materials. EIFS or Dryvit shall not be utilized. Wood components on the exterior of the building shall be minimized and are discouraged. Thin veneers are also generally discouraged.

For wall construction, limit horizontal surfaces in the exterior design. Projecting elements should be evaluated specifically for long-term durability, water-tightness and potential to accumulate water, debris or dust.

Careful considerations should be given to locations of control joints and exterior joints on the exterior of the building. Control joints in the exterior shall occur at no less than 30' on center. Expansion joints shall have internal drainage and shall be double containment systems.

10.3 Brick

Brick shall be compatible with surrounding building and contribute to a unified expression for the University. Normally, the Designer should select three to four representative samples of brick and present same for approval by the University prior to specifying same.

Facing brick shall be Grade SW with a minimum compressive strength of 8,000 psi. Generally, the brick shall have a uniform size throughout the building, unless previously approved by the University. Dimensional conformity shall be consistent with Grade FBX or FBS brick. A full depth brick (4" or greater) brick shall always be used at the exterior.

Brick and trim material shall be shown to have passed the ASTM C67 wick test. Any brick showing the signs of efflorescence shall be rejected. Any wall installation that shows areas of efflorescence shall be removed to discover the reason for water entrapment.

Generally, no sealing or coating of brick shall be allowed. If a water repellent is approved for use, it shall be "breathable" and shall have no less than a 10-year warranty.

Brick should not be utilized below grade.

When repointing brick, remove only the mortar between the bricks and do not allow overcutting of the joint.

10.4 Mortar

Designer is required to follow International Masonry Institute guidelines based on the particular application being applied. For existing conditions, mortar color shall match. Special colors in mortar are generally discouraged.

Do not use mortar that is stronger in compression than the brick or creates a bond greater than the compressive strength of the brick.

Joint reinforcement is preferred to be stainless steel, however at a minimum galvanized carbon steel wire is acceptable. Provide joint reinforcement and seismic bracing where required.

10.5 Sealants

Sealant warranty shall be a minimum of 10 years. The compatibility of the sealant with the exterior materials should be verified prior to specification. A double backer rod and sealant system should be utilized in all exterior applications.

10.6 Rain Screens

Rain screens are permitted in the exterior design however, the specifications shall include requirements to inspect and test all components of the back-up systems prior to installation of the rain screen.

10.7 Architectural Precast

All architectural precast shall be engineered, commercial grade and shall have reinforcement (welded wire mesh minimum). All precast shall utilize wet casting, and no dry casting shall be permitted. Freeze-thaw conditions shall be considered in the design and engineering of the precast panels. All precast shall be subject to inspection regardless of whether it is or non-structural.

Joints shall be of an adequate spacing to allow the proper installation of sealants. Panels shall not be designed to be in contact with each other.

All precast panel connections shall be subject to inspection in the field. Any slip connections that have been designed into the panels shall be tack welded after the installation to discourage future movement of the panels (unless required specifically by the engineer otherwise).

10.8 Stone

All stone on a project shall be from the same quarry, and from the same area or vein of the quarry for uniformity. For exterior applications, a thickness of 1 ¼" minimum is preferred. All stone utilized on a project should be "select grade" and be free from cracks, pits, spalls, seams or stains. Where possible, edges or corners of stone should be slightly chamfered to lessen chipping.

Projects should consider utilizing granite or other hard stones at the base of buildings where the grade comes in contact with the building.

All stone anchors shall be nonferrous metal, with stainless steel being preferred.

10.9 Damp proofing and Waterproofing

Designer shall be responsible for the interpretation of the geotechnical report of the existing sub-surface conditions for designing the appropriate level of waterproofing.

A waterproof membrane is preferred on all below grade and foundation installations, however at a minimum, damp proofing shall be provided. The waterproofing membrane or damp proofing shall have a minimum 20-year warranty.

All above-grade horizontal areas that are in regularly wet areas or are above interior spaces below shall have a waterproofing membrane system. The membrane system shall have a

minimum thickness of 30 mils. Sleeves and openings shall be properly flashed. All exterior areas shall be flood tested after the installation of the waterproofing membrane system.

Generally, water repellents shall not be used on exterior brick or masonry walls. The Designer shall obtain approval in writing from the University Representative in conjunction with FO for any proposed use.

10.10 Vapor Barriers

For locations where there is a high-water table present, the installation of a vapor barrier is required. Occupied interior spaces designed at or below grade shall require the entire floor slab to have a vapor barrier. Vapor barriers shall be impermeable, with the slab on grade having a moisture rating of less than .01 maximum. Include within the specifications that all seams, tears and penetrations in the vapor barrier are to be sealed with tape or mastic. Such condition shall be inspected prior to concrete placement.

10.11 Punched or Fixed Windows

With the exception of historic renovation, window frames shall be steel or anodized aluminum. No wood is allowed unless required as part of a historic renovation. Thermally broken frames are preferred. Only commercial grade frames shall be utilized, and no residential grade frames shall be allowed.

All windows shall be low-E double glazed, with a U-value no less than 0.27. It is preferred not to have operable windows, however the two exceptions are residential buildings and historic renovations, where operable windows are allowed. If operable windows are provided, also provide a contact tied into the BAS system indicating the window position so that any cooling systems can be shut off if the window is left in the open position.

Double hung windows are generally not utilized on campus, however if the University approves the use, specify complete operative tilt units with full size screens that can be easily repaired or replaced.

10.12 Glazing

When establishing the requirements of windows and doors for a particular application, specify the appropriate thickness of the glass units without oversizing. The University prefers glass thickness to be no greater than half an inch. Specify laminate glass and its color that can be easily obtained locally. The University would prefer that proprietary glazing unit is not specified, such as Viracon. Specify the performance demands that the glazing will undertake and allow for local replacement

10.13 Windows and Security Screens

Any operable window should be provided with a full window screen. Window screens shall have aluminum frames with aluminum hinges, and a lock to secure the screen, with mesh.

Security screens are required in residential buildings only. They are to be located at all first-floor windows of living units and at all upper floors where a window is accessible by an adjacent roof. All security screens are to have steel frames and a painted steel mesh. All security screens shall be hinged and shall have releasable locks on the interior. Designer shall seek approval of specification from the University Representative in conjunction with the DPS when specifying security screens.

10.14 Curtain Wall Systems

Curtain wall systems must be engineered and can be aluminum or galvanized steel. Clerestories are acceptable, but skylights or horizontally positioned glass are not preferred by the University. The University would prefer that a proprietary single source frame and glazing unit is not specified.

10.15 Entrances and Storefront

All double door entries/exits shall have rim devices with keyed removable mullions.

Entrance and storefront frames shall be thermally broken, where feasible. Anodized aluminum standard Stile is the preferred door type and must be designed to accommodate any equipment size within the building. The University Representative in conjunction with FO must be consulted if any other materials are being considered.

The University would prefer that frameless glass entry doors are not specified. Do not specify in-ground closures. Consider thickness and weight of the glazing when specifying entrance doors, to avoid over stressing the hinges, closers and stops. Consider insulated pane with low-E coating glass systems. Specify glass that can be easily obtained locally. The University would prefer that any proprietary single source frame and glazing unit is not specified, prior approval from the University Representative in conjunction with FO is required.

Magnetic Locks, WIFI or POE locks on entrances and storefront entries are prohibited.

10.16 Vestibules, and Entrance Mats (including Automatic Openers)

At all public or main entrances, a vestibule is required. A conditioning system shall be utilized to over pressurize the vestibule. No air curtains shall be utilized. In situations with limited space where a vestibule cannot be provided, a revolving door shall be provided.

Recessed floor mats shall be utilized at all entries. For most buildings, the mats shall be removable steel grating. For residential buildings, provide recessed removable carpeting.

Automatic door openers shall be provided at all major entrances on all publicly accessible buildings, and as required by code. Door openers mounted in the top jamb are preferred, and underground motors are not allowed. Door opener systems should accommodate the push button operation during normal operating hours and be tied into the University's access control system for off-hours. Devices must be installed that prevent an individual from becoming

trapped or crushed by the door, such as a reverse function or a push button, switch or key that is operated by an individual requiring continuous contact with the device in order for the door to open and close.

10.17 Flashing and Sheet Metal

All exposed sheet metal and flashings shall be copper, lead coated copper or stainless steel.

On all sloped roofs, utilize 6' minimum of ice shield at all eaves, in all valleys and at all gables. During all roof renovations or replacements, verify with the University Representative whether new reglets at all chimneys and parapets are required. Where roofing contacts existing masonry, install all new drip edges and replace all existing flashing.

10.18 Parapet Walls and Capstones

When parapets are existing or required, waterproof appropriately with flashing and counter flashing. . Capstones are preferred to be cast concrete or granite, but limestone and metal are an acceptable alternate. Set all capstones with stainless steel pins.

All roof replacements shall incorporate any repairs and reflashing of the existing parapet.

10.19 General Roofing Considerations

All roofing systems shall have a class "A" rating as listed by Underwriters Laboratory, Inc., for fire resistance. All proposed roof designs and details shall be submitted to FM Global for review and approval prior to completing the construction documents.

In the design of replacement roofs, all roof drains shall be replaced with new and all curbing and parapets shall be rebuilt with all new waterproofing.

It is preferred that foamed-in-place roofing systems are not used. Designers shall obtain University approval in writing for any proposed use.

Pitch pockets generally will not be permitted. Designer shall obtain University approval in writing for any proposed use.

In locating where rooftop equipment will be placed, ensure that the equipment designed and planned for shall be no less than 15 feet away from roof edges. Any equipment designed to be installed less than 15 feet from a roof edge must first be approved by the University Representative in conjunction with EHS and be guarded with passive fall protection devices, such as a guardrail system or horizontal lifelines.

10.20 Shingle Roofing Systems

Asphalt and shingle roofing systems are not permitted unless prior approval is granted by the University Representative. The sole exception is where historical restoration requires a use of an asphalt or shingle roof. If required, only commercial architectural-grade shingles with a 30-

year material warranty minimum shall be used. In the case of alike roof replacement, include replacement of the fascia board and drip edge.

10.21 Slate Roofing Systems

All slate roofing systems shall be engineered and shall not rely on empirical data. All slate shall have a minimum 75-year warranty. No OSB or plywood shall be used as a substrate. Relieving angles (eave and mid-roof) shall be utilized in the design of any slate roofing system where the slope is greater than 3 on 12. All designs of slate roofing systems shall be submitted for confirmation and approval by the structural engineer prior to utilization in the construction.

10.22 Membrane Roofing Systems

The University prefers EDPM roof systems over other roof systems. Membrane roofing systems color shall be specified based on a number of factors which must take into consideration the location of the building and its height in relation to other surrounding buildings. The membrane shall be at least 60 mils thick. Mechanically-fastened, tapered insulation shall always be utilized and a slope of no less than 1/4" per 12" shall be utilized. No ballasted roofs shall be specified.

A minimum unconditional ten-year material and workmanship guarantee for water tightness covering material and workmanship on the entire roofing system, inclusive of vapor retarders, insulation, bitumen, felts, membranes, flashings, metals, decks and any other feature required by the roof design, with no dollar limit from the Prime and subcontractor (where applicable) is required.

In addition, a minimum unconditional twenty-year unlimited manufacturer's guarantee for water tightness covering material and workmanship on the entire roofing system, inclusive of vapor retarders, insulation, bitumen, felts, membranes, flashings, metals, decks and any other feature required by the roof design, with no dollar limit. All manufacturer's materials used in the roofing system are to meet the latest standards for individual components of the roofing systems of the American Society for Testing and Materials.

Paver pathways shall be provided on all membrane roofs. Non-slip pavers shall be a minimum of two (2) feet square. Pathways shall go to all mechanical units, exhaust fans and roof drains. At all mechanical units, the pavers shall be provided around the entire unit, plus a minimum of six (6) feet X 6' six (6) feet at the access locations and coils.

For grease hoods, chemical hoods and other special conditions, specify an appropriate membrane surrounding the special conditions that will withstand the conditions.

Include in the design roof-top equipment screening, whether the project is new construction or a renovation. Confirm with the University Representative the type of screening that will be acceptable and incorporate into the Construction Documents.

10.23 Metal Roofs and Components

Metal roofing shall be a minimum of 14 gage and shall have a powder coated finish. Metal roofs shall not be used with the pitch is less than 3 on 12. Metal roofs shall utilize all concealed overlapping fasteners and shall require sealant be installed at all screw holes.

10.24 Green Roofs

Vegetated roof covers, also referred to as "green roofs", are layers of vegetation installed on building rooftops. Green roofs are an effective means for reducing urban stormwater runoff by replacing impermeable rooftops with permeable, vegetated surfaces. Rainwater is either intercepted by vegetation and evaporated to the atmosphere or retained in the substrate before being returned to the atmosphere through transpiration and evaporation

The green roof is a multilayered, constructed roof system consisting of a vegetative layer, media, a geotextile layer, and a synthetic drain layer. A variety of green roof designs exist. The simplest consists of a light system of drainage and filtering components and a thin soil layer, which is installed and planted with drought-resistant herbaceous vegetation. Modular green roof systems are available for new installations and building retrofits. These systems consist of interlocking modules containing plants that are shipped to the roof site for installation. The modules can be removed or replaced, thereby facilitating roof maintenance and repair.

Design considerations for vegetated roof covers include structural and load-bearing capacity, plant selection, waterproofing and drainage, and water storage.

10.25 Roof Hatches, Ladders and Access

It is preferred to have access to the roof by stairs, not ladders. Doors and roof hatches at the roof access shall have an alarm reporting back to DPS and shall have a keyed override on the inside, and key-less re-entry on the outside. See alarm requirements in the alarm section.

Where roof hatches are utilized, size the opening based on roof top equipment maintenance needs, but shall be no smaller than forty-two (42) inches square insulated with gasket covers. Specify standard sized manufactured roof hatches preferably rectangular in size, custom sized roof hatches are discouraged. Provide all roof hatches with safety-assist entrances such as "pop-up" grab bars. Provide adequate lighting and tie-offs at the tops of ladders and underneath roof hatches.

Where ladders are required, provide cages for any ladder that exceeds fifteen (15) feet in height or as required by code. At the base, the ladder shall have a keyed retractable portion that does not allow non-maintenance personnel from accessing the ladder. Review the design to assure that ladders are provided at all changes in roof elevations and to make sure access is provided to all roofs.

10.26 Roof Drains, Gutters, and Downspouts

Roofing systems shall be designed to be gravity draining, without the use of lift stations or pumps. If a lift station is required, it shall specifically be approved by the University prior to use and shall be outside the building.

All roof drains shall be cast iron, including the dome. When an existing roof is being replaced, the roof drains and the overflow drains shall generally be replaced at the same time.

It is preferable to have interior roof drains. If conditions only allow for exterior gutters and downspouts, they should be zinc-coated copper or lead. All gutters shall have gutter guards similar to Gutterglove or approved equal with a minimum 25-year warranty. Downspouts shall either connect to storm drains (never to curtain drains) or dispense into rain gardens. Only in cases where it is prohibited in connecting to existing storm drains shall the water be discharged to grade. Such conditions shall be brought to the attention of the University Representative in conjunction with FO to determine how the discharge shall be designed. Should the decision be made to discharge to grade, the water must be directed with extensions at least 8' away from the foundations of buildings. Downspouts and overflow drains shall not be directed to splash blocks at the base of the building and shall not direct any water onto sidewalks or other walking paths.

10.27 Fall Arrest Systems

Provide engineered tie-off anchor system and basket davits at all flat roofs where access within fifteen (15) feet of an eave or edge is required and for all sloped roofs. If safety lines or other active fall arrest systems are required, review the details of such system with the University Representative in conjunction with the EHS and FO prior to specifying in the design.

Install fall protection anchor points and/or lifeline systems on pitched roofs to enable safe maintenance of roof structures or mechanical systems located on rooftops. All roof anchors should be permanently identified as such.

For buildings under five (5) stories, the University generally cleans the exterior of the building off lifts and does not require separate window washing or basket davits.

10.28 Louvers

Where feasible, exterior louvers should be hot dipped galvanized with a powder coat finish. Aluminum louvers are an acceptable alternative as long as the metallurgy and reactions are verified with the exhaust stream. Painted metal and plastic louvers are not permissible.

Generally, only standard sizes of louvers shall be utilized. If custom louvers are required, the University shall be notified prior to specifying same.

10.29 Testing and Commissioning

The Designer shall request prior to commencing with the work, whether the University is intending on requiring the commissioning the exterior building envelope or portions thereof. Regardless if the project will be commissioned, the Designer shall be responsible for

coordination and witnessing water testing in the field for all new roof systems or roof replacements installations, all new window systems or window replacement installations and any new subsurface waterproofing installations that are a part of their design scope. Should there be breaches with the installation, the Designer will implement corrective measures to ensure receipt of a watertight envelope. The Designer shall also include in the specifications the requirement for the Contractor to specifically photograph the exterior waterproofing applications and installations, not limited to parapet flashing, foundations, and typical window installations.

Incorporate into the specifications that the Contractor shall perform its own water testing prior to requesting that of the University. Such request shall include the date, the time, what was tested, the extent of testing, results of the Contractors water testing(s) and corrective actions performed and when. Should there be more than one failed water test, outline within the specifications that any subsequent costs incurred by the University for re-inspection and witnessing of the water tight system shall be borne by the Contractor.

Roof Installations

The Manufacturer's Representative shall visit the site during the roofing work on a regular basis to ensure the installation is per their guidelines and requirements and provide a certified report to that affect.

Window Installations

At least 10% of exterior windows shall be water tested in the field. The testing shall be to 150% minimum of the maximum expected wind pressure. For complicated or oversized windows, or projects with a large number of windows, the Designer should consider additional wind tunnel testing requirements.

10.30 Snow and Ice Guards and Protection

The Designer shall provide a snow management strategy for all roof system designs. Such strategy shall be submitted to the University Representative for review at the end of Schematic Design. For all new roof installations, snow and ice guards shall be mechanically fastened to the structure. Canopies over entrances below sloped roofs as redundant protection should also be included. Where possible, building entrances and traffic areas should be below gable ends, not eaves.