The 2012 Design Criteria / Facility Standards Manual is updated to incorporate revisions in University policy and process, industry practices and technical criteria. The new Manual is posted in one Adobe Acrobat PDF file and in separate PDF files for each Division organized in the CSI 16 Division format.

The Table of Contents lists revised sections with the date of incorporation into the Manual. Current updates are dated 11-21-11 and highlighted in bold, italicized text. Revised information within the documents is similarly identified.

Table of Contents

(11-21-11)

UNIVERSITY OF MARYLAND

DC/FS EXECUTIVE COMMITTEE MEMBERS

Frank Brewer, Chairman

Jack Baker

Carlo Colella

Ken Riebert

Harry Teabout

Brenda Testa

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Anthony Stewart
John Vucci
Laura Wildesen

Coordinator (C)

Introduction

The facilities at the University of Maryland, College Park (UMCP) and at the Client Institutions (CI) of the University System of Maryland are maintained by their respective Office of Facilities Management (FM). Each Office of Facilities Management is concerned about the functional aspects of the University's buildings and grounds. They should be low in maintenance, energy efficient, and in general provide good value for the University with regard to life cycle costs as well as initial construction cost. It is not intended that this document limit the creative aspect of design; however, it is intended to bring about a standardization of certain aspects in all campus facilities.

Application

This document shall be applied to all new construction and building renovation projects on the College Park Campus, regardless if it is managed by the Department of Capital Projects or the Department of Campus Projects, and, for projects on the Campus' of Client Institutions. The Design Criteria/Facility Standards provides a set of guidelines to be used as the design develops from Schematic Design through Construction Documents and final bid documents. As "guidelines", the DC/FS is not intended to replace applicable building code requirements. Similarly, this document is not intended to replace standard campus practices that may not be consistent with the guidelines presented. If there is a need to deviate from the DC/FS, for other than code compliance, a Request for Deviation form shall be completed by the design team and forwarded to the University's Project Manager (the form is available at the end of Section 1.01, Building Goals, Design Principles, and Sustainability). The Directors of Capital Projects and Campus Projects shall grant such exceptions which they feel are in the best interest of the project. In addition, the Director, Operations and Maintenance, shall review and approve proposed changes that affect building operational performance.

Goals

As the flagship campus of the University System of Maryland, the University of Maryland College Park embraces its leadership role in the practice of environmental stewardship while supporting its mission of an outstanding teaching and world-class public research institution. Through its Strategic Plan (www.sp07.umd.edu), Facilities Master Plan (www.facilities.umd.edu/Masterplan/index.cfm), and Environmental Stewardship Guidelines (www.facilities.umd.edu/MasterPlan2/envguide.htm) the campus has established a number of initiatives to promote itself as an outstanding Green Campus while also addressing such equally important initiatives as sustainability, energy conservation, and holding new construction and major building renovations to stringent Leadership in Energy and Environmental Design (LEED) standards.

New construction and building renovations face the challenge of balancing the need to provide modern state-of-the-art teaching, research and office space while preserving and enhancing the architectural heritage of the campus' built and natural environment. In concert with the Facilities Master Plan, projects on campus shall develop open spaces, gathering places, vistas of green lawn and trees and groupings of buildings that promote a sense of community.

The following goals shall be applied to new construction, building renovations, and changes to the campus landscape at College Park:

- ***Preserve the architectural heritage of the campus***
- ***Promote a sense of community***
- ***Strive toward environmental sustainability beyond standard regulatory compliance***
- ***Achieve LEED Silver rating (min.) for new construction and major building renovations***
- ***For projects where achieving the LEED rating is not feasible, incorporate LEED design criteria to the maximum extent possible***
- ***Preserve the historically significant resources***
- ***Protect and improve indoor and outdoor air quality and minimize atmospheric pollution***
- ***Protect and improve outdoor and indoor light quality and minimize atmospheric light pollution***
- ***Minimize water use and discharges, improve discharge water quality, and promote water reuse***
- ***Reduce energy consumption/promote energy efficiency/promote renewable forms of energy***

While these goals are specifically incorporated into the Strategic Plan, Facilities Master Plan, and Environmental Stewardship Guidelines for the College Park campus, they are just as important for the Client Institutions serviced by the University of Maryland College Park Service Center (Department of Capital Projects). As such, they should also be applied to projects at Client Institutions to the maximum extent possible.

Format

These guidelines and standards, for the most part, organized in the Construction Specifications Institute's (CSI) format, using its master format list of section names. Only sections for which the University has guidelines or standards have been included; other guidelines and standards will be added as the need arises. When a section follows the master format list of section names and numbering system, and when a project specification manual is required for a project, the designer must utilize them as presented. The designer may add to the CSI format specifications provided in this document, but shall not reduce or remove the requirements listed in the specifications.

The designer may receive other UMCP documents (referenced herein) or CI documents. This Manual is not intended to dilute or contradict other UMCP/CI standards. Any conflicting information shall be brought to the attention of the Project Manager, Capital Projects or the Facilities Management project representative for clarification/resolution.

Updates

Supplements in the form of additions or replacements will be published periodically. The sections that have been either added or modified will be identified in bold under the revised Table of Contents followed by the revision date in parentheses. The same revision date also appears at the end of the heading of the respective sections. PLEASE NOTE that in some cases, only a few sheets will have been modified; in which case only selected pages need to be replaced in the Manual.

Compiled by Capital Projects and Facilities Management, University of Maryland College Park, these standards and guidelines are intended to serve as a guide for renovation and new construction projects at the University of Maryland College Park and Client Institutions of the University System of Maryland. They are the result of experience gained over a number of years and reflect the University's judgment about what is needed to obtain optimum lifetime performance from its buildings in terms of first time cost and maintenance.

The design and construction of buildings on a university campus pose a unique challenge to project designers.

It is the University's intent to create facilities that shall remain useful for 50 or more years. It requires a commitment to the taxpayers and users to understand the two major differences between a building built at taxpayers' expense and used by an institution and a building built for private industry use:

1. The building shall remain in use for 50 to 100 years.

2. The cost of operation is not passed onto the tenants or depreciated.

First, because of the long life expectancy and changing academic environment, the infrastructure of a building must be designed for flexibility and change. Interstitial space has to be large enough to accommodate mechanical and electrical system additions/modifications brought on by an increase in the density of use and the increased demands of technology. Mechanical rooms, though not viewed programmatically as assignable space, are assigned to Facilities Management for the operations and maintenance of a facility. Proper maintenance must be possible without requiring mechanics to jeopardize their safety or shut down major parts of a facility in order to perform maintenance. Adequate space must be provided to allow for maintenance without the use of special equipment.

Secondly, the State of Maryland system has not historically provided maintenance funds for either equipment or personnel to maintain a facility. Many times, equipment and finishes that are viewed as economical to replace in the private sector cannot be replaced in the state system due to the lack of maintenance dollars for personnel or materials.

It is therefore extremely important that the project designers recognize these facts and do the most to provide proper analysis in the selection of finishes, windows, doors and equipment.

In an effort to avoid excessive costs of University building systems and given the rapidly changing environment within the campus buildings, everyone involved in both the formulation and review of the DC/FS has focused on: reducing the use of high cost finishes on interior architectural systems (which typically changes several times during the building's life), looking to build to the intent of state & federal regulatory requirements, and minimizing the specification of proprietary items. On the other hand, also consistent with the administration's objectives, projects will continue to use the life-cycle costing approach to specify building systems - roofing, masonry, plumbing, electrical, and HVAC systems. Exceptions to the above will be made, as appropriate, on a project-by-project basis only.

History

The past organizational structure, was comprised of nine subcommittees (Architecture, Interior Design & Egress; Commissioning; Division 15; Environmental Controls; Environmental Permitting; Exterior & Site Considerations; Fire Alarms; Fire Suppression Systems; and Health Safety & Security) established to conduct a critique of the entire document based on the above criteria as well as create new and/or applicable guidelines and standards. The thoroughness of the process is also important to note. Any change or addition to the DCFS requires the review/recommendation of the respective Subcommittee prior to being submitted to the Technical Committee for review/change and approval in order to be incorporated into this document. In lieu of individual subcommittees the current structure consists of a single committee of representatives from Facilities Management and the campus community.

In addition to the above efforts, an Environmental and Fire Protection Consulting Team was hired to insure that the DC/FS criteria, including pending guidelines related to environmental safety, fire protection, and life safety issues, are reasonable and do not unnecessarily impose additional construction costs based on applicable regulations and best management practices. The Consultants also reviewed the document to identify issues that are not adequately addressed and provided relevant examples for consideration by UMCP.

The Consultant's findings indicated that there are few design criteria related to environmental safety, fire protection and life safety issues which would result in unnecessary and excessive costs. The expertise provided by the Consultants was either incorporated in the DCFS in accordance with the above review process or required additional review by the respective Subcommittee.

Since this is a "living" document, comments, observations, recommendations from all members of the UMCP Community as well as outside professionals are welcome and should be forwarded to: Capital Projects, DC/FS Coordinator, 0600 Service Building, University of Maryland College Park, and College Park, MD 20742.

Attachment #1

UNIVERSITY OF MARYLAND

DC/FS Approval Process

Requestor Completes Change Request Form
Requestor completes Change Request Form with language describing the proposed change. All information, under the three headings, must be provided in order for the review process to begin.

↓

Requestor Submits Change Request to Department Director
The Director evaluates the Request based on FM policy and cost. The Director must approve the Change Request prior to forwarding for further consideration.

↓

Department Director Submits Change Request to DC/FS Coordinator
The DC/FS Coordinator assesses the completeness of the Change Request and coordinates technical review by General Subcommittee. Resolution of comments is required prior to presentation to the Executive

↓

Executive Committee Review
The DC/FS Coordinator presents proposed change for final review and approval.

↓

Approval and Incorporation into DC/FS
Upon approval by the Executive Committee the change is incorporated into the DC/FS. Notification is issued to FM and Procurement. Publication date is coordinated with other updates and with FM IT for posting on the website.

Attachment #2

1. Requestor Completes Change Request Form

Requestor completes Change Request Form with language describing the proposed change. All information, under the three headings, must be provided in order for the review process to begin.

2. Requestor Submits Change Request to Department Director

The Director evaluates the Request based on FM policy and cost. The Director must approve the Change Request prior to forwarding for further consideration.

3. Department Director Submits Change Request to DC/FS Coordinator

The DC/FS Coordinator assesses the completeness of the Change Request and coordinates technical review performed by the General Subcommittee. Resolution of comments is required prior to presentation to the Executive Committee.

4. Executive Committee Review

The DC/FS Coordinator presents proposed change for final review and approval.

5. Approval and Incorporation into DC/FS

Upon approval by the Executive Committee the change is incorporated into the DC/FS. Notification is issued to FM and Procurement. The publication date is coordinated with other updates and with FM IT for posting on the website.

*Supplemental updates may be posted between primary yearly updates.

1. Requestor shall complete a copy of the attached Change Request Form (Attachment #4) for each requested change with the following information for each change:
   - Indicate the existing Division and Section number for proposed change.
   - Indicate the paragraph location for the new changes desired in bold letters.
   - Clearly describe the proposed change(s) to the current DC/FS Manual.
   - Describe the reason/justification for proposed change.
   - Provide an estimate of cost impact, i.e. initial cost and life cycle cost where appropriate, of proposed change.

2. Requestor shall provide an electronic copy of the proposed revisions to the existing Section as a newly typed draft or highlighted in red. The current edition of the DC/FS is available for download.

3. Requestor shall submit the completed Change Request Form and proposed draft to his/her Department Director for assessment and further evaluation. The Director will determine if the proposed change has merit for consideration to be incorporated into the DC/FS. If the proposal is to receive further technical evaluation, the Director must approve and sign the Change Request Form indicating support for the proposed change and concurring that the change is in the best interest of the University's cost control and facilities management policies.

4. The Director shall submit the approved Change Request Form and draft section to the DCFS Coordinator for technical review by the General Subcommittee comprised of appropriate area interest representatives.

5. The DCFS Coordinator will review the Change Request to confirm that all required information if provided and forward the proposed change to the General Subcommittee.

6. If approved by the General Subcommittee, the proposed change will be presented for final review and approval by the Executive Committee. If not approved by the General Subcommittee, the proposed change will be returned to the Director with an explanation of the basis of the decision.

7. If approved by the Executive Committee, the change will then be forwarded to Facilities Management's Information Technology to be placed on the Facilities Management website.

8. The website Table of Contents will be revised to reflect updates indicating the date of the change, with the Division, Section number and Section change(s) noted in bold italics.

DESIGN CRITERIA/ FACILITY STANDARDS MANUAL
CHANGE REQUEST FORM

University of Maryland Capital Projects	REQUESTOR: ______________________ DEPARTMENT: ____________ DATE SUBMITTED TO DIRECTOR: _________________________________ DIRECTOR'S APPROVAL:___________________________DATE:_______
SUBCOMMITTEE TO REVIEW	RETURN FORM TO: Jocelyn J. Fleming, COORDINATOR DATE:_______ CAPITAL PROJECTS SERVICE BUILDING ANNEX 301-405-1120

INDICATE DIVISION AND PARAGRAPHS TO BE CHANGED

DIVISION NO.	PARAGRAPH	REQUESTED CHANGE (Print)
		DESCRIBE REQUESTED CHANGE

JUSTIFICATION FOR CHANGE
EXPECTED INITIAL COST AND LIFE CYCLE COST

A. Building Goals:

Campus Projects, Capital Projects and Operations and Maintenance are entrusted with providing UMCP buildings which incorporate a high degree of:

1. Functional Efficiency
2. Innovative and Appropriate, Design
3. Contextual Harmony with the Site and Neighborhood
4. Appropriately Selected Materials and Systems
5. Health and Safety Characteristics
6. Accessibility for the Disabled
7. Life Cycle Value

These Architectural and Engineering Design Standards have been compiled to establish general and, in some cases, specific design policies as a guide for designing new facilities, as well as altering or renovating existing structures. **ANY DEVIATION FROM THESE STANDARDS MUST BE SUBMITTED TO, AND APPROVED IN WRITING BY CAMPUS PROJECTS, CAPITAL PROJECTS AND/OR OPERATIONS & MAINTENANCE ON THE FORM (ATTACHMENT #4) FOLLOWING THIS SECTION.**

These Design Standards supplement the job specific Facility Program. Should the requirements of these Design Standards conflict with other information or requirements of the project and/or site conditions, the Designer will be responsible for obtaining resolution with FM and for proceeding in accordance with a written waiver from Facilities Management.

B. Design Principles:

UMCP buildings, new and renovated, must provide the functional, aesthetic, environmental, and safety needs of the using-agency "client" and the requirements of governing authorities, with a reasonable balance between initial cost and life-cycle value. UMCP is dedicated to improving the quality of its campus and buildings through planning, architectural, and engineering services which must:

1. Ensure the highest degree of professionalism from the Design Team to develop and implement innovative and functional design concepts, in harmony with the site environment, and appropriate to the project needs.

2. Assure that design concepts for repair, alterations, and renovations are executed with the same professional consideration as that for new facilities.

3. Implement reliable procedures for controlling project estimates, construction costs, life-cycle factors, and time schedules.

4. Establish thorough quality-control coordination during all phases of the design process.

5. Respond to governing codes and standards ensuring environmental health and safety.

C. Sustainability:

The University of Maryland College Park (UMCP) recognizes its responsibility to design and build facilities for College Park and Client Institutions that: 1) meet the programmatic needs of our clients; 2) enhance the architectural character of the Campus; and, 3) promote a commitment to environmental stewardship by adhering to the principles of sustainability in both new construction and building renovation projects.

The University of Maryland is a member of the U.S. Green Building Council (USGBC) and recognizes the USGBC LEED rating system as the most widely accepted standard for evaluating sustainability in the built environment. The following Campus and State initiatives serve as the framework for the University's sustainable design practices:

- The Facilities Master Plan was adopted in 2002 and the Environmental Stewardship Guidelines was adopted in 2005.

- May, 2007 – President Mote, University of Maryland, signed the American College and University Presidents Climate Commitment which pledges to take significant steps to reduce greenhouse gas emissions from campus operations and move toward the goal of climate neutrality (zero net greenhouse gas emissions).

- October, 2007 – The University of Maryland, College Park Facilities Council agreed that new buildings and full building renovations at College Park be constructed with the goal of being eligible for LEED certification at the Silver level as prescribed by the U.S. Green Building Council.

- April, 2008 – Governor Martin O'Malley signed into Maryland Law, the High Performance Buildings Act. It requires specified buildings (to include higher education buildings) constructed or renovated with state funds, to be high performance buildings.

- May, 2008 – President Mote adopted the new University Strategic Plan. The Plan states that the University should become a model for environmental stewardship and sustainability "holding new construction and renovation to stringent LEED standards".

As a result of these initiatives, LEED 'Silver' has been established as the minimum rating for Capital projects achieving USGBC LEED certification. Each project should strive to attain the maximum number of credits possible within the constraints of the project program and budget. Even if a project is not going for USGBC certification, the design shall incorporate, to the maximum extent possible, sustainable design features consistent with the USGBC LEED rating system.

The design team shall work collectively throughout design development to identify the best combination of LEED rating points which will achieve the project's sustainability goals. For each project, the design team shall work in an integrated fashion to evaluate the pros and cons of implementing LEED rating points and to consider the impact they have on each of the design disciplines.

The following is a list of LEED System credits which shall be considered mandatory for all projects required to be LEED Silver (or greater) certified. The credits are based on LEED – NC Version 2.2 and should be applied to the most current version of the USGBC LEED rating system. Noted points shall be considered minimum.

Sustainable Sites
- ***Light Pollution Reduction – 1 point***

Water Efficiency
- ***Water Use Reduction – 2 points***

Energy and Atmosphere
- ***Optimize Energy Performance – 4 points***

Materials and Resources
- ***Construction Waste Management – 2 points***

Indoor Environmental Quality
- ***Low Volatile Organic Compounds (VOC) Emitting Materials – 2 points***

Maryland forests are typically not certified by the Forest Stewardship Council (FSC). Therefore, FSC approved lumber must be shipped to the State, often from long distances, contrary to sustainable practices. Therefore, the use of the Certified Wood credit is prohibited in attaining a LEED certification. The use of the Regional Materials credit, part of which may be satisfied through the use of Maryland lumber products, is encouraged.

All projects which are required to be LEED certified shall be registered and certified using the University of Maryland's U.S. Green Building Council membership. The University's Project Manager will facilitate this effort.

Construction and Demolition Waste Recycling Companies Washington, D.C. Metropolitan Area

(Note: This information is provided for reference only and should not be considered all inclusive or current or an endorsement of the companies listed.)

General Construction and Demolition Materials Recyclers:

1. "Tidewater Fibre Corp" construction and demolition waste company. Website: www.ticrecycling.com Address: 12206 Old Stage Rd, Chester, VA 23836. Phone: (804) 706-5877.
2. "Broad Run Recycling Center" construction and demolition waste company. Website: www.IDStrash.com Address: 9120 Developers Drive, Manassas, VA 20109. Phone: (703) 503-9300.
3. The Construction Waste Management Database contains information on companies that haul, collect and process recyclable debris from construction projects. Created in 2002 by GSA's Environmental Strategies and Safety Division to promote responsible waste disposal, the Database is a free online service for those seeking companies that recycle construction debris in their area. http://wbdg.org/tools/cwm.php
4. "Baltimore Scrap Corp" recycling center for construction and demolition debris. Website: www.baltimorescrap.com Address: 3100 Weedon Street Baltimore, MD 21226 (Corner of Frankfurst Ave. and Vera St, Curtis Bay, MD). Phone: (410)355-4455.
5. "Berg Recycling, Inc." recycling center for construction and demolition debris. Website:
6. www.bergrecycling.com Address: 1401 W. Hamburg St. Baltimore, MD 21230. Phone: (410) 837-5575.
7. "Montgomery Scrap Corp." recycling center for construction and demolition debris. Website: www.mscrap.com Address: 1500 Southlawn Ln, Rockville, MD 20850. Phone: (301)424-3000.
8. "Terrapin Recycling & Disposal, LCC" recycling center for construction and demolition debris. Website: www.terrapinrecycling.com Address: 7600 Rolling Mill Rd, Baltimore, MD 21224. Phone: (410) 285-5900.
9. "Cambridge Iron & Metal Co, Inc." recycling center for construction and demolition debris. Website: www.cambridgeiron.com Address: 901 S. Kresson St, Baltimore, MD 21224. Phone: (410) 206-3260.
10. "Stone Tech" recycling center for construction and demolition debris. Address: P.O. Box 1420, Salisbury, MD 21802. Phone: (410) 742-2851.

General Salvaged Building Material Centers:

1. "The Newel Post" architectural salvage depot, Website: http://www.pgcht.org/newelpost.html Address: 7600 Jefferson Avenue, Landover, MD 20785. Phone: (301) 627-4499.
2. "Tri-State Reuse Centre" Address: 225 West Main St, Hancock, MD 21750. Phone: (301) 678-6160.
3. "Ahoora, Inc." Address: P.O. Box 826 Merrifield, VA 22116. Phone: (703)438-0957.

4. “Bargain Village” Address: 12197 Jefferson Davis Highway, Woodford, VA 22580. Phone: (804) 448-0059.
5. “Black Dog Salvage” Architectural Antiques and Salvage. Website: www.blackdogsalvage.com Address: 902 13th Street WW, Roanoke, VA 24016. Phone: (540) 343-6200.
6. “Caravati’s Architectural Antiques” Website: www.caravatis.com Address: 104 E 2nd Street, Richmond, VA 23224. Phone: (804) 232-4175.
7. “Cmc” Address: 4509 Pouncey Tract Road, Glen Allen, VA 23059. Phone: (804) 369-2120.
8. “Empire Salvage & Recycling, Inc.” Address: 200 Thistle Street, Bluefield, VA 24605. Phone” (276) 322-3554.
9. “Governors Antiques and Architectural Supply” Address: 8000 Antique Lane, Mechanicsville, VA 23116. Phone: (804) 746-1030.
10. “Hamilton Salvage Building Materials” Address: 3201 Dwina Road, Coeburn, VA 24230. Phone: (276) 762-5140.
11. “Imperial Building Supply” Address: 856 W 45th Street, Norfolk, VA 23508. Phone: (757) 489-4254.
12. “Lantz Building Supply” Address: 138 Linville Avenue, Broadway, VA 22815. Phone: (540) 896-7048.
13. “Pryor’s Hauling Company” Address: 4509 Pouncey Tract Road, Glen Allen, VA 23059. Phone: (804)360-2120.
14. “Virginia Antique Building Materials” Address: 600 Greenview Court, Pulaski, VA 24301. Phone: (540) 980-4232.

Non-Profit Salvaged Material Centers:

1. “Second Chance” architectural salvage non-profit. Website: http://www.secondchanceinc.org Address: 1645 Warner St, Baltimore, MD 21230. Phone: (410) 385-1101.
2. “The Loading Dock: A Building Materials Reuse Center” non-profit. Website: www.loadingdock.org Address: 2 N. Kresson St, Baltimore, MD 21216. Phone: (410) 728-DOCK.
3. “Habitat for Humanity” Restore of Northern Virginia, for construction and salvaged materials donation. Website: www.restorenova.org Address: 7770 Richmond Highway, Alexandria, VA 22306.
4. “Community Forklift” accepts donated building materials. Website: http://www.communityforklift.com Address: Sustainable Community Initiatives, 4671 Tanglewood Drive, Edmonston, MD 20781. Phone: (202) 544-0069

Salvaged Wood Center:

1. “Kings Arrow Antiques Lumber” Address: 11175 Tattersall Trail, Oakton, VA 22124. Phone: (703) 407-5912.
2. “Big Wood” Salvaged wood purchaser/dealer. Website: www.big-wood.net Address: Afton, VA 22920. Phone: 434-361-9300.

Carpet Recycling:

1. "Shaw Contract" for recycling used carpet from any manufacturer. Phone: (877) 502-SHAW.
2. "Invista Reclamation Program" for recycling used carpet from any manufacturer. Website: http://antron.invista.com/content/sustainability/ant08_04_01.shtml

Acoustical Ceiling Panel Recycling:

1. "Armstrong Ceiling Recycling Program" for recycling old acoustic ceiling panels. Website: http://www.armstrong.com/sustainability/programs-recycling.html

Gypsum Recycling:

1. "Gypsum Agri-cycle" for processing drywall waste that is generated from new construction sites. Website: www.gypsumagricycle.com/

REQUEST FOR DEVIATION FORM
DESIGN CRITERIA / FACILITY STANDARDS

In accordance with Division 1, General Requirements and Guidelines to the A/E, 1.01 Building Goals, Design Principles and Sustainability, I request the following deviation from the Design Criteria / Facility Standards Manual.

DEVIATION DESCRIPTION:

____

____

____

____

JUSTIFICATION: (To include value engineering analysis)

____

____

____

____

REQUESTED BY: ____

TITLE: ____

FIRM: ____

DATE: ____

PROJECT REPRESENTATIVE APPROVAL:

PROJECT MANAGER: ____

DEPARTMENT: ____

DATE: ____

DIRECTOR APPROVAL:

A Request for Deviation must be approved by the Director, Campus Projects or Director, Capital Projects (College Park Projects) or Designee (Client Institutions), as appropriate. In addition, the Director, Operations & Maintenance, shall review and approve proposed changes that affect building operational performance. In the event that approval is denied, the applicant may request reconsideration from the Associate Vice President for Facilities Management.

DIRECTOR/DESIGNEE: ____

ASSOCIATE VICE PRESIDENT: ____

1.02 BUILDING SERVICES AND PREVENTIVE MAINTENANCE REQUIREMENTS

The spaces identified in this section shall not be used as access to other spaces.

A. Housekeeping Zone Closets:

1. Provide a minimum of one (1) 4'-6" x 8'-0" housekeeping closet with double doors on each floor of a building (see attached floor plan for layout of closet and the Table identifying number of closets required). The following shall be standard equipment in each housekeeping closet:

   a. 36" X 36" floor mounted pre-cast mop-ceptor.
   b. 36" shelf above mop-ceptor.
   c. Mop strip above mop-ceptor.
   d. Mop-ceptor faucet shall have threaded spout with pail hook and 6 foot hose with racket.
   e. One electrical outlet.
   f. One light fixture switched to door opening.
   g. Trap primer and accessories.

2. Floors and walls (to at least 4'-0" high above finished floor) shall be covered with hard, waterproof surfaces, preferably ceramic tile.

3. One additional closet shall be provided that is large enough to house an automatic scrubber (48" x 60" x 48" high) in buildings of 40,000 GSF or larger. For units that do not utilize sealed batteries, the electical lighting, fans, wiring, etc., shall comply with the requirements of the National Electrical Code for "Classified Locations". The exhaust fans shall operate 24 hours per day.

4. Only equipment identified in this section shall be located in custodial closets. Installation of HVAC, electrical, telephone or plumbing equipment is not acceptable.

5. A set of double doors is required for each housekeeping closet. Each door (minimum 30" each) shall swing out into the corridor.

B. Housekeeping Central Storage Room:

1. A 200 GSF storage room (minimum) located adjacent to a loading dock or service entry is required in buildings of 40,000 GSF or larger.

C. Housekeeper's Room:

1. Provide one 100 GSF room per building (minimum), located adjacent to housekeeping central storage room.

2. The size of this room increases in increments of 15 GSF for each additional 20,000 GSF of building.

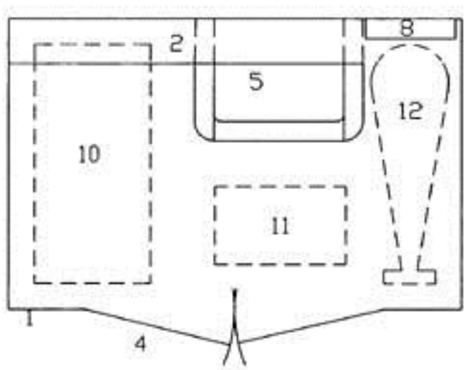
D. Preventive Maintenance Shop:

1. Provide one 100 GSF room per building (minimum), located adjacent to primary mechanical room(s) and loading dock or service entry.

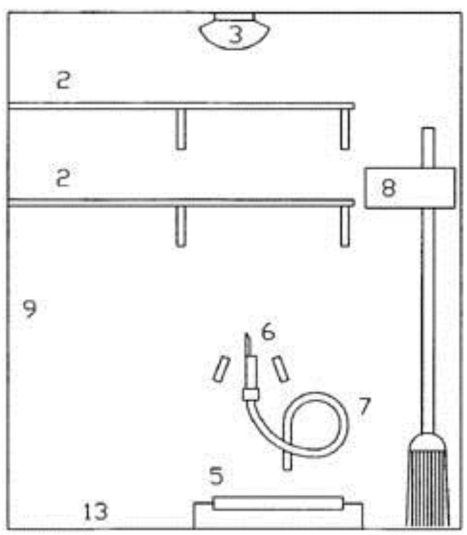
E. Preventive Maintenance Storage:

1. If a building is 40,000 GSF or larger, a 200 GSF room (minimum) separate from, but adjacent to, the maintenance shop, is required. The size of this room increases in increments of 20 square feet per each additional 20,000 GSF of building.

HOUSEKEEPING ZONE CLOSET



PLAN VIEW



FRONT VIEW

Legend

11. Dimensions: 8' long, 4 1/2' deep.
12. Shelving 10" deep, with bracket supports.
13. Fluorescent fixture with switch mounted occupancy control that utilizes 180 degree field of view.
14. Two 30" doors, with vents and lockable.
15. Utility floor sink, (note: off-center) with stainless steel lip cover.
16. Bibb faucet with support hanger.
17. 4 foot length of hose.
18. Tool holder.
19. Walls ceramic to 4' min., painted enamel (including ceiling) above 4'.
20. Location for custodial cart or waste hamper.
21. Location for 2-bucket (or 3-bucket) mopping outfit.
22. Location for floor machine or vacuum.
23. Floor--hard, water-proof surface, preferably ceramic tile.

SCALE: 1/2"

	Housekeeping Spaces				Maintenance Spaces			
Building Size(GFS)	Zone Closets #	SF@4' X8.5'	Central Storage	Housekeeper room	Shop	Storage	Total GSF	Pct of GSF
20,000	1	36	None Requ	100	100	None Requ	236	1.18%
40,000	2	72	200	115	100	200	687	1.72%
60,000	3	108	220	130	100	220	778	1.30%
80,000	4	144	240	145	100	240	869	1.09%
100,000	5	180	260	160	100	260	960	0.96%
120,000	6	216	280	175	100	280	1,051	0.88%
140,000	7	252	300	190	100	300	1,142	0.82%
160,000	8	288	320	205	100	320	1,233	0.77%
180,000	9	324	340	220	100	340	1,324	0.74%
200,000	10	360	360	235	100	360	1,415	0.71%
220,000	11	396	380	250	100	380	1,506	0.68%
240,000	12	432	400	265	100	400	1,597	0.67%
260,000	13	468	420	280	100	420	1,688	0.65%
280,000	14	504	440	295	100	440	1,779	0.64%
300,000	15	540	460	310	100	460	1,870	0.62%

Zone Closets are the basic work and supply room for individual housekeepers and should be located adjacent to restrooms. Housekeeping Central Storage is the storage room for the building and shouldbe convenient to both the service entry, loading dock and the elevator. Housekeeper Room is the lunch, meeting and office facility. It should be adjacent to the Central Storage Room. Maintenance Shop is the basic work area for the building maintenance. It should be located adjacent to the service entry and main mechanical space. Maintenance Storage Room is the supply storage area for maintenance and should be located adjacent to the Shop and Service entry.

1.03 CODES (12-2-02)

All design shall comply with accepted engineering practices in compliance with the following codes unless specific approval is obtained for variance. When a specific project warrants variance the request is to be submitted in writing to DAEC early in the design stage.

Although the following list contains major codes and standards which currently apply to construction for the University, it is not to be considered all inclusive. All other standards, codes and regulations imposed by the Department of General Services or the University which may be initiated subsequent to the program submittal must be adhered to. All references utilized are to be the most current editions, approved or adopted by the State and local agencies, including all applicable revisions or appendices.

In addition, all designs shall comply with Governor's Executive Order .01.01.1992.11 Building Performance Standards for State Buildings which outlines the following; "All State agencies shall utilize and apply the building performance standards set forth in the State's Model Performance Code at COMAR .05.02.01 and the State Fire Prevention Code at COMAR 12.03.01 promulgated pursuant to Article 38A, § 3 of the annotated Code of Maryland, as amended for all construction, alteration, remodeling, and renovation of all buildings that are owned, leased, operated, or controlled by the State." In summary, the Model Performance Code includes the BOCA Building Mechanical (ICC International), and Energy Conservation Codes; and the State Fire Prevention Code includes NFPA 101 and the BOCA Fire Prevention Code.

A. The International Building Code 2000

B. The ICC International (B.O.C.A. National) Mechanical Code

C. The B.O.C.A. Energy Conservation Code

D. Standards of the National Fire Protection Association

E. National Electrical Code

F. Maryland Occupational Safety & Health Administration

G. State of Maryland Fire Prevention Code

H. Americans With Disabilities Act - Accessibility Guidelines for Buildings and Facilities - 1990

I. Maryland Building Code for the Disabled

J. State of Maryland's Department of General Services, Procedures for Implementation of Energy Conservation

K. Washington Suburban Sanitary Commission (WSSC) Plumbing and Gas Fitting Regulations

L. State of Maryland's Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks (ANSI/ASME A17.1)

M. The Institute of Electrical and Electronics Engineers, Inc.

N. American National Standards Institute: "National Electrical Safety Code" - ANSI C-2 and ANSI C-37

O. 29 CFR S1910 & S1926

P. Maryland Department of Transportation, Maryland State Highway Administration - Standard Specifications for Construction and Materials

Q. Maryland Department of the Environment (MDE)

R. Manual on Uniform Traffic Control Devices (MUTCD)

1.04 ENVIRONMENTAL HEALTH & SAFETY (EH&S) IN FACILITY DESIGN (12-2-02)

A. EH&S CODES, REGULATION, AND STANDARDS:

Consistent with the Governor's Executive Order 01.01.1996.03 - Regulatory Standards and Accountability, the design shall comply with the latest approved edition of applicable Federal, State, and local codes, regulations, and standards involving Environmental Health and Safety (EH&S) in the delivery of University facilities.

1. GENERAL

This section sets forth governmental regulations and fundamental building codes which are included and incorporated herein by reference and made a part of the University's "Design Criteria/Facilities Standards (DCFS) Manual." Requirements include;

a) Adherence during design to conditions set forth in applicable codes, regulations, and standards.

b) Securing notices, permits, licenses, inspections, releases, and similar documentation, as well as payments, statements, and similar requirements associated with compliance with codes, regulations, and standards in the design of campus facilities.

c) Discernment of EH&S standards of care and best management practices, outlined herein which will assist in considering areas of EH&S compliance. Provisions shall be included in programmatic and design documents to address regulatory issues with reference to applicable standards as well as the "General Duty Clause" of the Occupational Safety and Health Act of 1970. Further, designs shall envision EH&S provisions which avoid contractual or tort liabilities (e.g., professional error or omission).

2. CODES AND REGULATION

Except to the extent that more explicit or definitive requirements are written directly into the DCFS Manual, all applicable codes, regulations, and standards have the same force and effect (and are made a part of the Manual by reference) as if copied directly into the DCFS Manual, or as if published copies are bound herewith.

3. REGULATORY REQUIREMENTS

Compliance with the following regulatory standards is mandated by Federal or State law.

a) FEDERAL DEPARTMENT OF LABOR (DOL)/OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS.

1. Occupational Safety and Health Act of 1970

2. Title 29 CFR Part 1910 General Industry Standards

3. Title 29 CFR Part 1926 Construction Industry Standards

b) MARYLAND DEPARTMENT OF HEALTH AND MENTAL HYGIENE (DHMH/DIVISION OF LABOR AND INDUSTRY (DOLI)/MARYLAND OCCUPATIONAL SAFETY AND HEALTH (MOSH) REGULATIONS.

1. Annotated Code of Maryland, Title 5 Occupational Safety and Health

2. Code of Maryland Regulations, COMAR Title 09, Subtitle 12

   a. COMAR 09.12.20 - .24 Maryland OSH Act, General

   b. COMAR 09.12.31 MOSH Incorporation by Reference of Federal Standards

   c. COMAR 09.12.33 Access to Information About Hazardous and Toxic Substances

   d. COMAR 09.12.35 Confined Spaces

e. COMAR 09.12.36 Field Sanitation

f. COMAR 09.12.38 GIS for Personnel Platforms Suspended from Cranes, Derricks, and Hoists

c. FEDERAL ENVIRONMENTAL PROTECTION AGENCY (EPA)

1. Title 40 CFR Part 61, Subpart M - Asbestos NESHAPs

2. Title 40 CFR Parts 260 through 265 and 268 - Resource Conservation and Recovery Act (RCRA)

a. Part 260 Hazardous Waste Mgmt Systems: General

b. Part 261 Identification and Listing of Hazardous Waste

c. Part 262 Generators of Hazardous Waste

d. Part 263 - Transportation of Hazardous Waste

e. Part 264 - Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

f. Part 265 - Interim Storage Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

g. Part 268 - Land Disposal Restrictions

3. Title 40 CFR Part 112 - Oil Pollution Prevention

d. MARYLAND DEPARTMENT OF THE ENVIRONMENT (MDE)

1. Code of Maryland Regulations, COMAR Title 26

a. COMAR 26.02.07 Procedures for Abating Lead Containing Substances form Buildings

b. COMAR 26.10.02 -.11 Oil Pollution and Tank Management

2. COMAR Title 26, Subtitle 11 - Toxic Air Pollutants

a. COMAR 26.11.02 Air Quality Permits, Approvals, and Registration

b. COMAR 26.11.06 General Emissions Standards, Prohibitions, and Restrictions.

c. COMAR 26.11.21 Control of Asbestos

3. COMAR 26, Subtitle 13 Hazardous Waste Regulations

4. COMAR 26.16.01 Accreditation and Training for Lead Paint Abatement Services

e. FEDERAL DEPARTMENT OF TRANSPORTATION (DOT)

1. Hazardous Substances Title 49 CFR Parts 171 - 177

4. MANDATORY CODES

Governor's Executive Order 01.01.1992.11 - Building Performance standards for State Buildings, mandates adherence to the following codes in University facilities;

a) International Building Code (IBC)(Latest Edition)

b) ICC International Mechanical Code (Latest Edition)

c) WSSC Plumbing Code (Latest Edition), in College Park

d) Local/State/ICC Plumbing Code (Latest Edition), for other campuses

e) NFPA Codes and Standards (Latest Adopted Edition)

5. CONTRACTUAL PROVISIONS FOR RELIABLE EH&S DESIGN

The following industry standards of care shall be incorporated into programmatic or design documents where such standards have application to the work.

a) Environmental Site Assessment

ASTM E 1527-93	-	Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process

b) General Building Ventilation

ASHRAE 62-1989	-	Ventilation for Acceptable Indoor Air Quality
ASHRAE 55-1981	-	Thermal Environmental Conditions for Human Occupancy
ASHRAE Handbooks	-	HVAC Applications
(Latest Editions)	-	Refrigeration
	-	Fundamentals
	-	Systems and Fundamentals Equipment

c) Specialized Ventilation

ACGIH Handbook	-	Industrial Ventilation: A Manual of Recommended Practice, 22nd Edition
ANSI/AIHA Z9.3-1994	-	Standard for Spray Finishing Operations

d) General Laboratory Ventilation

ANSI/AIHA Z9.5	-	American National Standard for Laboratory Ventilation (1993)

e) Spray Finishing Booths/Rooms

ANSI/AIHA Z9.3-1994	-	Standrd for Spray Finishing Operations

f) Eyewash/Safety Shower Stations

ANSI Z358.1-1998	-	American National Standard for Emergency Showers and Eyewash Stations

g) Laboratory Design For Biosafety

Biosafety Labs	-	DC/NIH 3rd Edition Biosafety in Microbiological and Biomedical Laboratories (Current Edition)
NIH Guidelines	-	Guidelines for Research Involving Recombinant DNA Molecules(Current Edition)
	-	Primary Containment for Biohazards: Selection, Installation, Use of Biological Safety Cabinets (Current Edition)
BL3 Commissioning	-	USDA, Agricultural Research Service (ARS), Construction Project Design Standard, ARS Manual 242.1 (8/91)

D. Best Management Practice In EH&S

During project development, the Project Team shall identify potential sources of pollution or other damage to the environment that may occur during facilities construction. When a potential source of environmental degradation is identified, suitable provisions shall be included in technical specifications to eliminate or minimize damage. Additionally, the following environmental policies affecting facilities development must be adhered to;

1. INSTITUTIONAL STANDARDS OF CARE IN EH&S

The following risk management programs at UMCP shall be consulted in relation to applicable EH&S design and construction issues. Many of these documents are available for review at the University's Department of Environmental Safety (DES) Website. http:www.inform.umd.edu: 8080/CampusInfo/Departments/EnvirSafety

a) DEPARTMENT OF ENVIRONMENTAL SAFETY (DES)

1) Asbestos Management Plan

2) Biosafety Manual

3) Chemical Hygiene Plan

4) Confined space Entry Plan

5) Hazardous Waste Management Manual

6) Laboratory Safety Guide

7) Lead-Based Paint Management Plan

8) Lockout/Tagout Program

b. DEPARTMENT OF AEC - SAFETY ANALYSIS UNIT

1) Specifications for Industrial Hygiene Services

2) Hazardous Waste Management Requirements on construction

2. PROHIBITED BUILDING MATERIALS

The use of the following materials is prohibited on all University Projects;

a) Products containing asbestos

b) Interior products containing urea/formaldehyde

c) Products containing polychlorinated biphenols (PCBs)

d) Solder or flux containing greater than two-tenths of one percent (0.2%) lead and domestic pipe or fittings containing greater than eight percent (8%) lead

e) Paint containing greater than six-one hundredths of one percent (0.06%) Lead by weight

Due to concerns for Indoor Environmental quality, the application of fibrous absorptive materials (e.g., ductliners) to ductwork interiors is strongly discouraged as a means to control noise. Duct liners shall be limited to the minimum application required to achieve programmatic noise criteria and shall be surface cleanable. Alternative technologies are preferred over the use of fibrous absorptive materials in the airstream of ductwork. Serviceable sound attenuation devices are preferred over the wholesale use of interior ductliners.

3. CONTROL OF AIRBORNE HEALTH HAZARDS

Construction operations which may result in the diffusion of dust and other perticulates, toxic gases or other harmful substances in quantities hazardous to health shall be safeguarded by means of temporary local exhaust ventilation or other protective measures to ensure the safety of the public. Where applicable, physically isolate adjacent occupied areas with temporary partitions, mechanical system isolation, or other practical engineering controls.

Prior to building commissioning, indoor air shall be purged with outdoor air. Exhaust airborne particulates and wet pollutant emitters to the building exterior in a manner which precludes those health effects commonly associated with exposure to construction-related pollutants. Air purging shall be phased prior to furniture installations to avoid absorption of airborne pollutants and formation of a sink for remission of construction-related pollutants.

4. LEAD-BASED PAINT DURING BUILDING ALTERATIONS

Pre-1980 buildings scheduled for alterations which impact painted surfaces shall be surveyed for lead content consistent with regulatory requirements and the University's specifications for Industrial Hygiene services. In facilities used as residential facilities or child care centers, lead-based paint must be abated to the satisfaction of Maryland Department of the Environment (MDE). Approved encapsulation products allowed for use in the abatement of lead-painted surfaces are available from MDE.

5. ASBESTOS IN EXISTING BUILDINGS

Pre-1985 buildings scheduled for alterations which impact building materials shall be surveyed and assessed for asbestos conditions consistent with regulatory requirements and the University's specifications for Industrial Hygiene services. Where damage or disturbance is anticipated during construction, appropriate corrective action must be designed into the project. Where feasible, designs which avoid or minimize disturbance through in-place management techniques are preferred over wholesale removal.

EPA-accredited Asbestos Project Designers shall use National Institute of Building Sciences (NIBS) Model Guide Specifications for Asbestos Abatement and Management in Buildings (Latest Edition) as the baseline minimum design performance standard. Project Designer minimum qualifications shall include;

- $1,000,000 Professional Errors and Omissions (E&O) Insurance
- Three (3) Years of Experience Designing Asbestos Abatement Projects
- Four (4) year degree in industrial hygiene, engineering, or physical / natural science

Project Designers shall consult with University representatives regarding campus specific criteria including (but not limited to) the following issue areas;

- Preferred Means and Methods of Abatement
- Preferred Means and Methods of Project Monitoring
- Processing Submittals and Record keeping
- Back Charges, Percent Payments, and Withholding Provisions
- Specific Institutional Notifications
- Work Initiation Conference Issues
- Pollution Liability Insurance
- Professional Errors and Omissions Insurance
- Qualifications of Abatement Contractor
- Qualifications of Subcontract Consultants and Laboratories
- Training and Qualifications of Staff
- Hazardous Waste Management requirements
- Notifications of Completion (OSHA and MDE mandates)

When approved during A/E negotiations, asbestos conditions may be managed through coordination of other trades under separate contract (e.g., On-Call Abatement Service Contact). Notwithstanding, all necessary coordination notes shall remain the responsibility of the A/E.

6. RADON MITIGATION

   a) New Construction: Where the potential for radon release is identified through geotechnical studies, measures consistent with the ICC International Mechanical Code (IMC) 401.9 shall be proposed to mitigate indoor radon concentrations below levels which create a health hazard.

   b) Alterations: Existing buildings scheduled for slab or structural wall alterations shall be measured for radon levels, where directed by University representatives. The University will provide previous radon readings where available. Radon levels exceeding those which require mitigation shall be managed consistent with IMC.

7. GUIDANCE DOCUMENTS

   Following are some select guidance documents related to noteworthy EH&S issues in facilities development.

   a) Occupational Safety and Health Administration

      1. Stairways and Ladders, OSHA Document 3124 (93)

      2. Lead in Construction, OSHA Document 3142 (93)

      3. Fall Protection in Construction, OSHA 3146 (95)

   b. Environmental Protection Agency

      1. Office Equipment - Design, Indoor Air

Emissions, and Pollution Prevention Opportunities

2. Proposed Model Standards and Techniques for control of radon in New Buildings (FR4/12/93, Vol 58, #68)

3. Building air Quality: A Guide for Building Owners and Facility Managers (12/91)

4. Standardized EPA Protocol for Characterizing Indoor Air Quality in Large Office Buildings (6/94)

c. Maryland Occupational Safety and Health (MOSH)

1. MOSH Guides for Evaluating Indoor Air Quality (7/89)

d. Maryland Department of the Environment

1. Renovating Old Paint Safely: 8 Keys to Maryland's Lead Abatement Regulations

2. Lead Paint Hazard Fact Sheets 1-7 (6/92), 8 (1/94)

3. MDE Approved Encapsulation Products

e. National Institute of Building Sciences

1. Model Guide Specs for Asbestos Abatement

2. Model Guide Specs for Lead Paint Risk Reduction

f. American Conference of Governmental Industrial Hygienists

1. Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs), Latest Edition

2. Guidelines for the Assessment of Bioaerosols in the Indoor Environment (1990)

g. American Industrial Hygiene Association

1. Industrial Hygiene Audit: manual for Practice (94)

h. American Society for Testing and Materials

1. Provisional Standard for Environmental Regulatory Compliance Audits, PS 11

2. Provisional Standard for the Study and Evaluation of an Organization's Environmental Management Systems, PS 12

3. Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, E 1739

i. National Safety Council

1. Ergonomics: A Practical Guide, 2nd Edition (1993)

j. National Air Duct Cleaners Association (NADCA)

1. Mechanical Cleaning of Non-porous Air Conveyance System Components, Standard 1992-01

1.05 LIST OF ACRONYMS AND ABBREVIATIONS

ACI	American Concrete Institute
ADA	Americans With Disabilities Act
A/E	Architect/Engineer
ADSB	Architectural Design Standards Board
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
APA	American Planning Association
APPA	Association of Physical Plant Administrators
ASTM	American Society for Testing Materials
ARB	Architectural review Board
ASLA	American Society of Landscape Architects
BER	Budget Expenditure Request
BOCA	Building Officials and Code Administrators
BOD	Beneficial Occupancy Date
BPW	Board of Public Works (State Board: Governor, Comptroller, & Treasurer).
BSU	Bowie State University
CA	Capital appropriation (type of State Funding)
CBFR	Capital Bond Fund Requisition
CCMS	Central Control and Monitoring System
CDT	Contractor's Design Team
CE	Civil Engineer

1.05 LIST OF ACRONYMS AND ABBREVIATIONS

CEW	Cost Estimate Worksheet
CFR	Capital Fund Requisition
CIC	Computer Implementation Committee
CIP	Capital Improvement Projects
CM	Construction Manager Management (A unit of DAEC)
CO	Change Order
COB	Close Of Business
COP	Certificate of Participation
CPM	Critical Path Method
CPTL	Complete Project Tracking Log
COMAR	Code Of Maryland Annotated Regulations
CQC	Construction Quality Control
CR	Capital Renewal (also called Facilities Renewal)
CS	Construction Supervisor
CSI	Construction Specifications Institute
CVRP	Contractor and Vendor Request For Payment
DAEC	Department of Architecture, Engineering and Construction (formerly E&A, DEAS)
DBFP	Department of Budget and Fiscal Planning
DCBS	Department of Communication & Business Services
DD	Design Development (Phase of A/E Services)
DEAS	Department of Engineering & Architectural Services (see DAEC)
DES	Department of Environmental Safety
DGS	Department of General Services (State)

1.05 LIST OF ACRONYMS AND ABBREVIATIONS

DIM	Design Initiation Meeting
D-LOG	Project No., Work request No.
DM	Deferred Maintenance
DM/P&D	Design Manager/Programming & Design (A unit of DAEC)
DNR	Department of Natural Resources
DPP	Department of Physical Plant (UMCP)
DPS	Department of Procurement and Supply
DTR	Design Technical Review
E	Equipment
E&A	Engineering and Architecture (see DEAS)
EE	Electrical Engineer
EPA	(aka USEPA) Environmental Protection Agency (US)
ES	Environmental Safety
F&A	Finance and Administration (a unit of DAEC)
FAS	Financial Accounting System
FC	Finance Committee (UMCP)
FEI	Federal Employee ID#
FF&E	Furniture, Fixtures, and Equipment
FPWG	Facilities Planning Working Group (UMCP Sub-Committee of Finance Committee)
FRP	Facilities Renewal Program
FSD	Full Size Detail
FSU	Frostburg State University
FY	Fiscal Year

1.05 LIST OF ACRONYMS AND ABBREVIATIONS

GC	General Contractor
GCL	General Construction Loan (Type of State Funds)
GFE	Government-Furnished Equipment
GFM	Government-Furnished Material
GPSSB	General Professional Services Selection Board
GSF	Gross Square Footage
HEGIS	Higher Eduction General Information Survey
ICA	Intercollegiate Athletics (UMCP)
ICBO	International Conference of Building Officials
ID	Interior Design
IDC	Indefinite Delivery Contract
ID&E	Interior Design and Equipment (a unit of DAEC)
IFB	Invitation For Bid
IFCP	Institution Funded Construction Program
IS	Information Services
JV	Journal Voucher
LASP	Landscape Architecture and Site Planning (a unit of DAEC)
LRFPC	Long Range Facilities Planning Commission
MARC	Maryland Annual Request Ceiling
MBI	Maryland Biotechnology Institute
MDE	Maryland Department of Environment (State)
MG	Mechanical Engineer
MDNR	Maryland Department of Natural Resources (State)
MFRI	Maryland Fire and Rescue Institute

MHEC	Maryland Higher Education Commission
MOM	Minutes Of Meeting
NASF	Net Assignable Square Footage
NCP	Non-Capital Project
NEC	National Electric Code
NFPA	National Fire Protection Association
NIC	Not-in-contract
NPC	Notification of Project Completion
NTP	Notice To Proceed
NTS	Not To Scale
OAPP	Office of the Associate Provost for Planning
ORPB	Office of Resource Planning and Budget
OSHA	Occupational Safety and Health Act
PA	Planning Appropriation
PC	Project Coordinator
PCB	Poly-Chlorinated- Biophenyis
PCM	Production Control Manager
PCO	Project Close-Out
PCS	Procurement for Contractual Service
PCU	Production Control Unit
PD	Preliminary Design (Phase of A/E Services)
PM	Project Manager, Project Management (a unit of DAEC)
PO	Project Order

1.05 LIST OF ACRONYMS AND ABBREVIATIONS

P&O	Programming & Design (a unit of DAEC)
P&S	Procurement and Supply
RAE	Reference Administrative Service
RDPWR	Request for Determination of Prevailing Wage Rates
RFA/ORS	Request for Alternation/Other Reimbursable Expenses
RFE	Request For Estimate
FRI	Request For Information
RFP	Request For Purchase, Request For Proposal
RFS	Request For Services
SCD	Substantial Completion Date
SCUB	Satellite Central Utilities Building
SD	Schematic Design (Phase of A/E Services)
SDC	System Development Charges (WSSC)
SFCP	System Funded Construction Program
SRC	Survey Research Center
SSD	Small Scale Drawing
SSU	Salisbury State University
T&M	Time and Material
TBD	To Be Determined
TMS	The Masonry Society
UMAB	University of Maryland at Baltimore
UBC	Uniform Building Code
UMAES	University of Maryland Agricultural Experiment Station
UMES	University of Maryland Eastern Shore

1.05 LIST OF ACRONYMS AND ABBREVIATIONS

UMBC	University of Mayland Baltimore Campus
UMCEES	University of Maryland Center for Environmental and Estuarine Studies
UMCP	University of Maryland College Park
UMSA	Univeristy of Maryland System Administration
UMUC	University of Maryland University College
UON	Unless Otherwise Noted
UPB	Unit Price Book
VCAF	Vice Chancellor for Administration and Finance
VPA	Vice President for Administration
V.I.F.	Verify In Field
WAC	Work Acceptance Conference
WCC	Work Control Center
WIC	Work Input Control, Work Initiation Conference
WO	Work Order
WOCS	Work Order Contracting System
WRA	Water Resource Administration
WRN	Work Request Number (D-LOG)
WSSC	Washington Suburban Sanitary Commission

1.06 MAINTENANCE OPERATION REQUIREMENTS

A. Adequate space is required in and around each building for the following maintenance and operation functions:

1. Elevator Shafts
2. Elevator Mechanical Rooms
3. Duct and Service Shafts
4. (Building) Equipment and Boiler Rooms
5. Telecommunication Closets for Switching Equipment
6. Electrical Closets
7. Housekeeping Closets
8. Maintenance Storerooms
9. Maintenance Shop
10. Loading Dock
11. Service Parking Spaces (minimum of 3-5) near Building Entrances
12. Dumpster/Dumpster Pad adjacent to Building Loading Dock

B. Parking for Service Vehicles shall be provided as follows:

1. Space for buildings with 25,000 GSF or less.
2. 1 additional space for each additional 50,000 GSF. Maximum of 5 spaces.

C. All interior spaces shall be identified by name and number.

D. All maintenance spaces shall have (as a minimum) concrete floors which have been painted and covered with an epoxy sealer to achieve a non-slip finish.

E. Floor drains are required in building equipment and boiler rooms. Floors in these rooms shall be sloped to the floor drains. Interior floor drains shall drain to the sanitary sewer system. Areaway drains shall drain to the storm system.

Coordination with DAEC is required to determine the ultimate discharge location (i.e. sanitary vs. storm sewer) for floor drains in rooms where hazardous materials or other liquids are stored.

F. Electrical equipment shall be installed on housekeeping pads.

G. Mechanical and electrical rooms should be accessible from the exterior of the building via 8' exterior double doors and directly accessible from hallways for ease of access by DPP personnel. Entrances through other rooms are not acceptable.

During the life span of a typical campus building many minor and major alterations are necessary as the requirements of the University change. The capability to accommodate alterations must be incorporated into the building from the outset. Structural systems should be designed to provide some leeway for increase in load concentrations in the future. They should also be designed to facilitate future alterations, e.g., the cutting of openings for new vertical elements, such as piping, conduit, and ductwork.

A. Codes and Standards

The codes and standards listed here are intended as guidelines only. The list is not meant to restrict the Consultant from using additional guides or standards.

1. American Concrete Institute: Building Code Requirements for Reinforced Concrete and Commentary (ACI 318 and ACT 318R).

2. American Concrete Institute: ACI Manual on Concrete Practice.

3. American Concrete Institute: Building code Requirements for Masonry Structures (ACI 530) and Appendix A: Special Provisions for Seismic Design and Specifications for Masonry Structures (ACI 530.1).

4. American Institute of Steel Construction: Manual of Steel Construction.

5. American Iron & Steel Institute: Cold-formed Steel Design Manual.

6. American Welding Society: Structural Welding Code AWS D1.1.

7. American Welding Society: Structural Welding Code, Reinforcing Steel, AWS D1.4.

8. American Aluminum Manufacturers' Association: Aluminum Handbook.

9. Steel Deck Institute, Inc.: Design Manual for Composite Decks, Form Decks, and Roof Decks.

10. Steel Joist Institute: Specifications.

11. Seismology Committee, Structural Engineers' Association of California: Recommended Lateral Force Requirements and Commentary.

12. American Institute of Timber Construction: Timber Construction Manual.

13. National Forest Products Association: National Design Specifications for Stress Grade Lumber and Its Fastenings.

14. American Society of Civil Engineers: Minimum Design Loads for Buildings and Other Structures, ASCE 7.

15. BOCA National Building Code.

B. Loads

1. Floor and Roof Loading

The Consultant shall provide, as a minimum, a uniformly distributed live load of 100 pound per square foot in all areas of the building, unless otherwise noted in the Facility Program. Roofs shall be constructed for a minimum of 30 pounds per square foot. In areas requiring special attention to floor loading, e.g., library stacks, heavy equipment and machinery, etc., the Consultant shall investigate the specific support requirements of these areas and design for these spaces accordingly. In no event shall the design live load be less than what is required by the applicable codes.

Do not use live load reductions for horizontal framing members and columns, or load-bearing walls supporting the top floor or roof.

2. Wind and Snow Load

For the purpose of code, wind, and snow load determination, UMCP buildings are designated as "standard occupancy" structures with corresponding Importance Factor I and Ip equal to 1.0.

C. Structural Systems

1. Steel Framing Systems

a. Unshored composite steel beams deflect under the weight of concrete slabs at the time of placement. In order to achieve a level floor, additional concrete may need to be poured. Where unshored construction is used, the additional dead load caused by the increased concrete thickness should be accounted for in the structural design and specification.

b. Shored composite steel beams do not deflect under concrete placement, resulting in less cost of material for concrete and steel. These savings may offset the costs of shoring. Once the shoring is removed, the floor deflects. This type of construction results in a floor that is less level than an unshored system.

c. Cambered composite beams and girders may produce the most level floors. A camber should be considered for beams longer than 25 feet. The camber should equal the deflection calculated for the combined dead load of wet concrete, steel deck and steel beams. Superimposed dead and live loads should be excluded from the calculation.

2. Concrete Framing Systems

a. Cast-In-Place Systems that have fewer limitations in cutting openings during future alterations are preferred over other systems.

b. Precast floor framing systems should not be used for office buildings unless the design can be demonstrated to adapt well to future changes in locations of heavy partitions or equipment. Precast systems may be considered for low-rise structures such as parking garages, industrial buildings, and storage and maintenance facilities.

c. Pre-tensioning and Post-tensioning as with precast floor framing, should not be used unless the design can be demonstrated to not impede future flexibility. Post-tensioned beams may be used where code allows in beams.

D. Stability and Serviceability Criteria

1. Progressive Collapse

The design structure must not be subject to progressive collapse, as defined in the BOCA National Building Code. The failure of a beam or slab should not result in failure of the structural system below or in adjacent bays. In case of column failure, the damage should be limited to the bays supported by that column.

2. Vibration of Floor Systems

Transient vibration induced by passing traffic or footfall should be minimized.

3. Corrosion Protection

a. Structures in salt environments must have a positive means of corrosion protection. Structures requiring protection include concrete foundations exposed to saline ground-water, parking decks, bridges, and pavements where de-icing salts are used, and structures exposed to salt-laden air.

b. Steel. Structural steel exposed to the elements must have a protective coating on all steel surfaces. Small, isolated structural steel elements may have hot dipped, galvanized zinc coating or coal tar epoxy paint. Larger exposed steel structures, such as parking, should use a two-coat system consisting of an organic zinc rich urethane or epoxy primer, shop applied over blast cleaned surfaces followed by a field applied finish coat.

c. Concrete. Make provisions for crack control and employ the following methods, alone or in combination, according to the severity of the condition:

1. Epoxy coated reinforcing bars.

2. Concrete surface sealers.

3. Corrosion inhibiting concrete additives.

4. Microsilica concrete used in lieu of additives.

D. Concrete Elements in Parking Structures. Protect the concrete in parking structures or below building levels by using corrosion inhibiting additives, epoxy coated reinforcing bars, and a concrete surface sealer. Epoxy coated reinforcing bars should be used for the top bars of the concrete beam and slab construction and the stirrups of beams and spandrel beams. They should not be used for the bottom bars in beams nor for the reinforcement of columns and walls.

4. Construction Tolerances

Concrete Floor Slab Finish Tolerances should be measured in accordance with ASTM E1155 and should comply with ACI 117: Standard Specification for Tolerances for Concrete Construction and Materials.

5. Protection of Adjoining Property

a. Protective measures, including those required by local code, must be taken to avoid the effect of the structure on adjoining buildings both during and after construction.

b. Sheeting, Shoring, and Underpinning, protecting the banks of the excavation or adjoining buildings must be made the full responsibility of the construction contractor.

c. Footings should not project beyond property lines.

E. Attachment of Nonstructural Elements

All nonstructural elements, components, and equipment located within a building or on the site must be anchored to withstand gravity and wind loads.

1. Exterior Cladding

a. Exterior cladding must have connections and joints that permit relative movement between stories. Connections should have sufficient ductility and rotation capacity to preclude the possibility of brittle failure in connection welds or fracture in concrete. Inserts in concrete should be attached to, or hooked around, reinforcing steel.

b. Slotted or oversized holes at cladding connections should be used to permit movement parallel to the plane of the building skin.

c. Window frames should be positively anchored to resist lateral loads. Clearance and flexible mountings should be provided to permit thermal movement and minimize glass breakage in storms and earthquakes.

2. Partitions

a. Nonstructural, rigid partitions must be supported by the structure in such a way that they cannot inadvertently become load-carrying elements.

b. Masonry walls should be isolated from the structure of the floor above by a gap and be restrained by continuous or intermittent steel angles at the top of the wall on both sides or by steel straps extending into the grout of the wall. Masonry walls should be isolated from concrete columns by flexible joints.

c. In full height walls, the top of a steel stud should be separated from the track to allow for vertical deflection of the slab.

d. Building expansion joints must be carried through crossing partitions.

3. Ceiling Systems

Suspended Grid Systems must not support light fixtures that are not supported independently. Suspended ceilings, including air diffusers, light fixtures and speakers, must be braced as required. Suspended ceilings must be isolated from walls which extend above the ceiling to the building structure.

4. Monolithic Ceiling. Gypsum board ceiling should be fastened with large head nails or screws. Building expansion joints must be carried through all monolithic ceilings.

F. Furnishings and Equipment

1. Fixed Casework and Equipment

Fixed casework and built-in equipment, such as storage racks and built-in bookcases 5 feet or more in height, should be anchored to floor and walls. Where cabinets or shelving are hung from walls, their weight must be included in the partition design.

2. Mechanical and Electrical Equipment

Equipment Anchorage. Mechanical, electrical, and plumbing equipment listed below should be anchored to prevent overturning or sliding due to lateral forces. For lateral loads due to wind, the provisions of the BOCA National Building Code should be followed.

Air-handling Units
Battery Racks
Boilers
Chillers
Control Panels
Cooling Towers
Emergency Generators
Heat Exchangers
Motors
Panelboards
Pumps
Switchgear
Tanks
Transformers
Uninterruptible Power Supplies
Vessels

G. Alterations in Existing Buildings and Historic Structures

Alteration requires ingenuity and imagination. It is inherently unsuited to rigid set of rules. Each case is unique. It is recognized that total compliance with standards may not be possible in every case. Where serious difficulties arise, creative solutions that achieve the intent of the standard are encouraged and should be presented for the review and approval of DAEC.

1.08 INTRUSION DETECTION (06-01-02)

A. When required by the Program for new or renovated construction projects or when requested by the Users thru the Project Manager, the A/E shall provide all appropriate security devices, possibly including special locks, card readers, palm reader devices, motion detectors, cameras, alarms, lights, etc. for the building, laboratories, rooms or areas designated to require security. It is the A/E’s responsibility to determine the scope of security required for all major renovations or new construction of research facilities based on the University’s Research Facility Security Policy and meetings with Environmental Safety and Building Security System. Copies of this Policy are available from the Department of Environmental Safety. A copy of this policy is appended below.

B. The Project Manager and User representative should attend all Partnering sessions and design initiation meetings with the A/E.

UNIVERSITY OF MARYLAND, COLLEGE PARK
RESEARCH FACILITY SECURITY POLICY

I. Purpose

This is a statement of official University of Maryland policy to define the security systems that will be installed in new research facilities, and to recommend security system upgrades in existing research buildings. First among the University’s stated priorities is solidifying research activity at the University to establish the University as a premier national research university. The University cannot and will not be able to achieve its goal if it is not able to provide minimal security assurances to its own faculty and other researchers, private and public research sponsors, government agencies and corporations. This document is intended to demonstrate that the University takes seriously the security needs and interests of its researchers, understands the different risks involved in the wide variety of research conducted on the University campus, and is committed to taking reasonable measures to help assure the safety, well-being and security of research facilities, data and personnel.

II. Scope

This policy describes a security performance standard for construction of new and renovation of existing research facilities. Minimum security requirements for all research facilities and additional requirements for areas with hazardous materials are addressed. This policy does not address measures necessary to protect expensive equipment, proprietary information, or a product. As a performance standard, this policy does not specify products or compliance details.

III. Responsibilities

A. The Department of Environmental Safety (DES) shall:

1. Review and update policy annually.
2. Participate in pre-program meetings.

B. Architecture, Engineering and Construction (AEC) shall:

1. Ensure that the recommendations in the Policy are incorporated in the construction of all new research facilities.
2. Include DES, Building Security Systems, and users in pre-program meetings.
3. Provide training in use of security systems as part of commissioning process.
4. Incorporate reference to Policy into the intrusion detection paragraph of the Design Criteria Facility Standards Manual.
5. Involve representatives from DES and Building Security in review if there are changes in users or Program affecting the design of the research facility.

C. The users of the facility shall:

1. Accurately identify functional use of space during planning meetings.
2. Train personnel to use security measures responsibly.
3. Monitor appropriate use of security systems.

D. The Building Security Systems Office shall:

1. Determine the specific type and brand of hardware that corresponds with recommendations in this policy.
2. Participate in pre-program meetings.

IV. Policy

1. New Construction

A. All new research facilities will incorporate the following basic facility design features.

1. Segregate public access areas from research areas.
   a. Locate general access areas (classrooms and conference rooms) on lower floors.
   b. Locate research laboratories on upper floors, except for laboratories that may use explosive materials.
2. Perimeter security
   a. Electric locks on all exterior doors.
   b. Card readers on all exterior access doors.
   c. Security of ground level windows will be achieved by use of either
      i. Window grills, or
      ii. Electronically protected glass in operable windows.

d. Exterior lighting to provide appropriate illumination.
e. Alarms on roof maintenance doors
i. Automatically activated at night, deactivated during daytime.
ii. Connected to University Police and audible at site.

3. Elevator/stairwell security
a Stairwell doors to public access areas on lower floors will not have locks.
b. Card readers and electric locks on stairwell doors to research areas. Under conditions specified by the State Fire Prevention Code, some stairwell doors must unlock and allow access from the stairwell to the floor when the fire alarm is activated.
c. Card readers in elevators to research areas.

B. All new high risk research facilities (i.e., research facilities that house animals, containment laboratories or greenhouses; store select agents or acute toxins; or involve the use of radiation hazards will:
1. Incorporate the basic facility design features set forth in Part I. A., plus
2. Incorporate additional security features, on a case-by-case basis, that are identified during planning meetings as necessary by the users, AEC, Building Security Systems, and DES; for example:
a. Perimeter and elevator/stairwell security: Alarm wired to University Police or installation of camera monitors.
b. Doors to individual research laboratories: electric lock and card reader on laboratory doors or pre-wiring of some general laboratory doors for installation of card readers at later date if needed.

V. Existing Buildings
A. In conjunction with scheduled renovation, all existing research facilities will be upgraded to incorporate the basic facility design features set forth in Part I.A.
B. Prior to renovation users, AEC, Building Security Systems, and DES will meet to determine, based on the projected use of the building, whether additional security features are needed.
C. It is recommended that there be an automatic safety review of renovation plans by appropriate departments, including DES and Building Security System.

VI. Information
The Department of Environmental Safety and the Building Security Systems Office will provide guidance for implementation of this policy.

I. Policy Statement

The A/E shall provide required space and utilities for vending machines in new buildings and major renovation projects based on the design guidelines in this section. After completion of the schematic design, the AEC project manager (PM) will request the Department of Business Services (DBS) and the building occupants to meet to jointly finalize vending requirements based on the floor layouts in the schematic design and the design guidelines in this section. The PM will then provide the final requirements to the A/E to incorporate into future design phases.

II. Background

The university's vending program provides snack foods and beverages in convenient locations throughout the campus community. Vending machines are located in existing buildings and must be planned for in new buildings and major renovations. Pepsi-Cola and Blind Industries & Services of Maryland (BISM) are the current vendors and they provide a variety of products. Some locations offer cold food and a microwave in addition to the candy, chips, pastries, and cold beverages found in the majority of locations. The vending machines are owned and operated by the vendors. The university is responsible to provide adequate space and utilities for the machines.

III. Requirements

A. Location

Vending machines should be located in convenient yet unobtrusive locations in the building. Typically, they will be located in alcoves off the lobby or main hallways. They should be located proximate to ramps, elevators and/or the loading dock to facilitate product delivery and servicing of the machines. Also, their location must be in compliance with all environmental health and safety rules and guidelines. For example, they must be located such that they do not impede the adequate and safe means to exit the building during emergencies, nor impede access for emergency personnel (corridors and other means of egress must be free of obstructions and items may not block exit doors or restrict the width of any portion of a corridor to less than 44 inches). Lastly, the university requires recycling of materials including bottles (glass and plastic) and cans (aluminum and metal), and recycling collection areas are provided in campus buildings. Vending machines should be located proximate to recycling collection areas so that used cans and bottles can be recycled conveniently.

B. Space and Utility Needs

The space needs for vending is based on the number of vending machines required. The number of vending machines required is based on the number of occupants in the building, with some adjustments made due to other factors. The Department of Business Services will meet with the

building occupants after completion of schematic design and make final decisions on number, type and distribution of vending machines based on these guidelines and factors and the schematic layout of the building. Following are the guidelines and factors:

# Occupants	# Snack Machines	# Beverage Machines
100	1	1
200	2	2
300	3	3
400	4	4

Other factors:

- **If there are 100 or more occupants per floor in a large building, consideration may be given to place one snack and one beverage vendor per floor.**
- **For buildings with classrooms, the maximum number of students in the classrooms at any one time should be added to the occupant totals to determine number of vending machines.**
- **Buildings with little reduction in occupancy levels before and/or after the normal core hours of occupancy may require more vending machines than in the guidelines.**
- **Buildings that are occupied 24 hours per day (e.g., research labs) may require more vending machines than in the guidelines.**
- **Buildings with a large number of outside visitors or transient people may require more vending machines than in the guidelines. These machines should be located in the high traffic areas.**
- **Occupants in a building may request specialized vending machines (e.g. coffee, cold food or frozen vendor) depending on their needs.**

- **For large buildings with multi-levels, two beverage vendors and one snack vendor on the main entry level and one beverage and one snack on each floor is recommended.**

In order to plan for vending placements, machine size, safety, utility and recycling needs must be considered. Following are requirements for each machine type:

Blind Industries & Services of Maryland Snack Machines:

Machine Type	Dimensions	Electric	Dedicated Circuit	Water Supply	Recycle
Senior Glass front snack	72"H 35"D 39"W	120V/ 3 A	No	No	No
Junior Glass front snack	72”H 35”D 34 7/8” W	120V/ 3 A	No	No	No
Coffee/hot beverage	72"H 31"D 38"W	120/ 16 A	Yes	Yes	No
Cold food/ Sandwich	72"H 33"D 30"W	220V/ 20 A	Yes	No	No
Frozen food/ice cream	72"H 32 1/4"D 41"W	120V/ 20 A	Yes	No	No
Microwave & coin changer	72"H 36"D 33 1/2" W	120V/ 15 A	No	No	No

Pepsi Machines:

Machine Type	Dimensions	Electric	Dedicated Circuit	Water Supply	Recycl
Machine holding 11.5 oz and 12 oz cans.	32"W 26"D 72"H	120V/11 A	No	No	Yes
Machine holding 20 oz.bottles	37"W 33"D 72"H	120V/11 A	No	No	Yes
Machine holding 11.5 oz and 12 oz.cans	40"W 31"D 79"H	120V/11 A	No	No	Yes
Machine holding 20 oz.bottles	40"W 35"D 79"H	120V/11 A	No	No	Yes

Other utility considerations:

1. **Extension cords may not be used. Electrical power cords for vending machines are normally 6 to 9 feet in length.**
2. **Certain vending machines may generate enough heat to require special ventilation or cooling. In conjunction with the Department of Business Services, the A/E must identify the location of such machines and provide adequate ventilation and cooling.**
3. **It may be desirable to provide floor drains in areas that will contain several beverage vending machines. In conjunction with the Department of Business Services, the A/E must identify such locations and provide the floor drains.**

1 OVERVIEW

1.1 INTRODUCTION

A. This document establishes requirements for the preparation and submission of electronic documents for UM design and construction projects. Questions concerning CAD Standards should be submitted to the University of Maryland Project Manager (UM PM) assigned to the project.

B. Any proposed modification or deviation from this standard must be approved in writing by the UM AutoCAD Systems Manager.

C. Architectural and/or Engineering (A/E) firms may use any method of drawing production but all submitted files must meet these requirements. The A/E is also responsible for ensuring that their sub-consultants meet these requirements.

D. Template drawings, formatted in accordance with these requirements, are available for use by the A/E.

E. The University will review and approve the CAD data submitted by the A/E (see Section 4 for the UM checklist used for this review.) All discrepancies found during this review must be corrected in the next submission. Any discrepancies remaining in the 100% submittals must be corrected and resubmitted within 30 days.

F. Costs for re-printing, re-assembly, or project delays due to the A/E's failure to follow these requirements may affect the A/E's fees or reimbursements. The A/E is encouraged to raise any questions or concerns with the UM PM well in advance of submittal deadlines.

1.2 ACCESS TO UNIVERSITY CAD FILES

A. The A/E with written approval from a UM PM, may request copies of existing UM CAD files and/or hard copy drawings from FM Archives. Available CAD files include floor plans, site plans including survey monuments, and topographical contours. Such files are provided only for the convenience of the recipient. The information in these files has been gathered from a variety of sources and may or may not conform to the current requirements specified herein. UM makes no representation as to the completeness or accuracy of the information. The A/E will be required to sign an agreement accepting these terms in order to use UM files. See Electronic File Use Agreement for Digital Data, Attachment.

B. CAD files submitted to UM by the A/E must be accurate and must conform to these CAD requirements even if using information provided by UM which is inaccurate or does not conform to these requirements.

C. FM Archives will not research and/or compile the necessary drawings needed for a specific project. It is the responsibility of the UM PM or A/E to coordinate and select the appropriate information and request copies from FM Archives. UM will not provide CAD files or hard copies of documents to any design sub-consultants.

1.3 FILE FORMAT

A. All submitted files must be fully compatible with the version of AutoCAD currently being used by UM. This information will be available from the UM PM responsible for the project.

B. If a program other than AutoCAD is used for drawing production, it is the A/E's responsibility to ensure complete AutoCAD compatibility and data integrity. An A/E using programs other than AutoCAD are encouraged to send translated files for testing prior to submission deadlines.

C. DXF files are not acceptable.

D. Drawings must open in AutoCAD without errors, AEC objects, font substitution or missing linetype files.

2 GENERAL DRAWING REQUIREMENTS

2.1 BEST PRACTICES

A. With rare exceptions, all object properties should be assigned by layer, not by object.

B. All building elements should be drawn to actual, not nominal dimensions.

C. Co-terminus lines drawn on the same layer shall be drawn or joined as a single entity.

D. No redundant (overlapping) line work is allowed.

E. Inserted images should be used only if absolutely necessary. Company logos should be inserted as blocks or drawing elements rather than as images.

F. Units shall be set to architectural inches, with a precision no smaller than 1/32". Civil engineering drawing units shall be decimal feet with a precision no smaller than .00.

2.2 SITE PLANS/SURVEYS

A. Site drawings will be developed in Maryland State Plane coordinates (NAD 83) with a minimum of three survey monuments shown on each site sheet. The drawings will be maintained in the project coordinate system and rotated, if necessary, in paper space viewports.

2.3 DRAFTING CONVERSIONS

A. All drafting conventions must comply with the CSI Uniform Drawing System of the National CAD Standard.

2.4 MODEL/PAPER SPACE

A. All building, site and construction detail elements shall be drawn in model space at full scale.

B. Text, notes, schedules, dimensions and diagrams may be drawn as preferred by the A/E but must be easily legible when plotted.

C. All paper space tabs must be assigned a page setup defining the paper size to match the intended plotted sheet size and plotter set to "none."

2.5 LAYERS

A. All layering shall follow National CAD Standard format (current version).

B. Revision clouds and triangles shall be on a separate layer.

C. Other than block elements, no objects shall be drawn on Layer 0.

D. No objects shall be drawn on the Defpoints layer, including viewports.

2.6 TITLE BLOCKS

A. Template drawings are available from UM and include title blocks for all approved sheet sizes. These title blocks must be used, even if other templates features are not used.

B. All information represented as attributes in all sheet blocks must be entered correctly.

C. An A/E working for the Department of Campus Projects (rather than Capital Projects) is required to use the 36 x 22 sheet unless alternate size as approved by UM PM.

2.7 LINETYPE

A. Dashed lines shall be drawn with dashed linetypes never as multiple line segments.

B. Linetype scale must be set so that each linetype is clearly discernible when plotted.

C. Use of AutoCAD standard linetypes is strongly preferred. If custom or complex linetypes are necessary, a .LIN file and associated .SHX and .SHP files must be provided with each submittal.

2.8 TEXT

A. The AutoCAD Standard text style shall not be redefined.

B. Only AutoCAD standard SHX fonts, Microsoft standard TTF fonts, Archstyle.shx or Architext.shx may be used.

2.9 DIMENSIONS

A. The AutoCAD Standard dimension style shall not be redefined.

B. Dimension text must accurately reflect actual dimension, no manual input of dimension text is allowed for new construction. Manual input of non-dimensional text (e.g. EQ, VIF) is allowed.

C. It is always preferable to redraw inaccurate drawings to accurate dimensions. However, if minor inaccuracies are found in UM provided CAD files, dimensions for such areas can be manually inputted. The A/E will be solely responsible for the accuracy of all such dimensions and associated work.

D. Dimensions shall never be exploded.

E. When dimension text cannot fit within dimension lines, leaders must be part of dimension style, not drawn as separate objects.

2.10 BLOCKS

A. ***With the exception of details inserted as blocks, all block elements must be drawn on Layer 0.***

B. ***Nested blocks are not allowed.***

2.11 HATCHING

A. ***Hatching should be used as appropriate. Excessive hatching should be avoided but multiple lines, points, symbols, etc. used in place of hatching will not be allowed.***

B. ***Hatches are to be associative and should never be exploded.***

C. ***Hatches, polylines with width, and/or solids used to represent poche must have defining boundary lines which are on a separate layer.***

2.12 PLOTTING

A. ***All drawing sheets must be formatted to plot from paper space at a scale of 1:1.***

B. ***All drawings for a project, including those from sub consultants shall be plotted with a single plot style table.***

C. ***The A/E is strongly encouraged to use the CTB file provided with the template drawings.***

3 SUBMITTALS

3.1 PRIOR TO ALL SUBMITTALS

A. ***Each plotted sheet shall be saved as a separate file.***

B. ***File names must include UM project number or QC number and sheet number, e.g.: QC-1000_A101***

C. ***All files are to be thoroughly purged. Purging to include 0 length lines, empty text objects, empty blocks and regapps.***

D. ***All files to be audited.***

E. ***All files to be zoomed to drawing extents in model space. No objects shall be located outside of hard copy drawing limits.***

F. ***All files to be zoomed to drawing extents in paper space. No objects shall be located outside of hard copy drawing limits.***

G. ***All viewports are to be locked.***

H. ***All layer visibility set to match plotted hard copy.***

I. ***All files to be saved so that drawing opens to display intended plot view.***

J. ***A/E may use any xref method during production. However, files delivered to UM must have all xrefs bound using the bind/bind method.***

3.2 SUBMISSIONS

A. The content of electronic files shall match the delivered hard copy set.

B. Electronic files shall be submitted simultaneously with hard copy submissions.

C. All CAD submittals shall be saved to disk and include all files required to create plots matching the hard copy submission including plot style tables. E-transmit can ensure this is done properly.

D. Default plotter to be set to "none."

E. All files shall be submitted on disk to the UM PM. A/E is responsible for delivering files from all sub-consultants. Disk label to include:

UM Building Name and Number
UM Project Name
UM Project Number
Date
Submission Phase
Disk Set Number (e.g. 1 of 3)
List of all drawing files ordered by sheet number and drawing title, e.g.:

QC-1000_CS001	*Cover Sheet*
QC-1000_AS101	*Site Plan*
QC-1000_A101	*First Floor Plan*

F. All CAD submittals shall be accompanied by a letter of transmittal in electronic and hard copy format. This transmittal shall be addressed to the appropriate UM PM with a cc to the AutoCAD Systems Manager and Document Control Manager

G. Letter of transmittal shall include:

UM Building Name and Number
UM Project Number
UM Project name
Date
Submission Phase
List of all drawing files ordered by sheet number and drawing title, e.g:

QC-1000_CS001	*Cover Sheet*
QC-1000_AS101	*Site Plan*
QC-1000_A101	*First Floor Plan*

H. List of all other files found on disk.

I. Matrix of all used layers including: descriptions of each layer, color, linetype, lineweight.

3.3 AS-BUILTS

A. The consultant will provide a field survey as built CAD drawing of the total work site including all topographic features and contour drawing with one (1) foot contour intervals and appropriate "spot" elevations. This survey will include all utility structures and text notations of all surface features such as trees, walks, curbs and other significant topographic elements.

3.4 SUBMISSION REQUIREMENTS BY PHASE

Phase	***Files Required For Submission***	
	PDF	***CAD***
Schematic Design	•	
Design Development	•	***Architectural/Civil/Structural drawings***
50%	•	***MEP drawings***
95%	•	
100%	•	***All disciplines***
As-Built	•	***All disciplines***

4 CAD Review Checklist

FILE FORMAT
- ☐ ***File format is .dwg and opens without errors, proxy objects, or missing linetypes, xrefs etc….***

BEST PRACTICES
- ☐ ***Object properties assigned by layer***
- ☐ ***No extraneous linework***

SITE DRAWINGS
- ☐ ***Uses Maryland State Plane coordinates (NAD 83)***
- ☐ ***Three survey monuments shown on each site sheet***

MODEL/PAPER SPACE
- ☐ ***All model elements drawn at full scale***
- ☐ ***All text legible***
- ☐ ***Page set up indicates intended plot size***

LAYERS
- ☐ ***Layering per National Cad Standard format***
- ☐ ***Revision clouds/ triangles on separate layer***
- ☐ ***No objects on Layer 0 or defpoints***

TITLE BLOCKS
- ☐ ***Uses standard sheet sizes and title blocks (36 x 22 for CAMP)***

LINETYPES
- ☐ ***Dashed lines drawn with dashed linetypes and display accurately in Paper Space***

TEXT
- ☐ ***Only standard ACAD, Microsoft or Archstyle.shx, Architext.shx fonts used***

DIMENSIONS
- ☐ ***No exploded dimension***
- ☐ ***No manual input of dimension***

HATCHING
- ☐ ***Hatching is associative***
- ☐ ***Poche has boundary lines on separate layer***

PLOTTING
- ☐ ***Plot from paper space at 1:1***
- ☐ ***All dwgs use single plot style table***

SUBMITTALS
- ☐ ***Each sheet saved as file***
- ☐ ***File names are correct***
- ☐ ***Drawings purged with no 0 length lines, empty text objects, empty blocks and regapps***
- ☐ ***All Xrefs bound using bind/bind***
- ☐ ***Layer visibility matches hard copy.***
- ☐ ***No objects outside hard copy drawing limits***

Disk includes:
- ☐ ***UM Building Name and Number***
- ☐ ***UM Project Name and Number***
- ☐ ***Date and Submission Phase***
- ☐ ***Set Number (e.g. 1 of 3)***
- ☐ ***Text file listing all files contained on disk***

Electronic File Agreement

This Agreement is entered into this_____ day of ___________________________***201***____,
by the University of Maryland through its Facilities Management Dept. (UM FM) and
____ (Consultant).

UM FM and Consultant agree as follows:

1. Consultant will use digital information for reference only and agrees not to disseminate or disclose said information for other purposes.
2. Consultant will take necessary and reasonable steps to prevent this information from being disclosed to unauthorized persons.
3. Consultant understands and agrees that UM FM makes no representation and extends no warranty to it or to anyone else as to the accuracy or completeness of the information contained in digital data but rather provides said data in an "as is" condition. Consultant agrees and does hereby waive any and all claims under any theory of law or damages or injuries against University of Maryland that may arise from the furnishing by UM FM of said data to Consultant.

Consent to the above terms as indicated by signature below:

Agree to on behalf of:
University of Maryland
Facilities Management Department

Provided by: ____

Authorized by: ____

Date: ____

Description of Data:

____

____

____

Consultant: ____

Signature: ____

Date: ____

Company: ____

Project No.: ____

2.01 BIKE LANES

A. In addition to specific project requirements, all new road construction and road replacement or improvement projects on the College Park Campus shall provide for minimum four (4) foot bike lanes adjacent to the curb or a minimum 16 foot usable lane width. Physical hazards such as excessive drop-offs at the gutter pan, open joints, unsafe drain grates or utility covers will not be allowed in the area to be used by bicycles.

B. Bike lanes shall be developed in accordance with the latest edition of the following Design Guidelines and Standards:

1. North Carolina Bicycle Facilities Planning and Design Guidelines

   North Carolina Department of Transportation
   Office of Bicycle and Pedestrian Transportation
   P. O. Box 25201
   Raleigh, North Carolina 27611-5201
   Telephone number: 919-773-2804
   Facsimile number: 919-715-4422

2. American Association of State Highway and Transportation Officials (AASHTO), Guide for the Development of Bicycle Facilities (1991)

3. AASHTO Standard - Specifications for Highway Bridges, Fourteenth Edition (1989)

4. AASHTO Roadside Design Guide (1989)

5. AASHTO Maintenance Manual (1987)

A. Provide termite treatment as required (particularly for existing facility renovations).

B. Pest control contracts are required during the construction phase for rodent control.

C. Include porticos, and adjacent plazas in the design of new projects as well as renovations.

D. Connect general building downspouts to campus storm drain system. Specify cast iron boots minimum of 4' above ground. Certain exceptions may be permitted depending on the location of the building and possible stormwater management requirements.

E. Selection of trees, shrubs, plants, sod, seed, etc. shall be coordinated by the Department of Architecture, Engineering and Construction with assistance by the Landscape Services Division.

F. Sidewalks shall be at least eight (8) feet wide unless otherwise specified by the University. Minimize the use of steps; ramps conforming with ADA are preferred.

G. Walks for fire vehicle access shall be in accordance with state fire code, state building code, and UMCP design guidelines for fire protection and safety.

H. Bottom of footings to be a minimum of 2 feet 6 inches below finished grade and rest on undisturbed soil.

I. Properly sign and number building(s) and rooms.

J. Exterior signs shall be placed in such a manner to eliminate the need for mowing beneath or around the sign.

K. A minimum of one (1) 3/4" freeze proof hose bib every 100 feet. and two (2) weather proof duplex electrical outlets shall be located on each face of a building.

L. Provide sign height to eliminate interference with pedestrian traffic.

M. Provide positive slope away from buildings. Include adequate drainage to eliminate water from ponding at building entrances.

N. Design exterior building features to discourage pigeon roosting.

O. Roadway, crosswalks, and street markings shall be as required from MSHA specifications. Shuttle-UM bus turning radius shall meet the requirements of DCFS Section 2.03.B.2.c, as described for turning fire apparatus, 50’ minimum radius.

P. Restrict the use of small raised, interior parking lot islands.

Q. Exterior painted surfaces should be discouraged and maintenance free exterior surfaces encouraged.

R. Avoid types of plant materials that could cause safety, security or maintenance problems. Also Reference 2. Fire Apparatus Accessibility Guidelines.

S. Do not provide mowing strip next to building surfaces.

T. No construction activity, storage, parking, access or egress to the site shall occur within the critical root zone of established trees to remain on the site. The critical root zone is defined as a distance of 3 feet equal distance from the trunk, for each inch of trunk diameter.

U. Tree protection fences within the critical root zone must be completed prior to any construction. The fences must be maintained through the entire construction period.

V. Trees which cannot be fully protected shall have a certified aborist provide recommendations, before final design decisions are made.

A. Mandatory Codes

The Maryland State Fire Prevention Code adopts by reference the NFPA 1 National Fire Prevention Code which provides that "the code official shall require and designate public or private fire lanes as deemed necessary for the efficient and effective operation of fire apparatus. Fire lanes shall have a minimum width of 20 feet”. NFPA 1, 3-5.2. Where buildings are under construction, alteration or demolition, fire department access and fire lane requirements are defined by Section NFPA 1, 41-2.1.

The State Building Code (IBC) provides an option to increase building area provided there is access to an open space by a street or fire lane 20 feet wide.

B. Reference Standards

The latest edition of the following code and standards include fire lane information and guidance:

NFPA 1	Fire Prevention Code
NFPA 241	Safeguarding Construction, Alteration and Demolition Operations
NFPA 1141	Fire Protection in Planned Building Groups

1. Definitions

   a. Access Control means the method used to limit access, such as breakable or removable bollards, gates or control arms.

   b. Entry Point means the area of transition from one type of fire lane to another.

   c. Fire Department Connection means piped inlet or outlet which is used by the fire department to supply water to a fire protection system.

   d. Fire Hydrant means a valved connection on a water supply system which is used to supply water to the Fire Department.

e. Fire Lane means a roadway, driveway, sidewalk or other area necessary for the passage or positioning of fire apparatus, personnel, or equipment. A fire lane is a Street (Type I), Fire Access Road (Type II), Fire Access Sidewalk (Type III), or Fire Access Surface (Type IV), Access Control, Entry Point, or area of Fire Protection Water Supply.

   1. Type I means a paved surface open to the passage of all vehicles at all times. (Street)

   2. Type II means a paved surface open to the passage of fire apparatus and emergency vehicles, but closed to the general public or controlled to allow only authorized entry. (Fire Access Road)

   3. Type III means a paved surface ordinarily used for pedestrian traffic, but required for emergency access. (Fire Access Sidewalk)

   4. Type IV means a ground cover not 100% paved, but available for emergency access. (Fire Access Surface)

f. Fire Protection Water Supply is the prescribed amount of water required for a building, hazard, or fire protection system calculated by the methods and standards of the Washington Suburban Sanitary Commission, Insurance Services Office and the National Fire Protection Association. Fire Protection Water Supply includes Water Mains, Fire Hydrants, and fire Department Connections.

g. High Rise Building Means a building or structure defined in the High Rise Building Safety Law or the State of Maryland. The Law defines all buildings four (4) or more stories or 45 feet above the lowest grade as High-Rise

Buildings.

1. High-Rise Buildings above 75 feet are fully sprinklered.

2. High-Rise Buildings below 75 feet = fully sprinklered -OR- accessibility provided on the sides (50%) of the building perimeter by a street (minimum 21 feet in width) and accessible to allow fire department aerial equipment to reach the building to 75 feet in height.

2. Fire Lane Structure

   a. Fire Lanes shall be structurally capable of supporting minimum vehicular weights of twenty-five (25) tons (35 tons is preferred) in all weather-conditions.

   b. Fire Lanes shall be clear of all obstructions overhead to a minimum height of 13 feet 6 inches (14 feet is preferred) above grade.

   c. Fire Lanes shall provide a complete surface adequate for turning fire apparatus. The turning path shall have a 50 foot minimum centerline turning radius and a 20 foot path width increasing to 22 feet at the widest part of the turn.

   d. Fire Lane slopes and gradients shall not restrict fire apparatus movement or position, but provide adequate drainage. (Should not exceed 10% and 3% within 100 feet of intersections)

   e. Fire Lanes shall be structured and maintained clear of all obstructions or impediments.

3. Fire Lane Design

   a. Fire Lanes shall be designed as required by the Maryland High-Rise Building Safety Law where the law applies.

b. Fire Lanes shall be installed within ten (10) feet of each building on all sides except as noted below:

1. Fire Lanes shall be installed on a minimum of two sides of a building (50% of the perimeter) where no more than three (3) levels or thirty (30) feet exist above the lowest grade level.

2. Fire Lanes shall be installed on a minimum of one side of a building (25% of the perimeter) where no more than three (3) levels or thirty (30) feet exist above the lowest grade level and the building is fully sprinklered. Exception: A building may require a wet standpipe or additional access where large ground spaces are provided.

3. Fire Lanes shall be installed on a minimum of two sides of a building (50% of the perimeter) exceeding three (3) levels or thirty (30) feet above the lowest grade level and the building is fully sprinklered and a compete wet standpipe system is available for fire department use.

c. No less than two (2) Fire Lanes (primary and secondary) shall be provided to reach each building or building complex. Any combination of fire lane types may be used to provide fire apparatus access to a building within noted travel distance and use restrictions. Exception: Additional Fire Lanes may be required where a deficiency of Fire Protection Water Supply or an extra hazard exist.

d. Fire Lanes shall be marked as required to permit legal enforcement as identified below:

1. Curbs shall be painted yellow and

stenciled in red "NO PARKING FIRE LANE".

2. Signs shall be red letters on white background "NO PARKING FIRE LANE".

3. A maximum spacing of 75 feet between signs or stencils is required.

4. Fire Lane Type I - Street

A street shall meet the same minimum requirements as Fire Access Roads.

5. Fire Lane Type II - Fire Access Road

a. Fire Access Roads shall be provided to every building where no more than three (3) levels or thirty (30) feet exist above the lowest grade level and set back more than 150 feet from a Public Road.

b. Fire Access Roads shall be provided to every building exceeding three (3) or more levels or thirty (30) feet above the lowest grade level and set back more than 50 feet from a street.

c. Any dead-end more than 150 feet long shall be provided with a turn-around with a minimum centerline radius of 50 feet.

6. Fire Lane Type III - Fire Access Sidewalk

a. Fire Access Sidewalks leading toward a Fire Lane at a building shall be no less than ten (10) feet in width increasing in width to accommodate turns.

b. Fire Access Sidewalks at a building shall be no less than 20 feet in width. No obstruction is permitted where aerial fire apparatus positioning is required.

c. Fire Access Sidewalks may be used as a secondary fire access to every building set-back no more than four hundred (400) feet from a street or Fire Access Road.

7. Fire Lane Type IV - Fire Access Surface

   a. Fire Access Surfaces shall be the same minimum dimensions as a Fire Access Sidewalk.

   b. Fire Access Surfaces may be provided in lieu of Fire Access Sidewalks as a secondary means of access.

   c. Fire Access Surfaces shall not exceed two hundred (200) feet travel distance.

   d. A Fire Access Surface may be used as a border for a Fire Access Sidewalk at a building, provided that a minimum sidewalk width of ten (10) feet is maintained.

   e. The boundaries of a surface shall be obvious or marked so that the fire department can readily see the limits of the surface.

8. Entry Points

   a. Entry Points shall be of sufficient size to allow fire apparatus turning into a fire lane on a completely paved surface without the necessity of stopping and backing up. (note 2.c.)

   b. Curb cuts or drop roll top curbs shall be provided at Entry Points when the elevation difference is more than (4) inches in height.

   c. No less than two (2) Entry Points, as separate and remote from each other as possible, shall be provided for fire apparatus access to every building, building complex, or courtyard.

9. Access Control

   a. Access Control devices shall be approved (in accordance with the project procedure) for each individual application. Access control gates are the preferred method.

b. Use only the minimum number of bollards required for access control.

1. Bollards shall not present a hazard when removed.

2. Bollards shall be the UMCP standard breakable or removable bollard (Reference SECTION 2 SITE STANDARDS).

c. Each Access Control device shall have a simple and uniform method of operation. No more than one (1) locking method shall be provided on each Access Control Device. Locks and keyways shall be "UMCP FD-1."

d. Any swinging gate shall swing in the direction of entry or in both directions.

e. No more than one (1) Access Control may be provided for any Fire Lane or combination of fire lanes to a building or building complex.

10. Fire Protection Water Supply

a. Sufficient numbers and types of Fire Lanes shall exist to deliver the amount of water required by calculated fire flow demand to the building, building complex, or hazard.

b. Fire Hydrants shall be located on Fire Lanes as required by this section.

1. Fire Lanes shall be arranged so that the distance from Fire Hydrants to buildings is minimal, but not more than one hundred (100)feet for the first hydrant (primary) and four hundred (400) feet for the second hydrant (secondary).

2. Where the same Fire Hydrant is used for a number of buildings, the Fire Hydrant shall be located at a Fire Lane intersection.

3. Fire Hydrants shall not be located closer than fifteen (15) feet to an Entry Point. Avoid obstructions to fire hydrant operation or visibility.

4. Fire Hydrants at Entry Points with Access Control shall be located at the exterior (public) side of the Access Control.

c. Fire Lanes shall be arranged so that the distance from a Fire Lane to a Fire Department Connection is no further than 100 feet.

d. Fire Department Connections shall be visible and unobstructed. The planting plan shall be arranged not to degrade visibility or make obstructions over time.

11. Construction, Alteration and Demolition Plans and Temporary Fire Access

a. Utilize existing fire lanes and access.

b. Observe guidelines above.

c. Follow the information and guidance of NFPA 241.

2.04 FIRE HYDRANTS AND ASSOCIATED WATER MAINS

A. MANDATORY CODES AND STANDARDS (latest editions)

1. State of Maryland Fire Prevention Code **NFPA 1 National Fire Prevention Code**

2. State of Maryland Model Performance Code (BOCA National Building Code --. Section 917)

3. WSSC - Washington Suburban Sanitary Commission (Note: Projects not in the jurisdiction of the Washington Suburban Sanitary Commission (WSSC), substitute local water authority, State of Maryland Plumbing Code, International (BOCA) Plumbing Code and NFPA 24 as applicable)

B. GENERAL DESCRIPTION

a. The campus receives water supply from WSSC and by legal agreement, complies with WSSC rules and regulations, including, but not limited to design standards and specifications.

b. The campus facilities are serviced by two methods: metered and unmetered.
Metered: The contiguous campus is connected to WSSC by a number of underground fire flow bypass meters. The double meters record ordinary domestic flow and when large volumes are demanded, open a second, larger size meter. Unmetered: Individual buildings and locations generally not on the contiguous campus have unmetered systems where all fire protection systems are supervised for flow with an executed fire supervision agreement with WSSC. The alternative is a meter set in the building or an outside shed constructed for the purpose.

c. The campus system between the WSSC meters and the various buildings and site facilities is the "campus on-site" system, and consists of mains up to 12 inches in diameter of various ages and conditions. Individual buildings and locations not on the campus are "on-site" systems for those buildings or complexes and usually consist of a single main.

d. The campus on-site system is the underground distribution from WSSC meters for all campus building and facilities including, but not limited to, domestic, irrigation, mechanical, fire protection systems, and fire hydrants. Individual building or complex on-site systems provide services required for the individual building or facilities.

e. The campus on-site system with multiple supply point meters, loops, and grids minimally performs at 2,000 gallons per minute (qpm) at 20 pounds per square inch (psi) fire flow over almost all the system. Individual building or complex facilities were provided fire flow in accordance with the calculated facility requirements.

C. WATER SERVICE

a. Sufficient fire flow shall be provided for the individual project as determined by a recognized standard method. Fire flow is additive to-all other-demand flows. The campus on-site system extension by loop, grid, or individual fire hydrant shall result in not less than 2,000 qpm at 20 psi residual. Individual buildings or complexes shall meet minimum WSSC criteria (1,000 qpm at the last fire hydrant and 500 qpm additional at the adjacent fire hydrant at not less than 20 psi residual).

b. The minimum size of additions or replacement mains to the campus on-site system (loop or-grid is 8-inch. Mains to single fire hydrants are minimum 6-inch but must maintain minimum fire flow. The minimum size of on-site mains to individual buildings shall be as calculated and meet WSSC criteria (minimum 8-inch where the fire flow requirement is over 1,000 gpm).

D. VALVES

a. In the campus on-site system, gate valves shall be provided to sectionalize the system so that any outage will minimally affect fire protection.

   1. Valves shall be provided for each hydrant lead-in connection so that no more than one fire hydrant may be out of service at any time.

2. Valves shall be installed so that fire hydrants and fire suppression systems for an individual building will not be out of service at the same time.

3. Valves shall be installed on each side of a tee or cross to maintain the loop or grid flow.

b. Valves shall be located in streets, sidewalks or other paved surfaces. Where a paved surface is not possible, valve boxes shall be set in a 12 inch by 12 inch by 4 inch deep reinforced concrete square.

c. Valve box covers shall be marked “WSSC WATER" where owned and maintained by WSSC and "WATER" on the campus on-site system and where owned or maintained by the university.

E. FIRE HYDRANTS

a. The number and spacing of fire hydrants provided shall be sufficient for the calculated fire flow and distribution requirements.

1. The campus on-site system requirement is approximately 300 feet between fire hydrants. Individual building or complex fire hydrant spacing is project dependent (WSSC criteria for dense, built-up areas is 250 to 300 feet).

2. Provide additional fire hydrants if the building is more than 300 feet from an existing campus on-site fire hydrant or public (WSSC) fire hydrant.

3. Fire hydrants should be available so that the first-hydrant is no more than 100 feet from the building and the-second fire hydrant no more than 400 feet from the building.

4. A fire hydrant shall be within 100 feet of a fire protection system fire department connection (siamese).

b. Fire hydrants shall be located only on streets and fire lanes as follows:

1. Locate at street and fire lane intersections but not within 15 feet of the intersection.

2. Locate fire hydrants on public sides of street or fire lane access controls (gates, bollards).

3. Locate fire hydrants 2 feet from curbs and streets (per WSSC detail). Exceptions shall not be granted except in case of unusual site conditions.

4. The pumper connection shall directly face the street or fire lane. Elevations of the center line of the pumper connection shall be between 12 and 24 inches above finished grade.

5. Locate fire hydrants so there are no obstructions to operation or visibility.

c. Fire hydrants shall be as specified by WSSC.

d. Fire hydrants shall be painted as follows:

1. WSSC owned and maintained are grey with green tops (WSSC specifications).

2. UMCP on-site campus system (metered) are chrome yellow (paint #_____________ or equal) with black (paint #___________ or equal) tops and caps (2,000 gpm and over at 20 psi). (Note: for fire hydrants under 2,000 gpm, the cap and top colors are as listed in NFPA 291).

3. UMCP individual building or facility fire hydrants (unmetered) are red (paint #___________ or equal).

e. Unmetered fire hydrants under the WSSC fire supervision agreement are electrically supervised as follows:

1. Waterflow alarm (pressure) switch (listed or approved) in NEMA 4 enclosure strapped securely to the hydrant barrel above grade. The switch is provided with a 1/2 inch tap into the hydrant barrel.

2. Metallic conduit, minimum 3/4 inch rigid with conductors.

3. Underground to building. Connect to building monitoring system or fire alarm system unless contracting with commercial alarm company (depending on project location and scope).

F. CONSTRUCTION, ALTERATIONS, AND DEMOLITION

a. Design water service and fire hydrants to be installed, in service, and accessible to fire department apparatus before construction -begins -or combustibles -are present on the site.

b. Design installation to minimize outages of existing fire protection.

c. Design replacement fire protection to be installed prior to demolition of existing fire protection,

d. Require that fire hydrants not in service be provided with a secure sign or marking which states "OUT OF SERVICE" or install a secured opaque covering.

A. GENERAL

1. Irrigation Piping

   a. Irrigation piping shall be pvc Sdr-21 except for the following.

      - Pipes under sidewalks shall be Sch.-40.
      - Pipes under roadways shall be Sch.-80.

   b. Sch.-40 or Sch.-80 pipes shall be 1 size larger than the Sdr-21, so that G.P.M. requirements below can be met.

   c. Pipe over 3" no matter the Scd. or Sdr.rating shall be gasketed due to expansion and contraction during winter and summer months.

2. Main Lines

   a. Main lines shall be sized 100% larger than largest zone on the system.

   b. Main lines under 2" going under sidewalks shall be the next size equal to or over the A.W.W.A. guidelines and consist of PVC Sch.-40. for strength and not effect the designed system as stated above except for 6" pipe and over. Pipe 6" and over will be sized to the next available size.

   c. Piping Sch.-80 shall be piped the next size larger than the Sdr.-21 as long as it meets system requirement above. Reference see requirement for 6" pipe and over 2.a. above.

   d. Systems shall be designed at no more than 70 PSI after all device and pipe friction losses have been accounted for, or a pump is in the plans to make up the pressure to an adequate level.

   e. Systems shall have a starting PSI of 80 PSI, unless a 16 hour observation of source from 4 am to 8 pm Monday through Friday proves differently. Testing shall be done during the spring months (April - June). No testing shall be accepted if conducted during a holiday.

3. Solenoid Valves

a. Solenoid valves shall be connected with the tee from main to a 45° elbow at least 8" above main line but under 12" from grade.

b. Backflow preventers and meters shall have 2 ball valves each, one in front of each device, one behind each device. For easy access there shall be one union in front of each device and one union behind each device.

c. Meters and backflow preventers shall meet W.S.S.C's requirements regarding room in front, behind, and below each device.

d. Backflow devices and meters shall be the same size as the irrigation main.

e. Pipes from potable water to backflow and meter to the underground irrigation main will be copper type K at the time it shall be changed to PVC.

f. No system pipes will be used to support these devices, a separate rack shall be installed.

g. Spray or rotor system that is 45 psi or less can have a drip system added on as long as the pressure to run system stays 45 psi. If this is utilized even precipation rates shall be maintained and a 200 mesh filter shall be installed at point of drip connection with lateral and a pressure regulator shall be installed before zone valve.

B. Drip Irrigation System

1. Drip Irrigation

Shall have polybutylene, polyethylene or PVC Sdr-21 pipe only, and be a looped system, designed at 45 PSI or less. In addition it shall have:

a. 200 mesh or disk filter before pressure reducer

b. Pressure reducer before electric solenoid valve

c. Vacuum relief valve at highest elevation of system

d. Flush valve at lowest elevation of system

e. Pressure reducing solenoid valve (see Valves).

2. The potable main installations shall be the same as A.3.e above, except when approved by Facilities Management - Grounds Maintenance Department.

3. Can be adapted to existing or in conjunction with spray or rotor zone as long as above are met, and will not need a separate solenoid valve.

4. Emmiters shall have been tested by Center for Irrigation Technologies (CIT) for 5 years and have a Coefficient Value of 0.03% (CV) as given by CIT.

C. Spray Heads

1. Spray heads shall have nozzle-turret sizes to match precipitation rates +/- .027 in/hr. and not use more than 3.7 GPM at 30 PSI nor exceed 7.86 in/hr. precip. rate. In addition, spray heads shall have:

a. Internal check valve that hold up to and over 8 feet in elevation. In addition, it must be serviceable from top of head.

b. Stem pressure regulator to prevent excessive water run-off saving water and to maintain all heads on system at a even pressure.

c. Pop-up head sizes 4-6-12 inches in height.

d. Trajectory of 25°. In addition, spray heads shall have been tested by CIT with a Coefficient Value not to exceed 1.3%cv.

2. Spray systems shall have been evaluated against a comparable drip system, and will only be used if drip system is found not to be effective and systems will have a drip system around zones next to roads and sidewalks.

D. Medium Rotors

1. Under no circumstances will golf or large rotors or impacts of any type or size be used.

2. Medium rotors shall pop up at least 4" to 6" and not exceed 20 GPM. In addition it shall have a:

   a. Radius of 38', but not more than 62'

   b. Spacing of 38', but nor more than 74'.

3. System heads shall have a 200% or physical head to physical head coverage, not have a precip. rate over .95 in/hr, and operate between 30 but not more than 80 PSI system pressure. In addition it shall have:

   a. One (1") inch female npt pipe threads

   b. At least 4 nozzles or turrets but no more than 6 sizes

   c. Adjustable arc from 40° - 360° in 10 degree increments, and have a dedicated 360 full circle non adjustable head

   d. At least a 5 year warrantee. In addition, it shall conform to Section C.2. above.

E. Controllers

1. Controllers shall be TC-2 compatable and UL listed and shall have a:

   a. Rain shutdown program programmable from 1-99 days

   b. Electrical input of 117 VAC +/- 10%

   c. Output voltage of 26.5 VAC at 1.5 A.

   d. Station load of 24 VAC

   e. Diagnostic circuit breaker that skips over overloaded circuits

f. Backup power supply fuse and holder

g. program backup non-volatile

h. Self-contained 10 year lithium memory

i. Battery backup 9 VDC nicad rechargeable with an established life of 3-5 days without power during outage

j. Lifetime lightning and surge protection warrantee

k. Cycle and soak program without having to tie up another program or start time

l. Programmable day on day off

m. Four programs with 8 start times per program, programmable in quarter hour increments

n. 365 day calendar that adjust for leap year

o. Non-volatile memory for Time, Program, and Program retention

p. Master valve on/off by station

q. Station status indicator lights and sensor status indicator light

r. Programmable under battery power

s. Vandal and weather resistant cabinets and key lockable door

t. Odd/even/cyclical programming schedules

u. Water budget program programmable in 10% increments from 0-200%

v. Test program variable from 1-99 minutes with a default of 2 minutes.

2. Controllers shall be installed with a power cut off switch for controller only and 2 outlets within 1'

from controller and be connected to a ground fault breaker. Breaker information shall be printed on front cover with building name, room, and panel number.

3. Controllers installed inside or on outside of building shall be 5' from floor or grade, and have a clearance of 30" on all sides and in front of for accessibility.

4. Controllers shall have three (3) lightning rods spaced 8' apart in a triangle formation. These rods should be covered by 6" round valve boxes.

F. Small Rotors

1. Small rotor shall have a minimum of 4 but no more than 6 nozzles or turrets and not use more than 9.46 GPM, and operate at pressures of 25 but no more than 65 PSI, and shall have a:

   a. Precip rate of at least .25 but no more than 1.26 in/hr.

   b. Spacing no less than 16' but no more than 50'

   c. Trajectory low angle 11°-15° and normal 23°-25°

   d. Have Arc adjustments from 25° to 350° and a separate 360° head non-adjustable. All rotors to be adjustable wet or dry

   e. Three (3) year warrantee

   f. Conform with ASAE S398.1 and have been tested by CIT.

G. Electric Valves

Electric valves shall be pressure regulating and heavy duty plastic and have a:

1. Course threaded solenoid

2. Pressure regulating range of 15-100 PSI

3. Thumb wheel adjustment.

H. Miscellaneous

1. Under no circustance will water be allowed to hit sidewalks or road.

2. Systems shall have one (1) reduced pressure backflow preventer and one (1) meter, both of which shall pass WSSC permit requirements.

3. Valves will be installed with 7 fittings, 1 tee from main 4-45's, 2 male adapters only, with the valve resting 8" above the pipe.

2.06 REFORESTATION (6-01)

The College Park campus has an approved simplified Forest stand delineation which may be utilized, where appropriate, when submitting requirements to the Department of Natural Resources. A forest conservation plan is also required for each project that disturbs more that 40,000 square feet of surface area. The College Park campus also has an approved long-term forest protection easement which has been developed for specific existing and future projects. The intent of establishing the forest protection easement is provide for mitigation requirements as determined by the forest conservation plan for each project. Reference all forest conservation plans to the long-term forest protection easement in order for the mitigation requirements for reforestation or afforestation to be reconciled.

The consultant is solely responsible for submitting all requirements of the Forest Conservation Act to the Department of Natural Resources. All projects shall be developed in accordance with the Forest Conservation Act and its pertinent Regulations as established in 1991 and in the revised third edition, 1997.

Copies of all of the Forest Conservation Manual may be obtained from the Division of State Documents, P.O. Box 2249, Annapolis, MD 21404-2249.

Additional information may be obtained by contacting:

Department of Natural Resources
Forest Service
Tawes State Office Building, E-1
Annapolis, MD 21401
Phone: 1-877-620-8367

2.07 PAVEMENT AND DRAINAGE CONSTRUCTION AND PARKING FOR MOTORCYCLES

A. Within the development of any requirement for parking, approximately 1% of the total number of parking spaces shall be designated and configured to permit the parking of motorcycles. The designated area for motorcycle parking shall have a concrete base. This pad shall be based on a dimensioned area of 4'-0" x 8'-0" for each required motorcycle space.

B. Unless otherwise specified in the construction documents all road and parking pavement construction and all storm drainage shall conform to the latest specifications, standards and details of the Maryland State Highway Administration (MSHA). Permanent and temporary roadway signage, striping, marking, signals or other control devices shall conform to MSHA standards or to the latest edition of the Manual on Uniform Traffic Control Devices published by the Federal Highway Administration.

C. Bicycle racks shall be provided where appropriate.

The following information has been established as standards for UMCP lot and space designations and configurations must be approved by the Department of Campus Parking.

A. Garages:

1. Minimum space size of 8.5' x 16'
2. Height Clearance-minimum of 6'8"
3. Elevator Shafts-Designed to allow access to clean the outside of the car window, or have contractor provide a system which will allow for cleaning of the windows
4. Elevator Pits-Design pit with Oil/Grit Separation system (see item C.).
5. Washdown capabilities for both cleaning and general maintenance include:

   a. The washdown process consists of a University mobile vehicle equipped with a storage tank which accepts a 1-1/2 inch threaded hose connection to fill the tank. The maintenance process consists of a 3/4 inch threaded hose connection for normal FM - Grounds maintenance.

   b. Each parking level shall contain the following hose bibb installations:

      1. Washdown Hose bibbs shall be located 150 feet apart, a minimum of two (2). Supply piping shall be 1-1/2 inch type L copper with a 1-1/2" threaded hose connection outlet.

      2. One (1) maintenance hose bibb located at or near the center of structure. Supply piping shall be 3/4" I.D. type L copper with a 3/4" threaded hose connection outlet.

      3. All hose bibbs shall be tamper proof with a slotted or square operator key and shall have an integral vacuum breaker with a standard hose thread and include a cap and chain.

4. Design will include a positive shut-off valve located at an accessible (and identified) location to drain hose bibb piping system in months when freezing temperatures are expected.

      5. Hose bibbs shall terminate 30 inches from the finished floor and be protected by a permanent bollard(s).

      6. Floor Drains-2' X 2' minimum

      7. Ramp Drains-Continuous Trench Drain at base of each ramp, minimum 6 inch pipe.

      8. Stairwells and Elevator Shafts - all glass for safety

      9. Add-on capability - all future design work should investigate possibility of building the garage with the ability to add additional levels in the future.

B. Surface Lots

1. Space sizes and configurations - to be determined by DCP and AEC. All motorcycle pads shall be in concrete.

   Minimum space sizes are as follows:

   a. Faculty Staff - 8.5' x 16'
   b. Students - 8' x 16'

2. Drive Lanes

   a. Two way - 24' minimum
   b. One way - 13.5' minimum with angled (60°) parking

3. All spaces to be striped with traffic WHITE non-lead base paint including handicapped spaces (9-30-04).

4. End Islands - painted, no concrete.

5. Disabled - number of spaces and marking in accordance with ADA standards with blue symbols.

6. Sign & Sign Standards - See Drawings.

7. Meter Pole Standards - See Drawings.

C. Oil/Grit Separators in Garages

Typically oil/grit separators would not be included in the storm drain system in garages. Instead, an automatic system to recover oil spills or discharges from hydraulic elevator pumps shall be provided whenever the sumps drain by gravity or by a self activating pump. An oil recovery system would not be required in cases where the elevator sump area is manually pumped to the drain system.

SIGN SPECIFICATIONS

PWD

PARKING LOT

Lot/Space designations and installation locations must be pre-approved by designated Department of Campus Parking Representatives.

Parking lot signs, Service Parking signs, State Vehicle signs, and sign Standards must be procured through the University of Maryland Facilities Management, Sign Shop.

<u>PWD SIGN MATERIALS:</u>

Sign is made of .080 Aluminum covered with Handicap Blue high performance (2-mil) vinyl transfer film and legend of while high performance (2-mil) vinyl transfer film baked on..

<u>PWD SIGN MEASUREMENTS:</u>

Sign is 30″ X 30″ square with rounded corners, mounted on standard with top of sign even with top of standard.

<u>PWD SIGN CONTENTS:</u>

Sign shall contain disability emblem, the words NO STOPPING OR STANDING, TOW - AWAY ZONE And MIN $250.00 FINE.

!!!!!!!!!!!!!NOTE!!!!!!!!!!!!!
There shall be no addendums

<u>PARKING LOT SIGN MATERIAL:</u>

Sign is made of 13mm White Sintra with red vinyl lettering and border.

<u>PARKING LOT SIGN MEASUREMENT:</u>

Sign is 30″ X 48″ with square corners, mounted on standard with top of sign even with top of standard.

<u>PARKING LOT SIGN CONTENTS:</u>

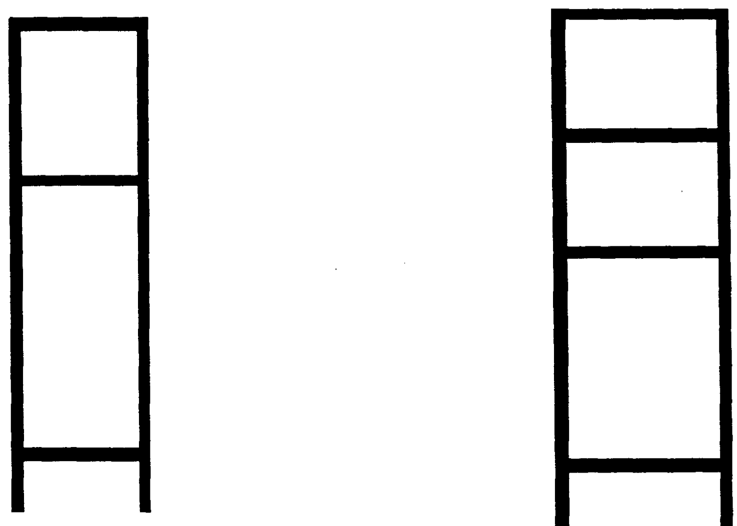
Sign shall contain wording as prescribed by DCP to designate **Lot number, and all** applicable restrictions for specific lot.

!!!!!!!!!!!!!NOTE!!!!!!!!!!!!!
There shall be no addendum permanently added to standard below sign.

SIGN STANDARD SPECIFICATIONS

STATE VEHICLE
SERVICE ONLY

LOT SIGNS
PWD SIGNS



Specifications for Standards:

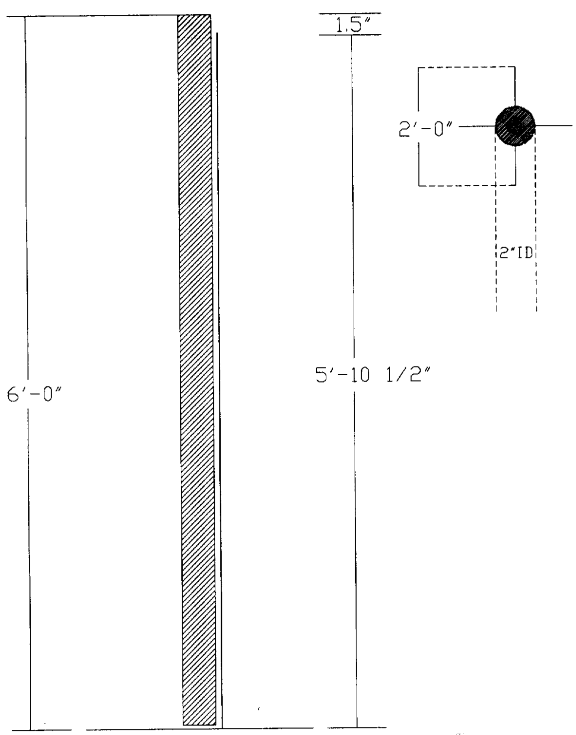
Material: 2" X 2" 11 gauge hot rolled square tubing except for a 1 " flat bar support 1' from the bottom of the standard. All joints shall be welded to a smooth finish.

Measurements: Length of the standard is 10', width 2' for special signs (State Vehicle Only and Service), 2.5' for Lot signs. The top-section of the special sign standard shall form a 2' X 2' square, the normal standard shall have two top sections each of which will be 2.5'x 2', square. PWD signs shall be mounted on Normal Sign Standards.

Coverings: Standard should be primed and completely finished with Handicap Blue, Gloss Black, or Rhonan White depending upon use.

Installation: Standard shall be seated in two (2) feet of concrete with eight (8) feet of the standard above around level.

METER POLE SPECIFICATIONS



The Poles shall be 2" ID Galvanized Pipe 6" long with ant-theft bar of ½" rebar or similar material welded the entire length except for the top 1 ½" to allow for insertion into the meter head. The bottom of the pole will have four (4) radials of at least 1" in length and placed at 90 degrees to the post and 90 degrees to each other. The posts shall have 2' of length buried in concrete and shall extend 4' above the ground surface. The posts shall not be painted.

2.09 PERT TELEPHONE (POLICE EMERGENCY REPORTING TELEPHONES INSTALLATION CRITERIA (12-2-02)

A. The number, type (free-standing or wallmounted) and location of PERT telephones will be recommended by the Consultant to the University on a project-by-project basis.

B. Free Standing Emergency Telephone (See Division 16.11)

1. The Contractor shall furnish and install an outdoor emergency telephone (manufactured by*Talk-A-Phone Company,* stock No. ETP-MT/R OP4/CP, no substitutions, with vandal resistant security unit with speakerphone with keypad and University of Maryland Software, blue light and strobe. Furnish with nicklad 2000 finish in Midnight Blue to match existing on campus in location shown on the drawings. Installation requirements include the following:

   a. A concrete foundation for the communication tower of 24" square and a minimum of 36" deep with a slight slope from center. Stub-up electrical and communication conduit (two 1-1/2") including a 8' x 5/8" copper ground rod in the center of foundation as shown on the attached drawing.

   b. A dedicated (unswitched) 120 volt, 20 ampere electrical power circuit in conduit from the University designated location to the location of the communication tower.

   c. A 1" conduit with six (6) 24 AWG, filled telephone cable from the University designed location to the communication tower. Reference Section

2. Referencing the attached Drawing #ETP-MT/R FOUNDATION, installation instructions for the Emergency Lighting and Communications Tower include:

   a. Install the four (4) 3/4" - 10 x 24 long anchor bolts below grade **with five inches (5") projecting above grade**. Use the template provided to properly position the bolts within the concrete foundation.

   b. After removing its protective shipping wrap, install the blue light/strobe assembly on top of the tower, feeding the 110 VAC power cord and control wires through the top of the tower. Fasten the blue light/strobe to the tower with three (3) 10 x 24 pan head/spanner screws (provided). Secure the 10" x 12" protective housing to the top of the tower using four (4) 1/4 x 20 pan head security screws (also provided).

   Note: It is not necessary to connect 110VAC power lines at this point.

   c. Install the fluorescent light ballast assembly over the Emergency Phone opening with the two security screws provided. Make sure the power is off, then install the fluorescent bulb. An acrylic window and frame cover the bulb. Peel the protective paper off the acrylic window and install the window and frame using the four security screws provided.

   d. Install one 3/4" nut and one washer on each anchor bolt (2" to 2.5" above grade to top of nut) and verify that the nuts are level (0° pitch).

   NOTE: To insure proper grounding of all electrical components, a grounding strap is required by the National Electrical Code. We recommend the use of an insulated, 6 AWG stranded wire connected between the electrical conduit (within the concrete base) and the tower. The best place to connect the ground wire to the tower is via one of the four anchor bolts. It is necessary to remove the paint from the inside edge of one of the anchor bolt holes and the inside surface around the bolt hole to ensure the grounding wire makes a good electrical connection to the tower. This must be done before installing the tower.

   After removing the cover plate from the tower's rear access opening, install the tower onto the bolts with the Emergency Phone opening oriented in the desired direction.

Install second set of nuts and washers. Wrap the 6 AWG grounding wire around the mounting bolt where the paint has been removed. Tighten the upper nuts; the bottom set is only for leveling. The possibility of corrosion where paint has been removed can be reduced by painting the nut assembly where the grounding wire has been attached.

e. Wire incoming 110 VAC power to the blue light/strobe and to the fluorescent light. Depending upon installation preference, use the electric plugs provided for the blue light/strobe and fluorescent light, or remove the plugs for hard-wiring.

f. Connect the black control wire of the blue light/strobe to the black wire of the Emergency Phone. This is the common wire. Then connect the orange control wire of the blue light/strobe to the orange wire of the Emergency Phone. This is the AUX 2 output lead. Attach the Emergency Phone to the tower with six (6) 10-24 spanner security screws (provided). Connect the phone line coming into the tower to the male RJ11 connector coming from the Emergency Phone. An outdoor rated RJ11 female modular jack on the end of the incoming phone line is strongly recommended.

g. Re-attach the cover plate over the access opening at the rear of the tower with the two (2) tamper resistance 1/4" spanner screws provided. You may discard the two regular screws which held the cover plate in place during shipment.

C. Wall-Mounted Emergency Telephone

1. The contractor shall furnish and install an outdoor, wall-mounted Emergency Telephone manufactured by Talk-A-Phone Company, Stock No. ETP-WM/CP, with vandal resistant security unit with speakerphone with keypad and University of Maryland software, blue light and strobe.

2. Referencing the attached Drawing, #ETP-WM, installation instructions for the Emergency Lighting and Telephone include:

a. The ETP-WM is held to the wall with 4 screws. Install two screws of the appropriate type to the wall as shown on the enclosed template (top two holes). Note that the screws should be located so that the ETP-WM will be at the desired height and in the correct position to receive any conduit connections.

b. Electric power and the telephone line can be brought into the unit in one of two ways.

i) There are three large openings in the back of the unit to allow the unit to be mounted over a standard electrical outlet box and/or telephone connector box.

ii) There are two conduit openings available on the bottom of the unit for connection of power and/or telephone line. (**Note**: Power and telephone lines cannot be run in same conduit.)

c. Remove the cap lid from the ETP-WM by removing the four #10 spanner security screws located on the side of the unit. <u>DO NOT REMOVE THE LEXAN® LENS</u>. Mount the unit on the wall using the two keyholes on the top rear of the unit to the two screws mounted to the wall in step a.

d. Install two additional screws of the appropriate type in the holes in the lower rear of the unit. Tighten all four screws.

e. Install conduit to hole(s) in bottom of unit, if this method is being used (see step 2), and bring power line and/or telephone line to inside of unit.

f. To wire the Blue Light/Strobe, find the AC power cord and the orange and black control lines coming from the strobe inside of the ETP-WM enclosure. Connect the power cord to the power source, and connect the orange and black wires from the Blue Light/Strobe to the orange and black wires (auxiliary output #2) extending from the Emergency Phone.

g. The faceplate light and ballast is installed prior to shipment. Be sure to connect the power cord to the power source.

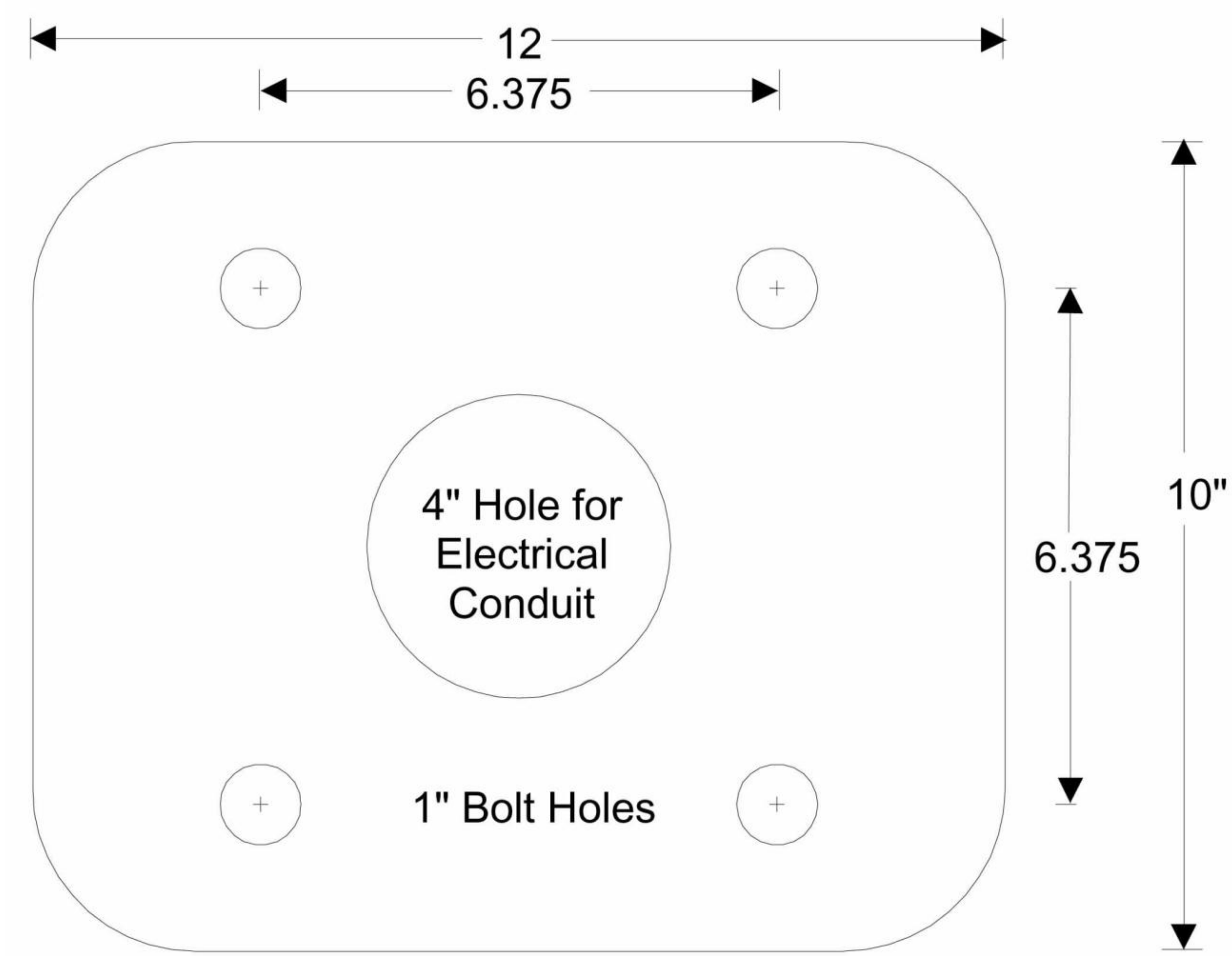
h. Connect the RJ-11 plug extending from the Emergency Phone to a phone line connection box.

i. Mount the Emergency Phone into the recessed opening of the ETP-WM using the 6 #10-24 security screws provided.

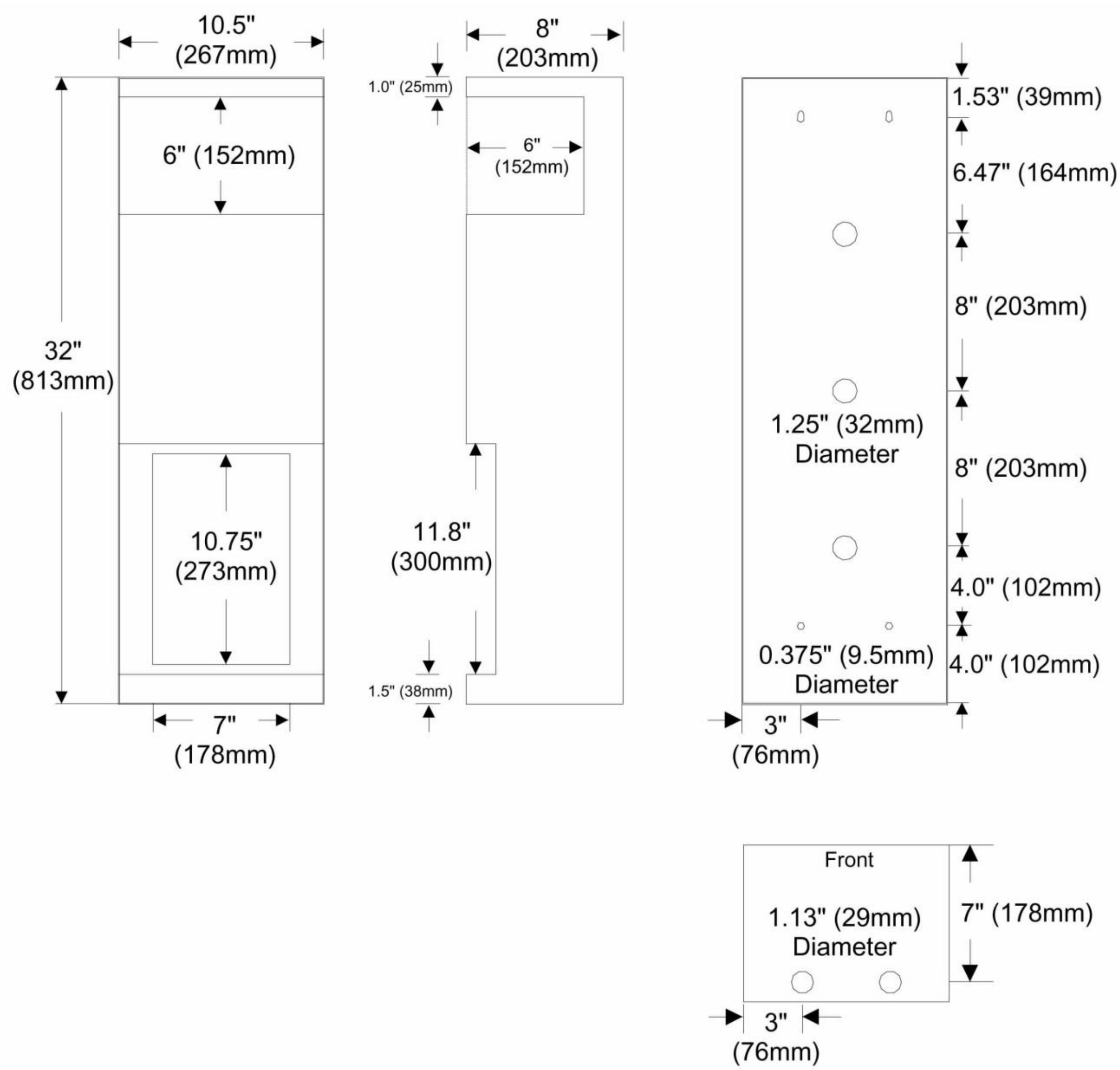
j. Re-install the cap lid that covers the blue light/strobe.

3. No exposed conduit is permitted in any new construction and unless proper approval is received from the University, the same applies to retrofit projects.

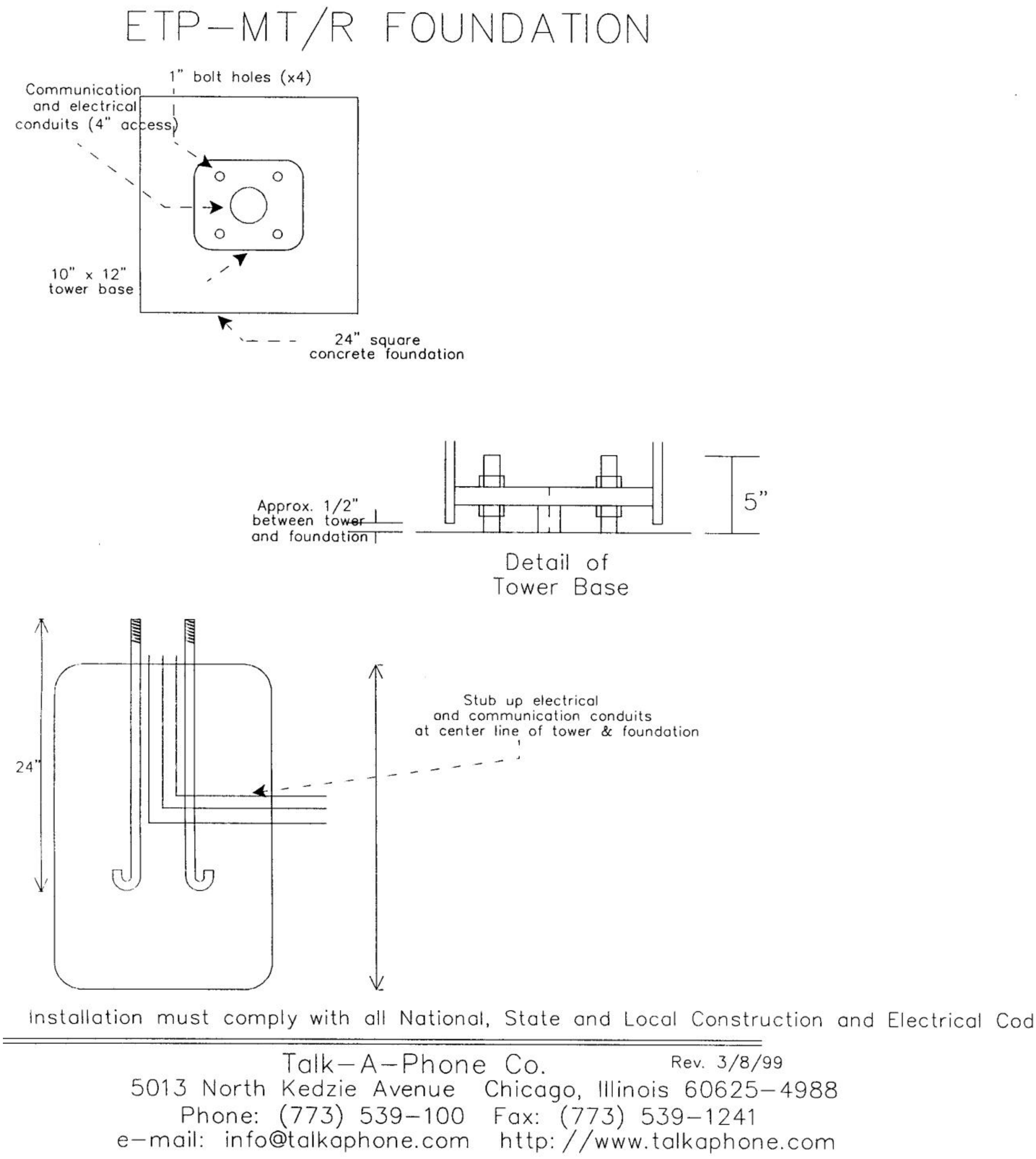
2.09 PERT TELEPHONE (POLICE EMERGENCY REPORTING TELEPHONES INSTALLATION CRITERIA (12-2-02)



2.09 PERT TELEPHONE (POLICE EMERGENCY REPORTING TELEPHONES INSTALLATION CRITERIA (12-2-02)



2.09 PERT TELEPHONE (POLICE EMERGENCY REPORTING TELEPHONES INSTALLATION CRITERIA (12-2-02)



A. Buildings shall **typically** be designed to permit gravity flow of sanitary and storm drainage. Where sewage ejectors or sump pumps are required, they shall be:

1. Located to have sufficient headroom to pull the pump shaft straight up through the floor plate.

2. Provided with lifting eyes or trolley beams to facilitate the removal of the equipment.

3. Provided with emergency power if failure of the pump should flood electrical or mechanical equipment.

4. Provided with a high level alarm, that is interfaced to the building's CCMS.

B. Pipes penetrating exterior walls below grade must be installed properly to prevent breakage due to building settlement or expansive soil.

C. Inverts shall be shown on all drawings.

D. All connections to campus distribution systems or public utilities shall be precisely located by dimensions or coordinates.

E. Depth of piping shall be shown and installed below all freeze lines (minimum) and inverts shall be shown at manholes and other critical points.

F. Access shall be provided to all working parts of plumbing devices. Do not permanently seal in wall any plumbing items requiring periodic maintenance.

G. Cleanouts shall be located at each 90 degree bend and every 100 feet in straight runs of 3" or larger piping.

H. Plumbing riser diagrams must be drawn in isometric form and there must be one for each riser on the project. Risers must be shown on all plans.

I. All domestic water applications shall be separated from non-potable connections via a back flow preventer (PRZ);

acceptable manufacturers/series include: Watts 909 Series, FEBCO 800 Series, and Wilkens (Zurn) 500 Series. PRZ installations shall be installed per plumbing code in the horizontal run at a height of 4 feet.

J. Sanitary sewer and water lines shall be designed in accordance with WSSC guidelines.

2.11 SEASONAL ISSUES

A. Contractor shall maintain emergency vehicle access to the construction site at all times. Snow, mud, debris, unsuitable driving surfaces, locked gates, and other obstructions shall not be allowed to interfere with access to the site.

B. Contractor shall police construction site of trash and maintain construction material in a secured fashion so as to prevent them from being blown from the site during periods of high winds.

C. Contractor shall maintain security lighting in the area of construction so there is adequate lighting in all pedestrian and parking areas adjacent to the construction site.

D. Contractor shall not interfere with University special events by disrupting traffic, engaging in operations with loud noise, or allowing debris to remain in roadways. Special events are primarily but not limited to Commencement and class registrations. The University will provide dates and times of any special events at the time of bid.

E. Account for conditions/restrictions such as, sun orientation, wind, leaf accumulation, snow drifting, noise and environmental factors. Prevent abnormal accumulation of leaves, and snow due to wind direction in relation to building location. Consider mowing requirements and grass cuttings when siting and orienting buildings or site amenities.

2.12 SITE CONSTRUCTION SIGNS

A. During construction, contractor shall provide, install and maintain signs for parking, traffic control, direction to project site, detours, construction material deliveries, pedestrian and property signs, vehicle directions, etc. of materials and finish as required by the Maryland Department of Transportation State Highway Administration Standards for Highways and Incidental Structures or approved equal as determined by the University of Maryland.

B. Upon completion of the project, the Contractor must remove all such signs and deliver them to the University as directed.

2.13 SITE STANDARDS (10-28-05)

Site standards have been established for the following:

A. Benches

B. Bike Racks

C. Bollards
   1. Steel Removable/Non-Removable
   2. Wooden Breakaway
   3. Pedestrian Bollard and Chain

D. Cigarette Urns

E. Concrete Dumpster Pads
   1. Plan View
   2. Section

F. Concrete Steps

G. Curbs
   1. Bituminous Concrete Curb
   2. 6" and 8" Concrete Curb and Gutter
   3. 8" Mountable Curb
   4. 4" Concrete Landscape Curb

H. Electric Parking Gates
   1. Single Gate (out)
   2. Double Gate (in/out)

I. Fencing
   1. Board-on-board

J. Handrails

K. Kiosks

L. Outdoor Drinking Fountains

M. Paving
   1. Concrete Pavers
   2. Concrete Walks
   3. Bituminous Asphalt Paving
   4. Brick on Concrete

N. Picnic Tables

O. Planting Details
   1. Trees
   2. Shrubs

P. Ramps for Persons with Disabilities (PWD)
   1. PWD Ramp, Plan View
   2. PWD Ramp, Section

Q. Security Gates

R. Trash Receptacles

S. Tree Grates

A. BENCHES (6' - 8')

1.	Material:	Teakwood
2.	Manufacturer:	Country Casual; 7601 Rickenbacker Drive, Gaithersburg, Md. 20879 (301)-926-9195
3.	Model:	Windermere
4.	Description:	A teak wooden bench without back rest and arm rests; intended for low traffic/high visual quality areas.
5.	Performance:	The Windermere style has strong, durable construction and hardwood to resist carving and vandalism; slats with spacers to allow air movement for comfort and long life; angled brackets for securing to pads and galvanized hardware throughout.
6.	Related Details:	Bench Anchorage. (See Drawing No. 37).

B. Bike Racks

1.	Material:	1-1/2" schedule 40 (.148" wall) black iron pipe O.D. - 1.90".
2.	Manufacturer:	Fabricated
3.	Model:	Fabricated
4.	Description:	Black arched schedule 40 pipe with concrete footings. Space racks 4' on center. Paint pipe with one (1) coat red primer and two (2) coats flat black enamel paint.
5.	Performance:	Durable and can be used with any type bike lock. Placed near major building entrances.
6.	Related Details:	Brick paving with concrete band. (See drawing No.09).

C. Bollards

C.1. Steel Removable/Non-Removable Vehicular

1.	Material:	Painted schedule 80 steel pipe.
2.	Manufacturer:	Fabricated
3.	Model:	Fabricated
4.	Description:	<u>Removable:</u> Bollards constructed of heavy-duty steel painted black with a security padlock. <u>Non-Removable:</u> Painted heavy-duty steel installed and filled completely with concrete.
5.	Performance:	Removable vehicular bollards are for high use service areas. Non-Removable bollards are placed around utility features to prevent

		damage, i.e. dumpsters, gas meters, hydrants.
6.	Related Details:	See drawings No.**10 and 11**.

C.2. Wooden Breakaway

1.	Material:	Pressure treated No. 2 Southern Yellow Pine posts.
2.	Manufacturer:	Fabricated
3.	Model:	Fabricated
4.	Description:	6" X 6" wooden post, unpainted and modified to serve as a bollard. Install in #6 crusher run.
5.	Performance:	Bollards are routed and sawcut at the base to allow breakaway access for emergency vehicles.
6.	Related Details:	See drawing No.12.

C.3. Pedestrian Bollard and Chain

1.	Material:	Pressure treated No. 2 Southern Yellow Pine posts.
2.	Manufacturer:	Fabricated
3.	Model:	Fabricated
4.	Description:	4" X 4" wooden posts connected by a 3/16" self-colored coil steel chain.
5.	Performance:	Control of pedestrian foot traffic.
6.	Related Details:	See drawing No.13.

D. Cigarette Urns

1.	Material:	Concrete Urn
2.	Manufacturer:	Shemins Nursery Burtonsville, Md. (301-421-1220)
3.	Model:	P-8600 - white concrete finish.
4.	Description:	Ornate white concrete urns. Placed near high volume pedestrian areas.
5.	Performance:	Aesthetically compatible

with the white columns of the building facades. Fill with white sand.

6. Related Details: N/A.

E. Concrete Dumpster Pad

E.1. Plan View
E.2. Section

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawings No.14 and 15.

F. Concrete Steps

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawing No.16.

G. Curbs

G.1. Bituminous Concrete Curb
G.2. 6" and 8" Concrete Curb and Gutter
G.3. 8" Mountable Curb
G.4. 4" Concrete Landscape Curb

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawings No.17,18, and 19.

H. Electric Parking Gates

H.1. Single gate (out)
H.2. Double Gate (in/out)

1. Material: Steel housed bases, wooden arms, a programmable control unit and detector loops.
2. Manufacturer: AMANO AGP 1700 Coordinate with Campus Parking

3. Related Details: See drawings No.21 and 22.

I. Fencing

I.1. Board-on-Board

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawing No.23.

J. Handrails

1. Material: Moulded steel with flat black paint finish.
2. Manufacturer: Acme Iron Works, Inc. Tuxedo, Md.
3. Model: Style #104 or similar style
4. Description: Moulded steel with red enamel primer and black flat paint finish. Moulded top bar, 1/2" square pickets spaced 4" O.C. and a lamb's tongue.
5. Performance: Placed on steps of more than three treads and as required by ADA Standards.
6. Related Details: See drawing No.24.

K. Kiosks

1. Material: 24" diameter concrete pipe with 2" x 4" No.2 pressure treated Southern Pine.
2. Manufacturer: Fabricated
3. Model: N/A
4. Description: 24" diameter (inside) concrete pipe, open top with 3/16" steel mesh cover, attached with 4 anchor bolts. Boards attached to pipe with two circular brackets. Metal materials shall be

galvanized and wood shall be sanded and stained.

5. Performance: Sturdy, relatively easily maintained and placed at intersection of heavily used pedestrian walks.
6. Related Details: See drawing No.25.

L. Outdoor Drinking Fountains
1. Material: Exposed concrete, stainless steel exterior metal components.
2. Manufacturer: Haws or approved Equal.
3. Model: #3177FR/#3060FR
4. Description: Single Fountain: Cylinder, exposed aggregate finish. Banner free fountain, "L" shaped exposed aggregate finish.
5. Performance: Single fountain/barrier-free fountain, freeze resistant valve system.
6. Related Details: N/A

M. Paving
M.1. Interlocking Concrete Pavers
M.2. Concrete Walk
M.3. Bituminous Asphalt Paving
M.4. Brick on Concrete

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawings No.26, 27, 28, and 29.

N. Picnic Tables

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawing No.30.

O. Planting Details
- O.1. Tree
- O.2. Shrub

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawings No.31 and 32.

P. Ramps for Persons with Disabilities (PWD)
- Q.1. PWD Ramp, Plan View
- Q.2. PWD Ramp, Section

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: As per ADA
5. Performance: See item 6. above
6. Related Details: See drawings No.33 and 34.

Q. Security Gates

1. Material: See item 6. below
2. Manufacturer: See item 6. below
3. Model: See item 6. below
4. Description: See item 6. below
5. Performance: See item 6. below
6. Related Details: See drawing No.35.

R. Trash Receptacles

1. Material: Electrostatically, polyester, power-coated steel receptacle with plastic liner.
2. Manufacturer: Victor Stanley, Inc. P.O. Drawer 330, Dunkirk, Md. (301)-855-8300)
3. Model: S-42 Ironsides
4. Description: All steel bars and structural support, 39-1/2" x 23-3/4" spunsteel concave lid with 32 gallon highdensity

		plastic liner.
5.	Performance:	Durable, vandal-proof, with easy lift-out liner containing drainage holes. Vinyl coated steel aircraft cable attaches lid to receptacle. Attach base to concrete surface through center anchor bolt hole.
6.	Related Details:	N/A

S. Tree Grates

1.	Material:	Cast Iron
2.	Manufacturer:	Neehan Foundry Company or Equal.
3.	Model:	As specified
4.	Description:	90 degree round with cast iron angle frame.
5.	Performance:	Install flush with adjacent surfaces.
6.	Related Details:	See drawing No.36 & 36A.

T. Trash Receptacles

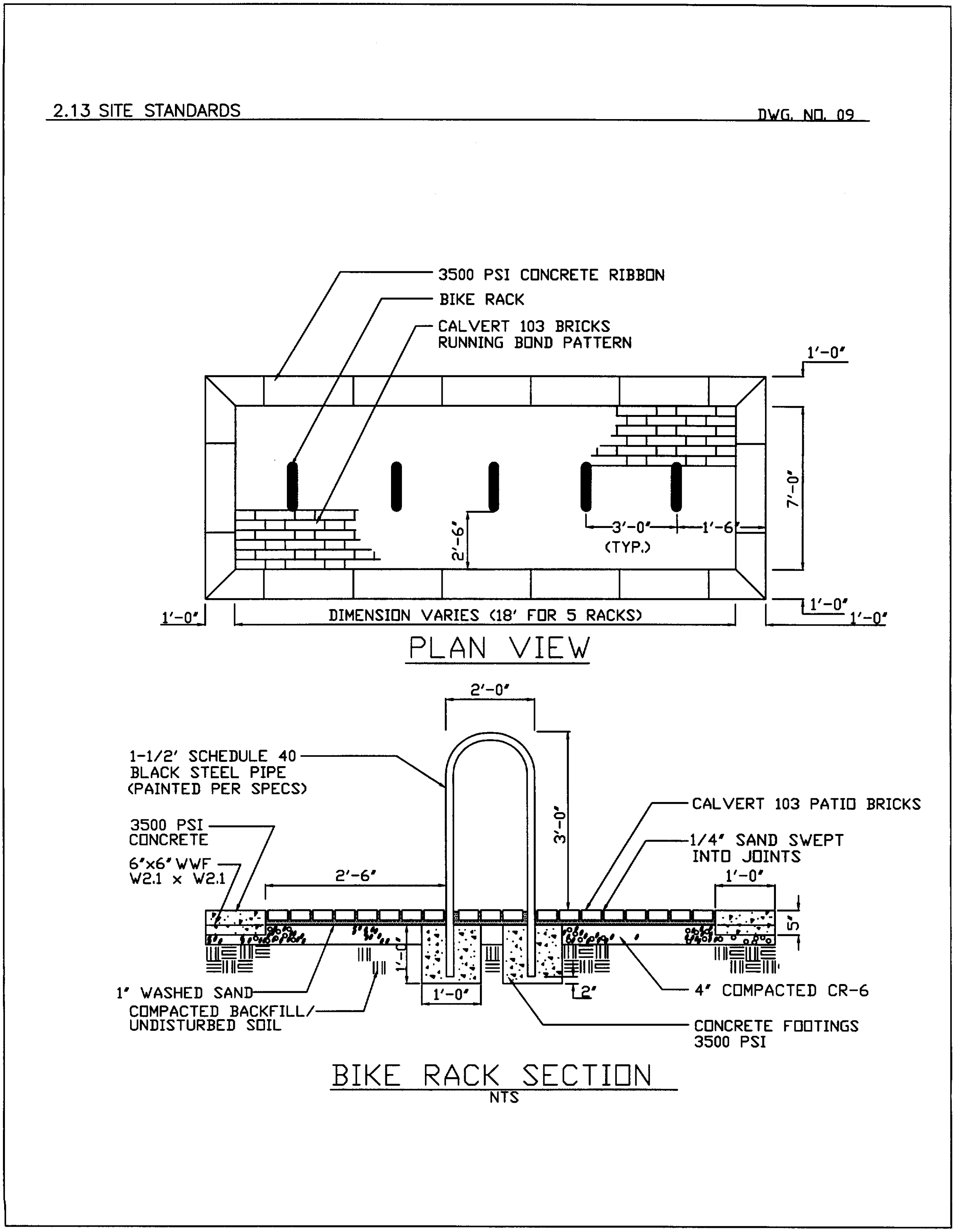
1.	Material:	Reinforced concrete container with an exposed granite chip finish.
2.	Manufacturer:	Carolina Container; Coward, S.C. (1-803-389-6161)
3.	Model:	Carolina Container model #5000C or Wausau Tile model #W-24 with WO-24 top.
4.	Description:	Both models are constructed of reinforced concrete with an exposed white granite chip finish sealed with an acrylic base sealer. The top shall be a black vacuum formed ABS material attached with a chain and having a 7" opening.
5.	Performance:	An aesthetically pleasing

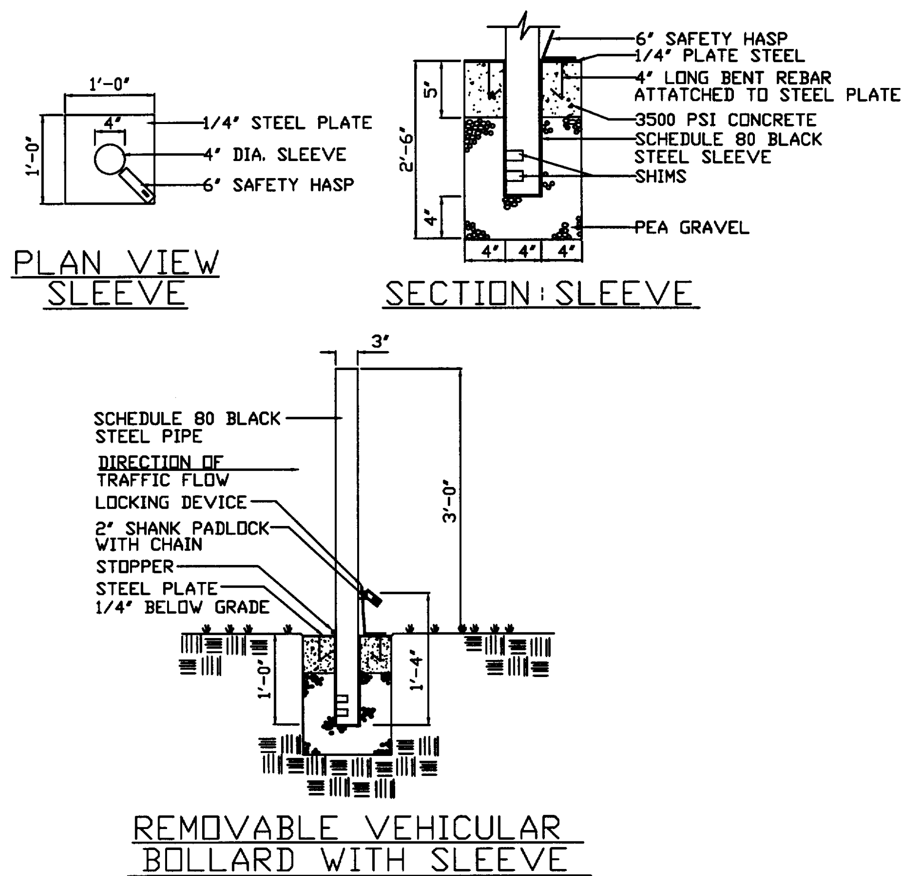
receptacle for high use areas. The container is durable and vandal-proof. The receptacle has an easy lift-out liner containing drainage holes which eliminates major maintenance costs.

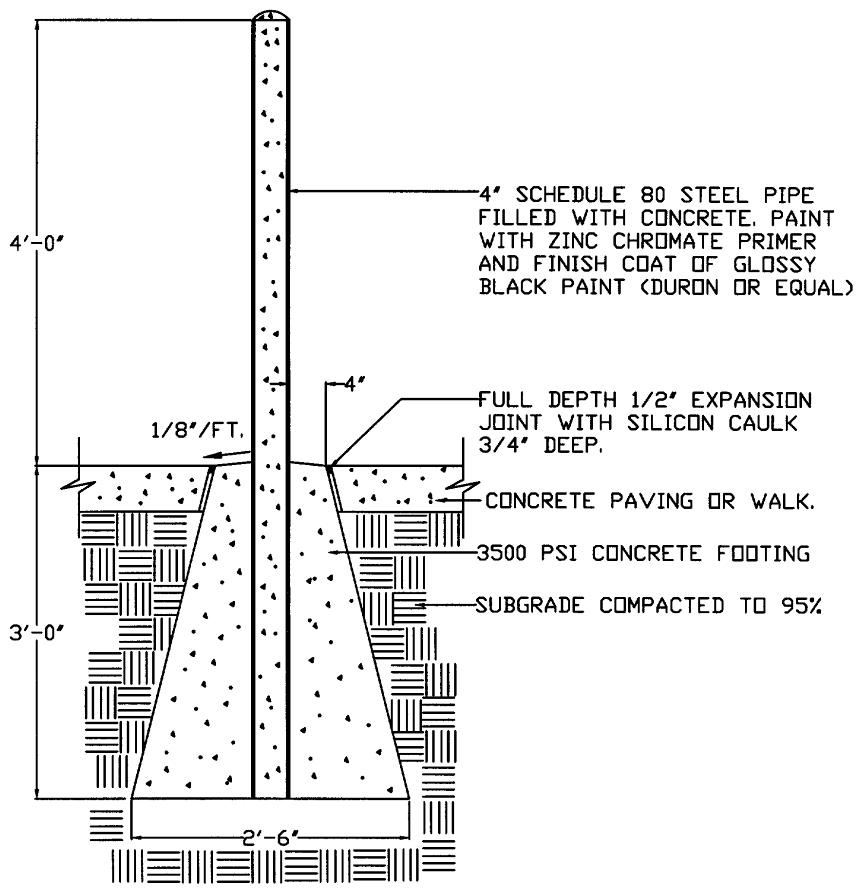
6. Related Details: N/A

U. Water Valves

1. Material: See 4. below
2. Manufacturer: See 4. below
3. Model: See 4. below
4. Description: To be developed
5. Performance: See 4. above
6. Related Details: See 4. above

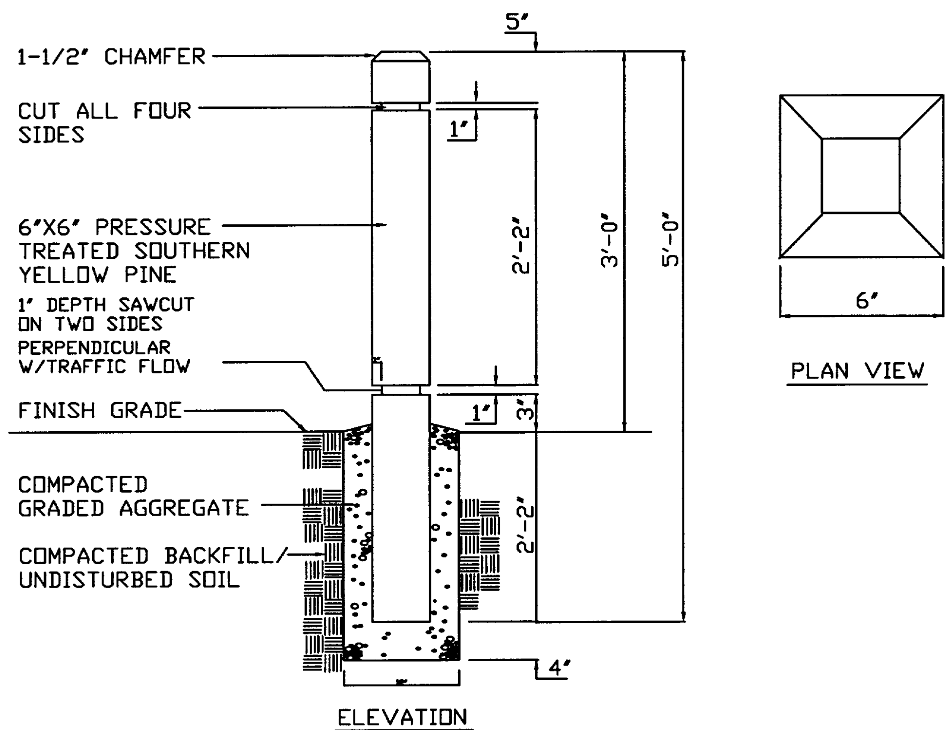

2.13 SITE STANDARDS
DWG. NO. 09
3500 PSI CONCRETE RIBBON
BIKE RACK
CALVERT 103 BRICKS
RUNNING BOND PATTERN
1'-0"
7'-0"
2'-6"
3'-0"
1'-6"
(TYP.)
1'-0"
DIMENSION VARIES (18' FOR 5 RACKS)
1'-0"
1'-0"
PLAN VIEW
2'-0"
1-1/2' SCHEDULE 40
BLACK STEEL PIPE
(PAINTED PER SPECS)
3500 PSI
CONCRETE
6"x6" WWF
W2.1 x W2.1
2'-6"
3'-0"
CALVERT 103 PATIO BRICKS
1/4" SAND SWEPT
INTO JOINTS
1'-0"
5"
1'-0"
1'-0"
2"
1" WASHED SAND
COMPACTED BACKFILL/
UNDISTURBED SOIL
4" COMPACTED CR-6
CONCRETE FOOTINGS
3500 PSI
BIKE RACK SECTION
NTS


1'-0"
4"
1'-0"
1/4" STEEL PLATE
4" DIA. SLEEVE
6" SAFETY HASP
PLAN VIEW
SLEEVE
6" SAFETY HASP
1/4" PLATE STEEL
4" LONG BENT REBAR
ATTATCHED TO STEEL PLATE
3500 PSI CONCRETE
SCHEDULE 80 BLACK
STEEL SLEEVE
SHIMS
PEA GRAVEL
5"
2'-6"
4"
4"
4"
4"
SECTION: SLEEVE
3"
SCHEDULE 80 BLACK
STEEL PIPE
DIRECTION OF
TRAFFIC FLOW
LOCKING DEVICE
2" SHANK PADLOCK
WITH CHAIN
STOPPER
STEEL PLATE
1/4" BELOW GRADE
3'-0"
1'-0"
1'-4"
REMOVABLE VEHICULAR
BOLLARD WITH SLEEVE



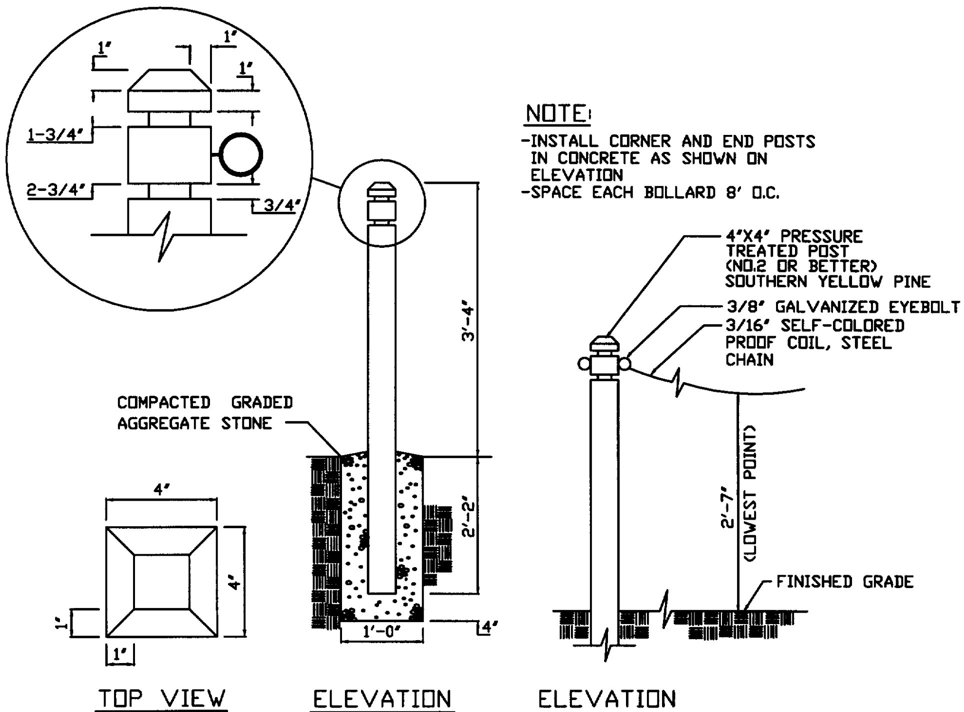
NON-REMOVABLE VEHICULAR STEEL BOLLARD

NTS



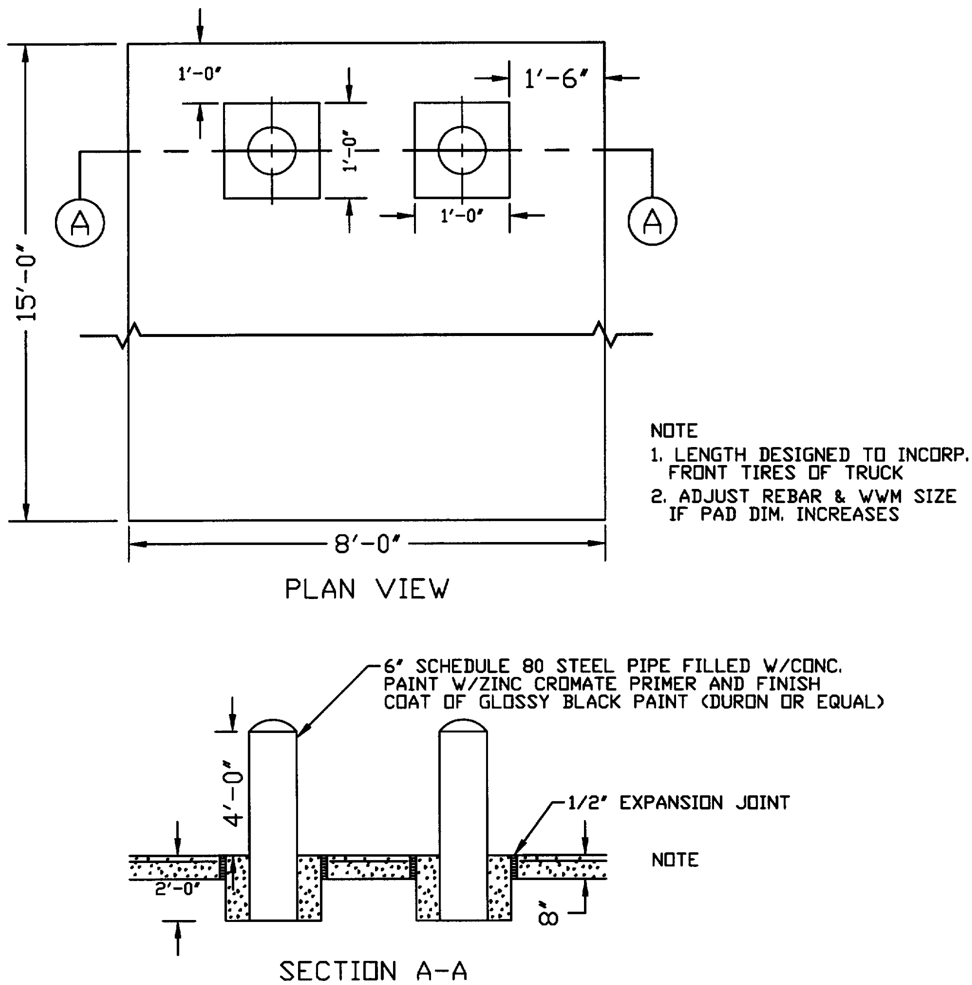
WOODEN BREAKAWAY BOLLARD

NTS



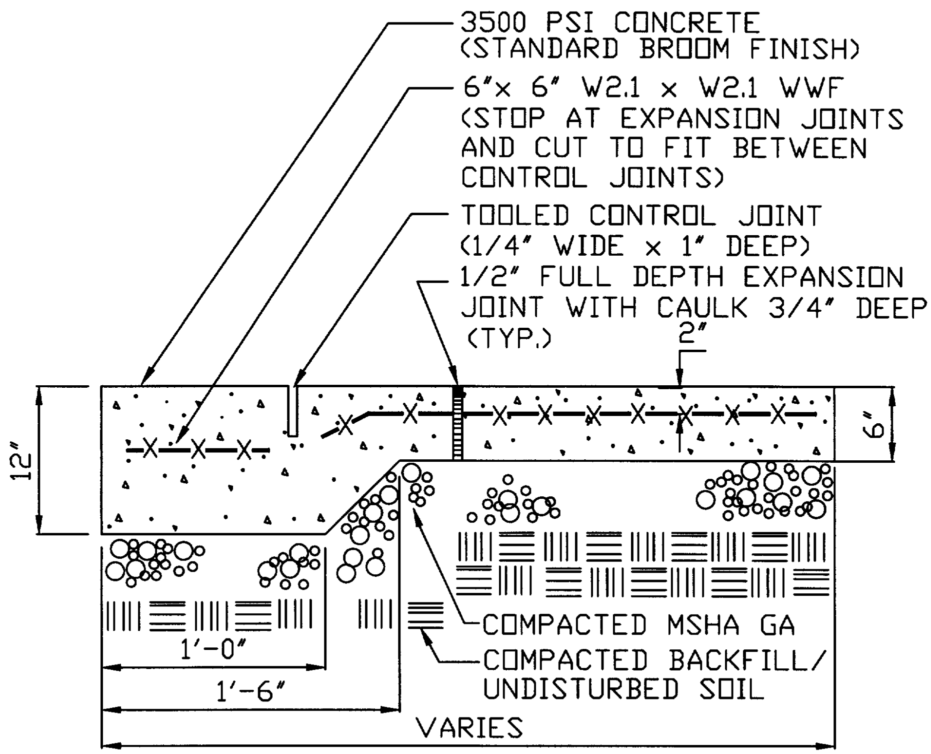
PEDESTRIAN BOLLARD AND CHAIN

NTS



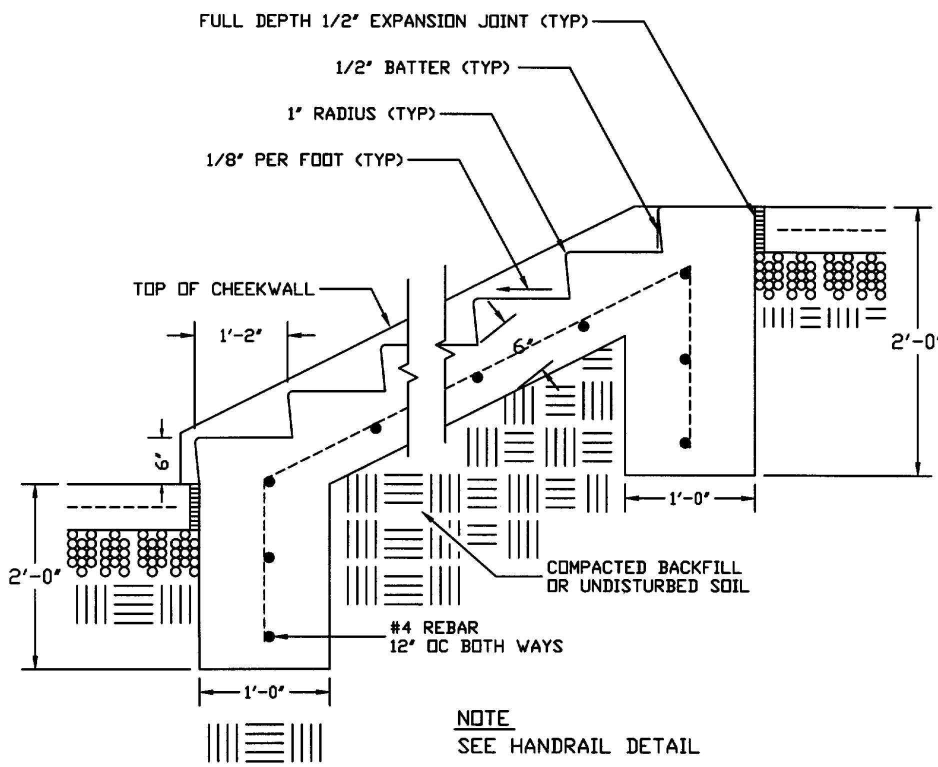
CONCRETE DUMPSTER PAD

NTS



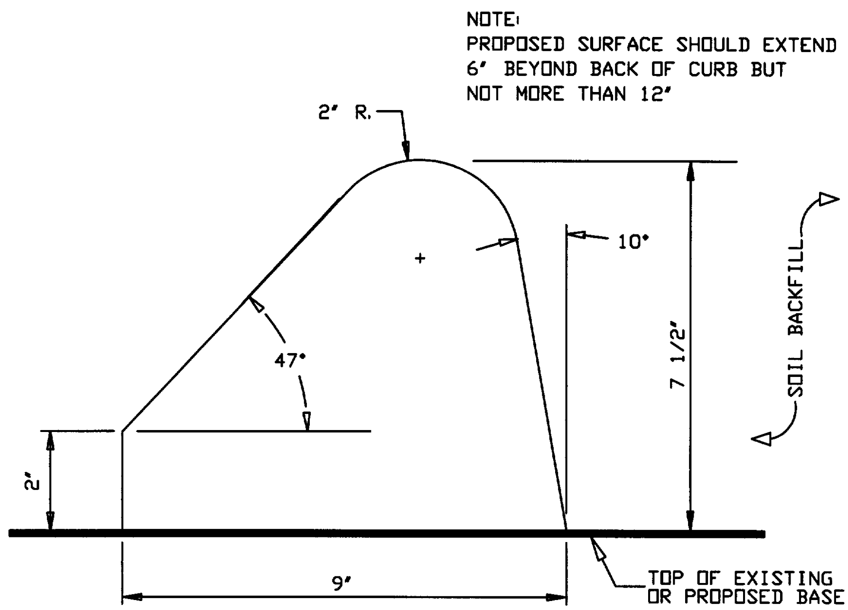
CONCRETE DUMPSTER PAD

NTS



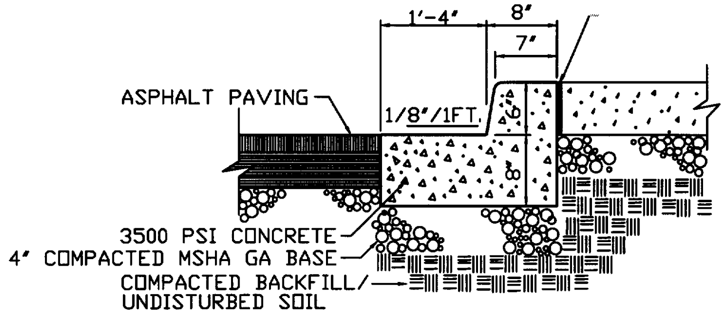
NOTE
SEE HANDRAIL DETAIL

CONCRETE STEPS
NTS



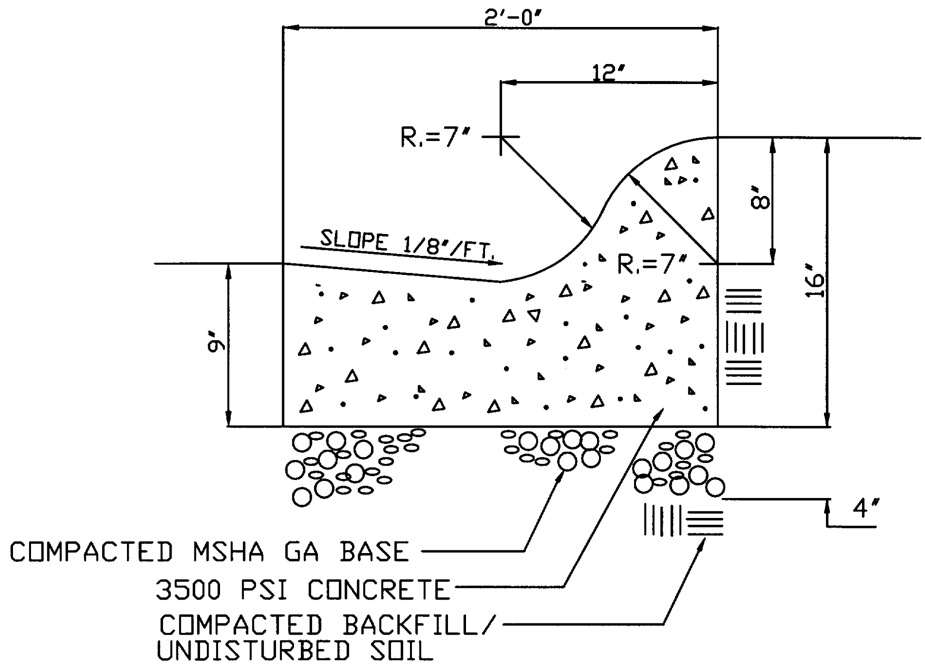
BITUMINOUS CONCRETE CURB

NTS



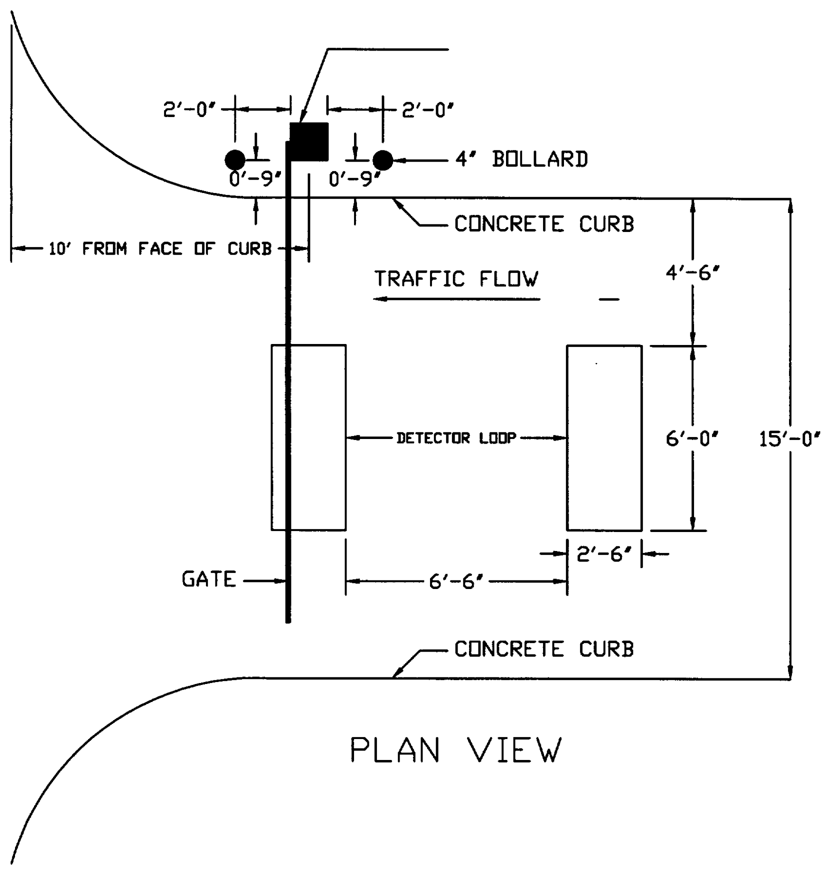
6" & 8" CONCRETE CURB AND GUTTER

NTS



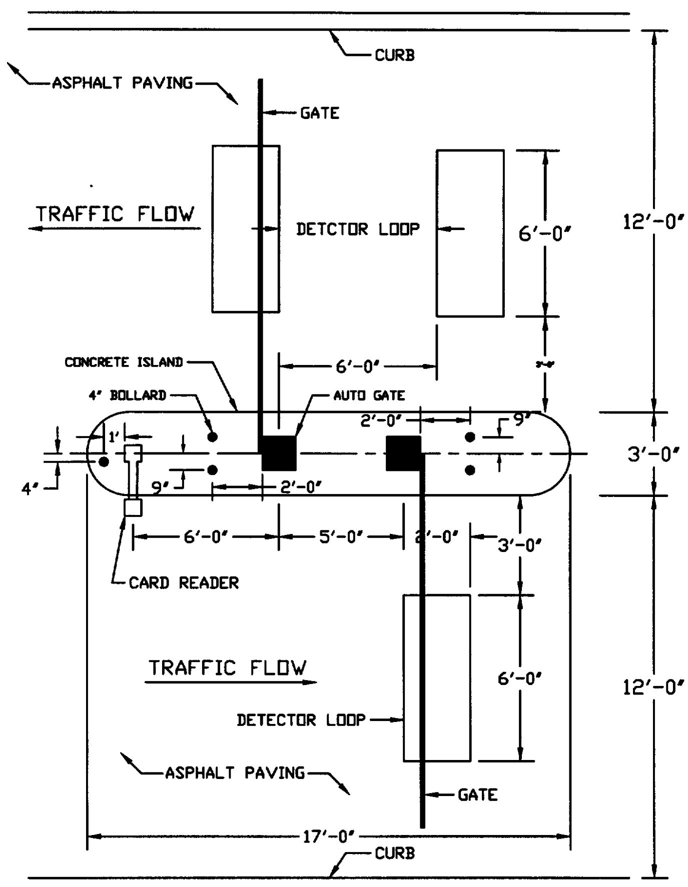
8" MOUNTABLE CURB

NTS



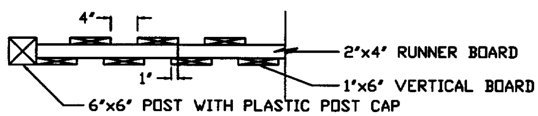
SINGLE ELECTRIC PARKING GATE - INGRESS

NTS

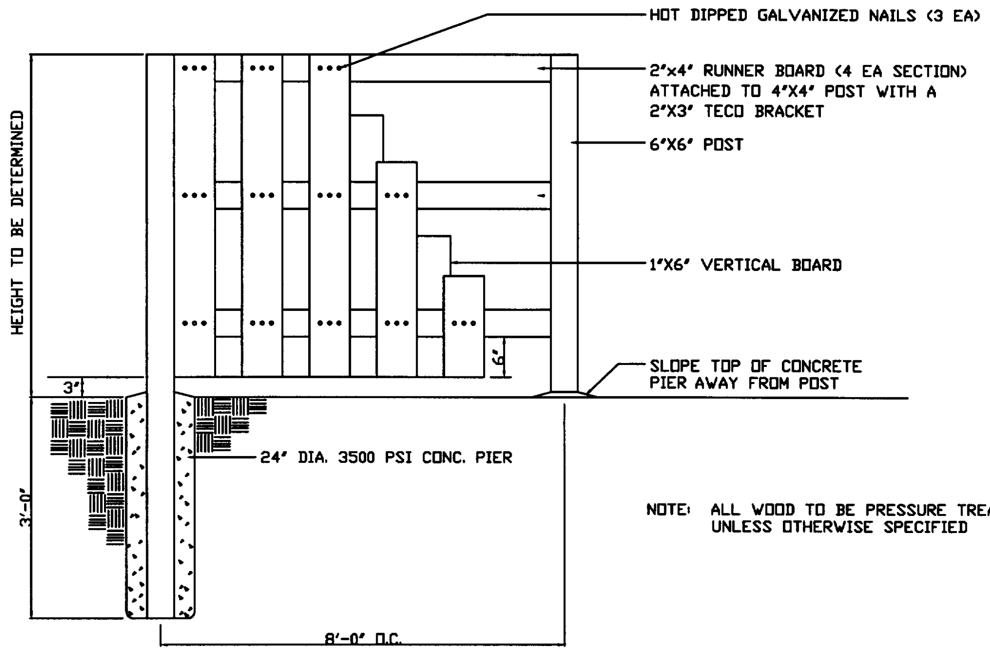


PLAN VIEW

DOUBLE ELECTRIC PARKING GATE
INGRESS AND EGRESS
NTS



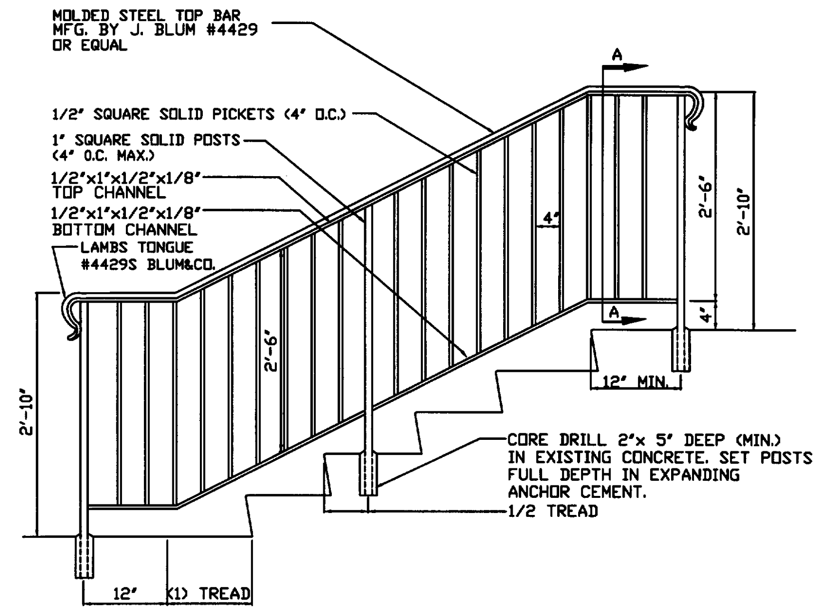
PLAN VIEW



NOTE: ALL WOOD TO BE PRESSURE TREATED UNLESS OTHERWISE SPECIFIED

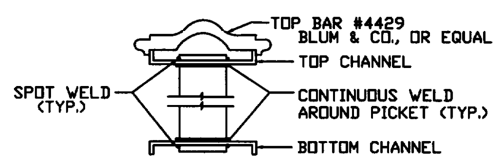
BOARD-ON-BOARD FENCE

NTS



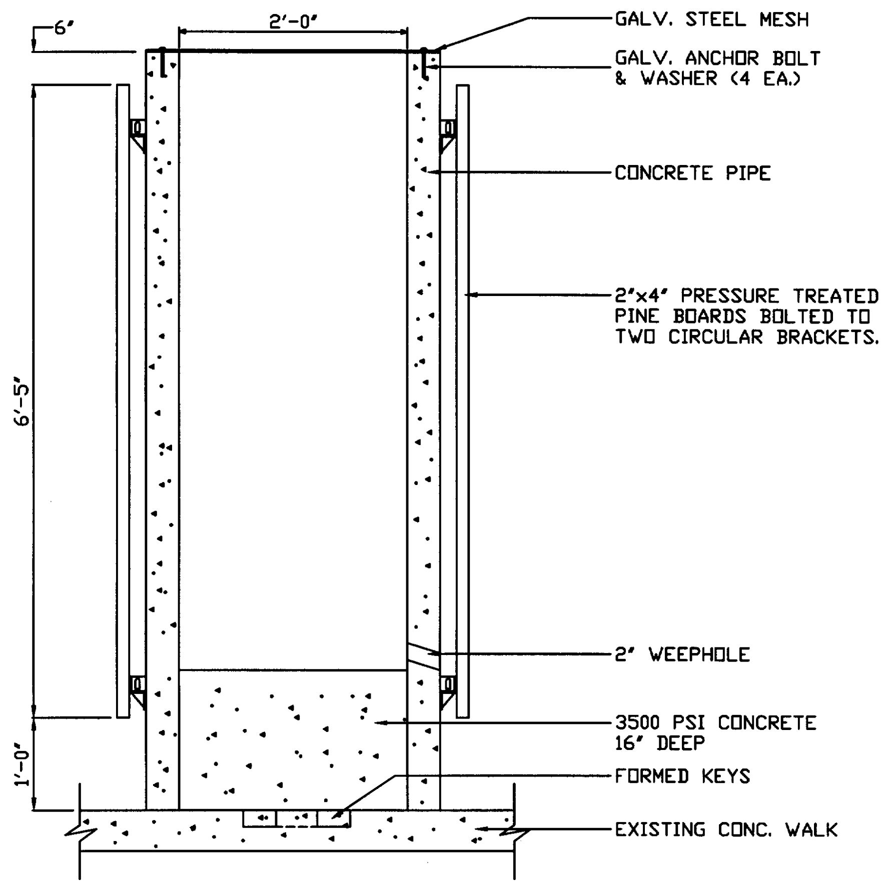
NOTE:

1. PROVIDE HORIZINTALRAILINGS AT LANDING
2. SLOPE ANCHOR CEMENT AWAY FROM POST AND CONTAIN CLEANLY WITHIN 2" HOLE
3. ALLOW 1" CLEARANCE BETWEEN LAMBS TONGUE AND END POST
4. ALTERNATIVE RALIINGS WILL BE CONSIDERED.

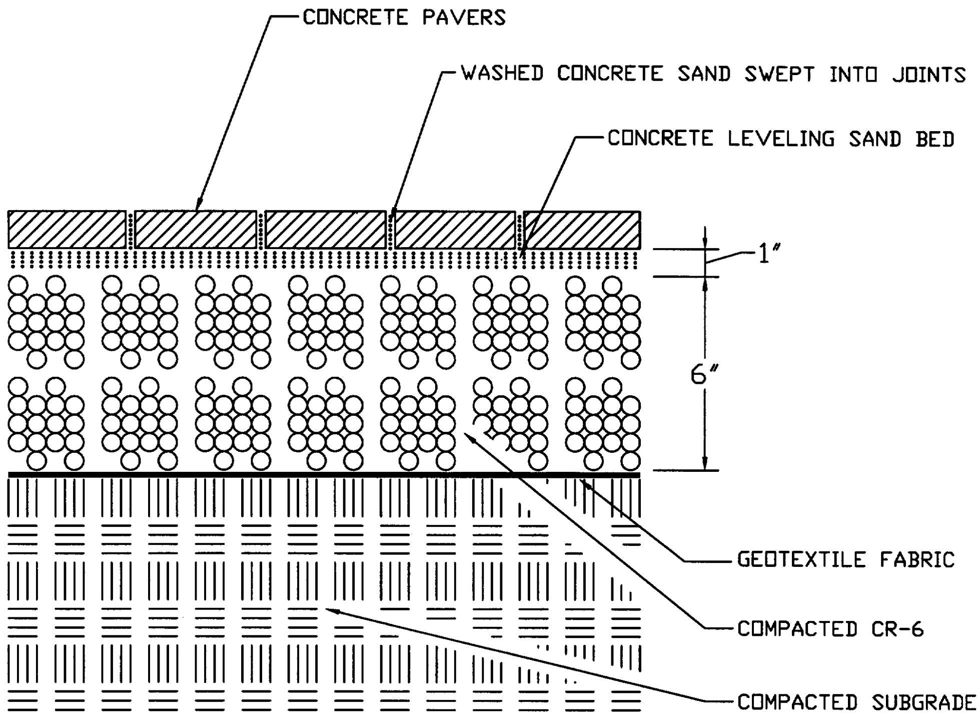


SECTION A-A
NTS

HANDRAIL
NTS


6"
2'-0"
GALV. STEEL MESH
GALV. ANCHOR BOLT & WASHER (4 EA.)
CONCRETE PIPE
2"x4" PRESSURE TREATED PINE BOARDS BOLTED TO TWO CIRCULAR BRACKETS.
6'-5"
2" WEEPHOLE
3500 PSI CONCRETE 16" DEEP
1'-0"
FORMED KEYS
EXISTING CONC. WALK

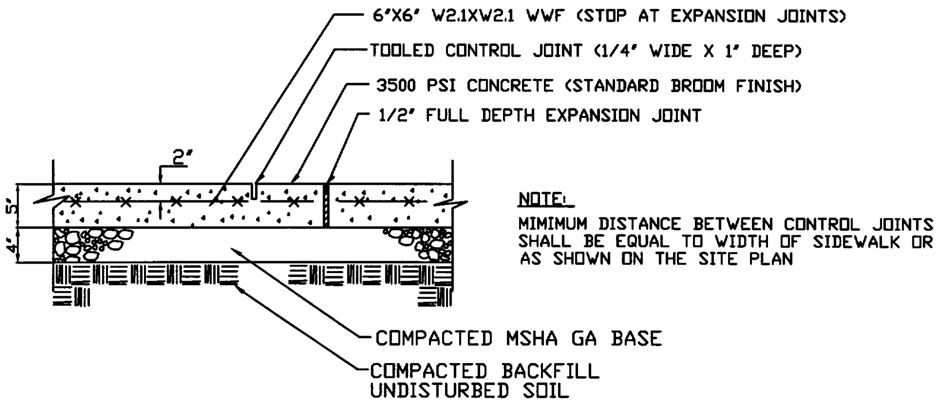
KIOSK
NTS



INTERLOCKING CONCRETE PAVERS

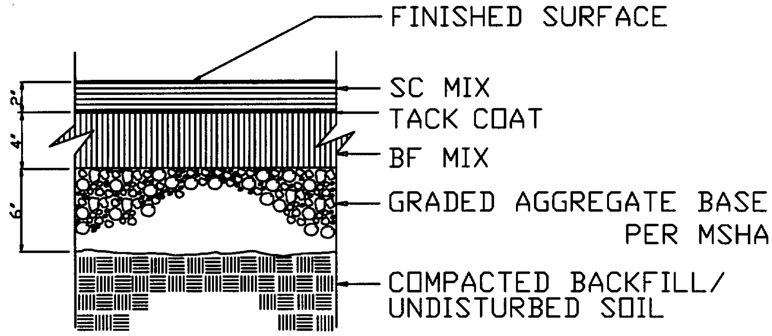
NTS

NOTE: CONCRETE PAVER TO BE COMPACTED WITH VIBRATORY TAMPER



CONCRETE WALK

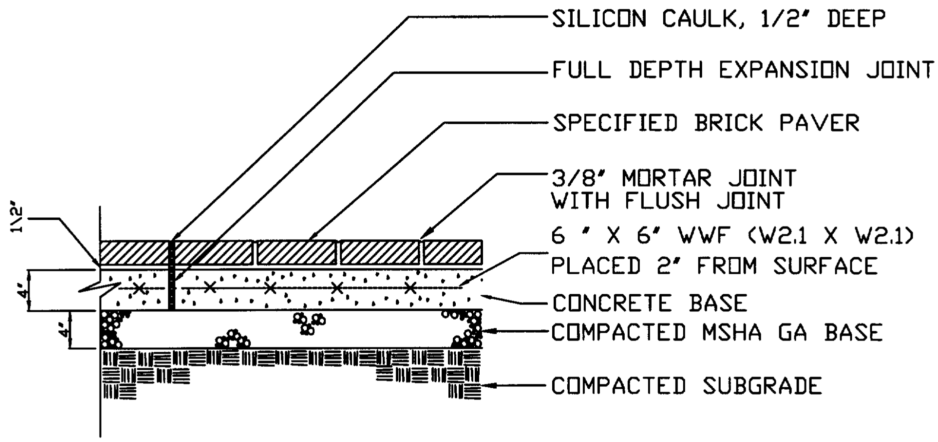
NTS



BITUMINOUS ASPHALT PAVING

NTS

NOTE: PROVIDE THIS SECTION ONLY IF ENGINEERED DESIGN IS NOT FEASIBLE, AND ONLY WITH APPROVAL FROM FACILITIES MANAGEMENT

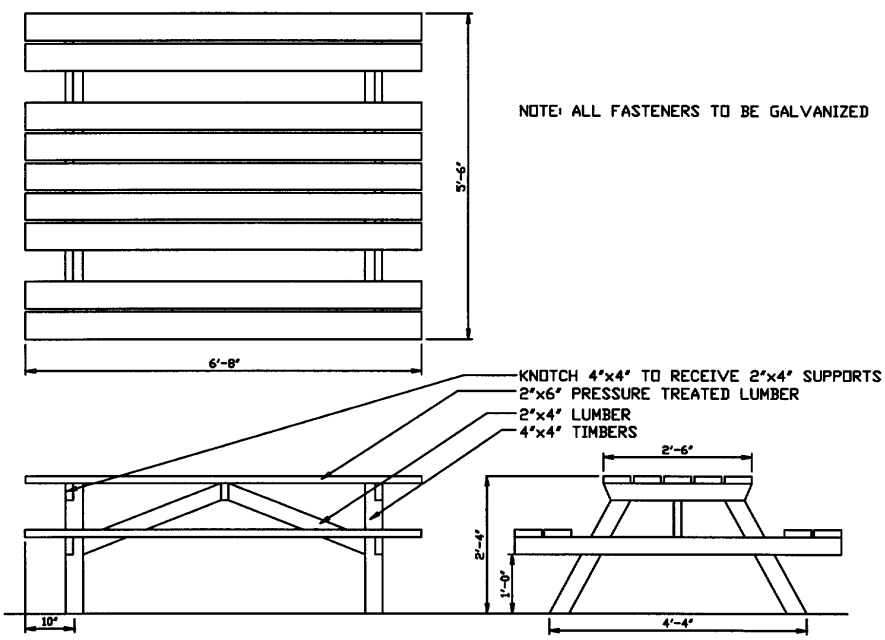


SECTION

BRICK ON CONCRETE

NTS

NOTE: FOR USE IN NON-VEHICULAR AREAS. SEE CONCRETE PAVER DETAIL FOR TYPICAL VEHICULAR PAVER APPLICATION

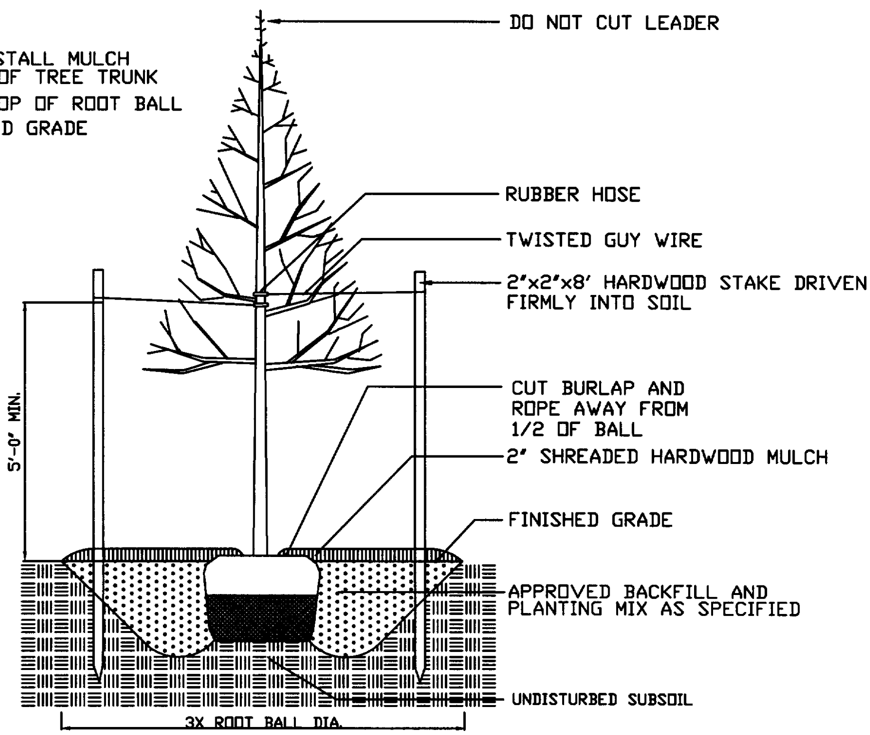


PICNIC TABLE

NTS

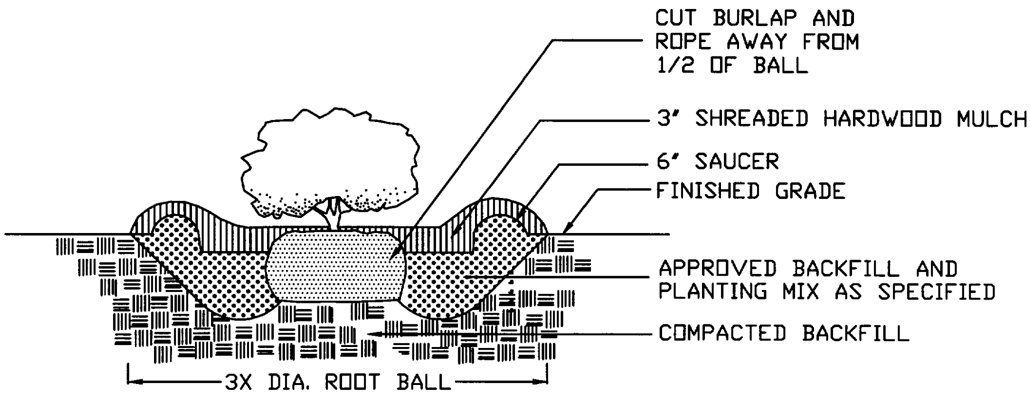
NOTE:

1. DO NOT INSTALL MULCH WITHIN 6" OF TREE TRUNK
2. INSTALL TOP OF ROOT BALL AT FINISHED GRADE

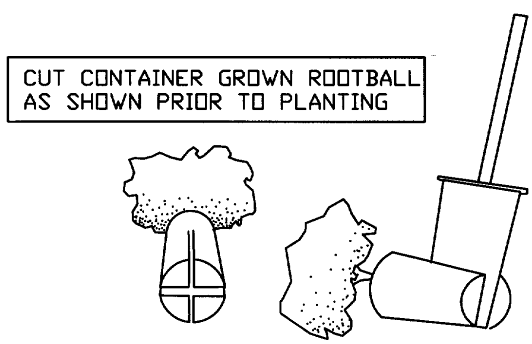


TREE PLANTING DETAIL

NTS

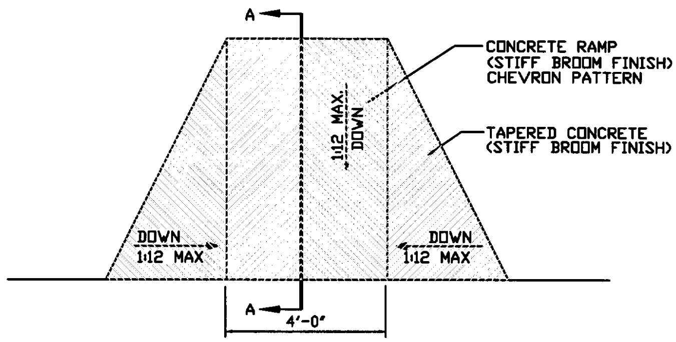


NOTE:
PLANT TOP OF ROOT BALL 2" ABOVE GRADE



SHRUB PLANTING DETAIL

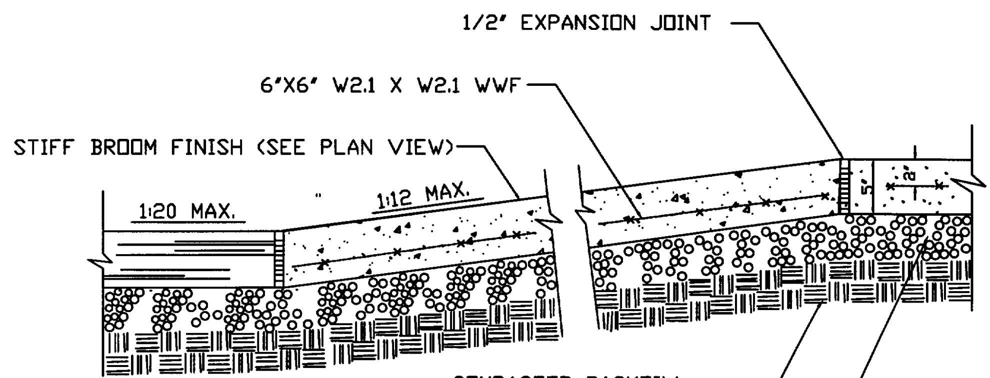
NTS



NOTE
1. SEE SECTION A-A
2. REFER TO ADA STANDARDS FOR SPECIFIC ADJUNCT SITE REQUIREMENTS

PLAN VIEW

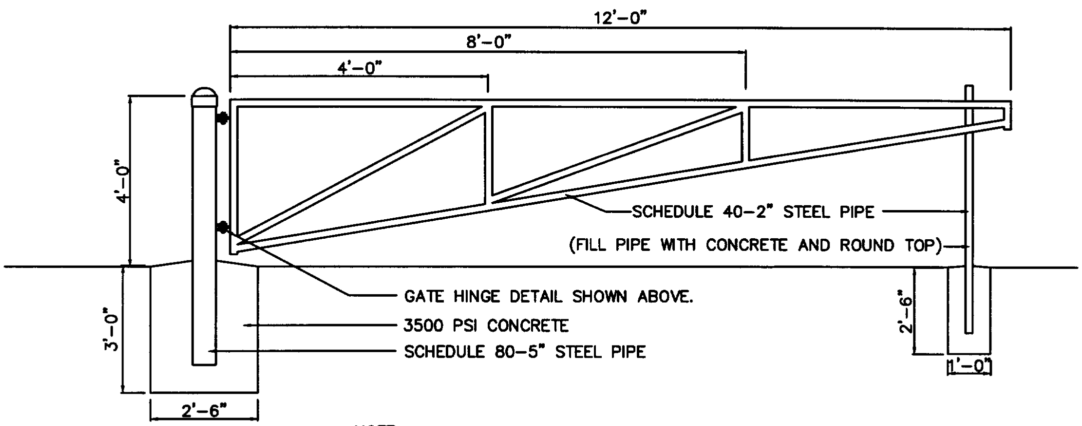
CURB RAMP
NTS



NOTE
3500 PSI CONCRETE (STIFF BROOM FINISH)

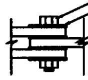
SECTION 'A-A'
NTS

PWD RAMP
NTS



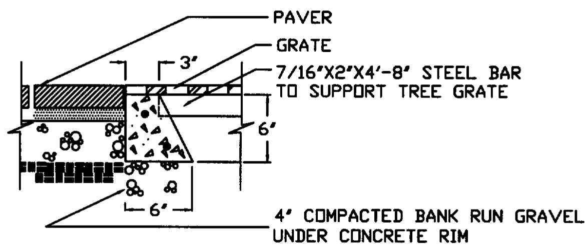
NOTE

1. WELDED JOINTS TO BE CONTINUOUS WELD.
2. APPLY ONE COAT PRIMER AND TWO COATS ENAMEL PAINT, COLOR PER OWNER
3. ATTATCH SIGN TO GATE USING GALVANIZED BOLTS.

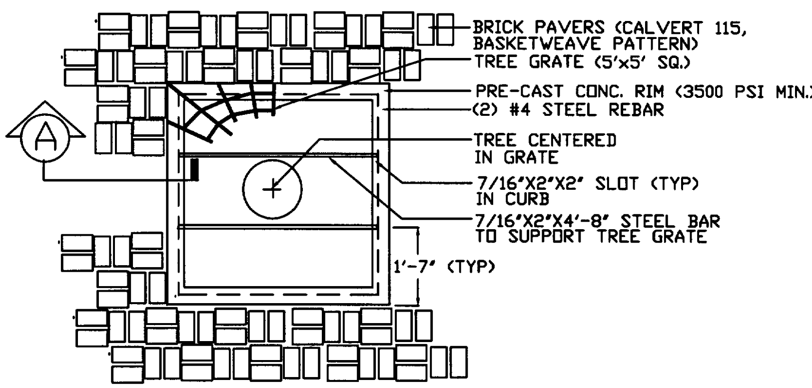


HINGE DETAIL
NTS

SECURITY GATE
NTS



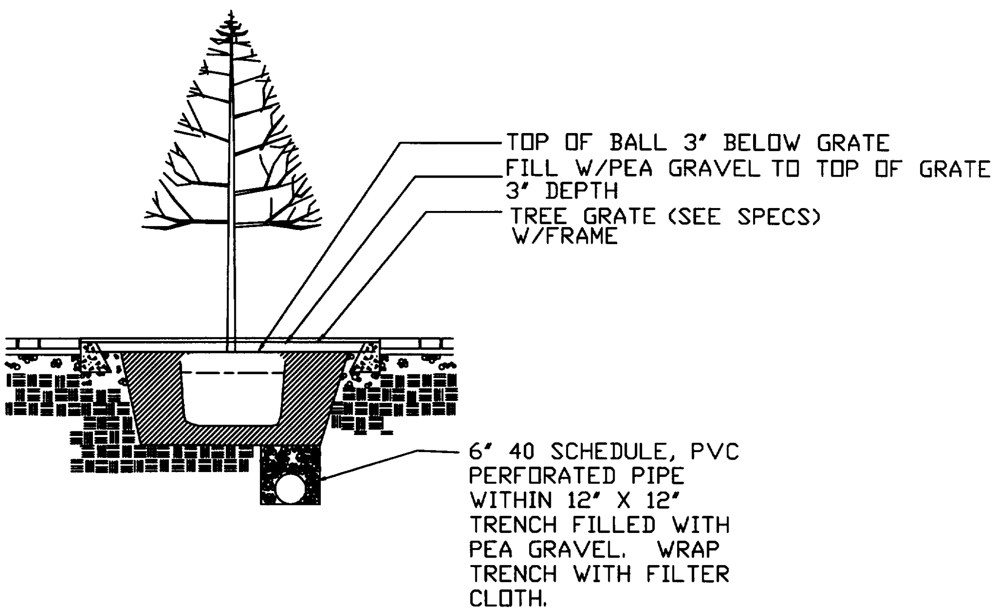
SECTION 'A-A'



PLAN VIEW

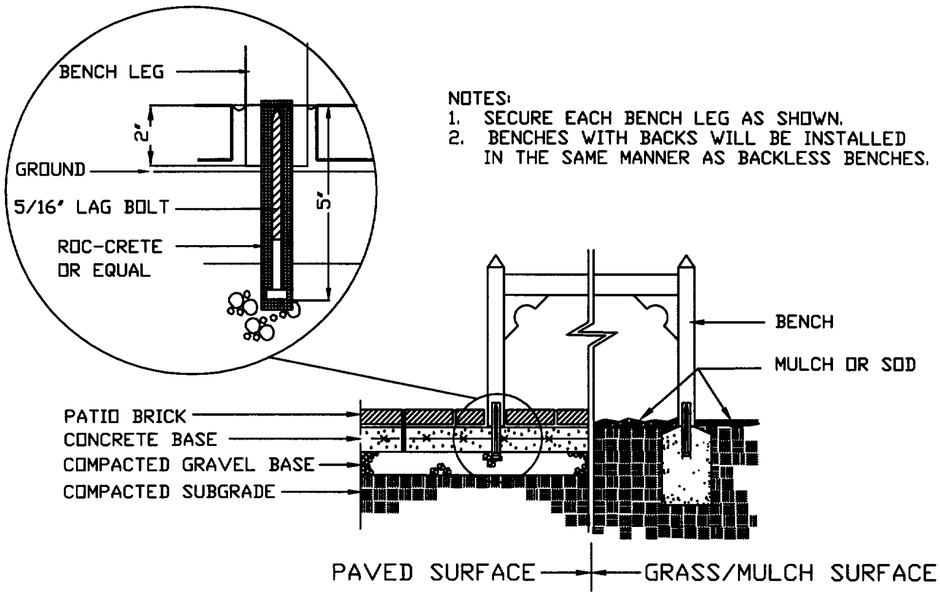
TREE GRATE

NTS



TREE GRATE

NTS



NOTES:
1. SECURE EACH BENCH LEG AS SHOWN.
2. BENCHES WITH BACKS WILL BE INSTALLED IN THE SAME MANNER AS BACKLESS BENCHES.

BENCH ANCHORAGE

A. The top 18" of soil at the project site shall be tested to determine it's suitability as a component of the planting media. If it is determined to be suitable, the contractor shall be required to remove and stockpile the top 18" of soil in areas that are to be regraded or otherwise disturbed. This includes staging areas and areas where equipment or materials is stockpiled.

B. If the top 18" is found not to be suitable, it must be amended to meet minimum specifications listed in item #2 prior to placement on site. In addition, soil prepared for backfilling shall be protected from compaction and contamination.

1. Landscape installation shall be accomplished by companies that are skilled in landscape installation and planting must be accomplished during the appropriate season. The successful bidder shall have on staff a "Certified Professional Horticulturalist" or Registered Landscape Architect and show proof of having satisfactory completion of similar size landscaping projects in both dollar value and size of plant material to be installed.

2. Stripped soil used for the planting media shall be tested by the contractor and amended if necessary to meet specifications prior to placement on the site. Soil shall be a sandy loam or silt loam in texture with a minimum of 3% organic matter, stones and debris no larger than 2", pH of 5.0 - 7.0, and soluble salts not greater than 500ppm. Suitable soil shall then be mixed with compost not to exceed 1/3 by volume and blended so the mixture is uniform.

3. Placement of the backfill planting media shall be done so there is no equipment driven over the top soil. This will require that utilities be installed at specified depth and landscape plants be placed onto the sub-grade before installation of soil backfill. After utilities and plants have been installed, place soil and compact as specified starting from one end of the site and working away from finished areas.

2.15 STEAM ACCESS OPENINGS (MANHOLES)

A. Minimum size: 10' x 10' x 8'
B. Minimum size lids: 24" (larger as required) - 2 required
C. Minimum number of vents: 2
D. Sump with steam driven pump (where applicable) connected to storm drain (to keep manhole dry).
E. Insulation: Foam Glass Insulation with Pitt Wrapping (interior of manhole only).
F. Construction Material: Precast Concrete

2.16 EROSION & SEDIMENT CONTROL AND STORMWATER MANAGEMENT(11-21-11)

A. Design Documents shall be submitted for ***Erosion & Sediment*** control and Stormwater Management approval to the Maryland Department of the Environment (MDE), Water Management Administration, ***1800 Washington Blvd.,*** Baltimore, Maryland ***21230*** in conformance with the requirements of the ***latest edition of the*** following two publications:

- ***2010 Maryland Standards and Specifications for Soil Erosion and Sediment Control***
- ***Maryland Stormwater Management Guidelines for State and Federal Projects***

A. Tree protection requirements are to be included in the construction contract. Prior to beginning any construction activity, the following steps are required to protect trees from damage:

1. Identify trees which will remain on the site. This includes not only those trees within the limit of work but also those which may have critical root zones within the area. This includes:

   - Chemical and fuel storage
   - Chemical waste of any kind
   - Concrete washout areas
   - Construction office placement and subcontractors offices
   - Construction parking
   - Construction vehicle corridors
   - Crane placement and crane corridors for moving material (if applicable)
   - Limb clearance of buildings and other features approved by University
   - Material storage
   - Other sub-contractors working areas must be approved by University
   - Painting procedures and clean-up
   - Soil stockpiling
   - Steel make-up areas
   - Trash stockpiling and hauling sites

   The roots of a healthy tree growing in uncompacted soil has a root system as much as five times the spread of the canopy. This is the area which must be initially considered.

2. Provide written report by a certified arborist identifying root evaluations of the trees which are in potential conflict with construction to determine the critical root zones.

3. Provide written report by a certified arborist indicating the best methods of construction which will minimize the impact on the critical root zone. Obtain specifications from the arborist for tree protection as required for the specific project in question with penalties to the contractor if the protected areas are violated.

4. Specifications will include the requirement that

inspectors and contractors be trained as to the reasons why intrusion into the critical root zone will be detrimental to the trees' survival. Training should occur prior to the start of construction.

B. Do not store materials, soil, equipment, etc. within the Critical Root Zone (CRZ) of trees which are to remain.

C. Provide, install and maintain a four (4) foot high temporary fence around the CRZ.

D. No construction activity, storage, parking, access or egress to the site shall occur within the critical root zone of established trees to remain on the site. **The critical root zone is defined as a ratio of 3 feet in diameter from the center of the trunk, for each inch of trunk DBH (diameter at breast height).**

E. Tree protection fences within the critical root zone must be completed prior to any construction. The fences must be maintained through the entire construction period.

F. Trees which cannot be fully protected shall have a certified aborist provide recommendations, before final design decisions are made.

2.18 TRASH DUMPSTER & COMPACTOR PADS (12-2-02)

A. Trash dumpsters/dumpster pads shall be located adjacent to, or as part of, loading dock area or receiving areas. In the event the facility does not have a loading dock/receiving area, the dumpster pads are to be located in a manner that does not distract from the aesthetic attributes of the facility and its surrounding site, but is located relatively adjacent to the facility and in accord with the following requirements for placement and configuration.

B. Trash dumpster pads shall have a concrete base and apron designed to support an impact load of 25 tons. The pad shall have concrete filled steel bollards for protection and centering at rear and sides as necessary. UMCP uses standard front-end loader dumpsters which are 6'-10" (82") in width. The inside distance between side bollards shall be a minimum of 10'-0" (120"). In order to specify the minimum width, the specifications should include a straight path for the trash truck of at least 45'-0" feet for trash truck access. If the trash truck must pick up the dumpster box at any angle, rather than a direct straight approach, then the inside distance between bollards may require more than 10'-0" (120"). Also reference Section 2.13, Site Standards, Concrete Dumpster Pad, Drawing No. 14 and 15 with adjustments.

C. The dumpster(s) shall be accessible to building housekeepers from the loading dock level to eliminate the need to lift heavy trash bags above head height.

D. Trash Dumpster Siting shall address the following:

1. Do not place in proximity with:

   a. Outside air intakes for mechanical ventilation systems.

   b. Other locations which may create a public nuisance such as
      - operable windows
      - designated smoking areas
      - food service handling areas
      - lunchbreak/picnic areas
      - storm drain inlets

2. Comply with Applicable Standards:

   a. ASHRAE 62-1989/5.5 (Ventilation systems)
   b. ICC/IMC 401.7.1 (Intake openings)
   c. COMAR 26.11.06.08 (Nuisances)
   d. OSHA 29CFR1910.141 (g) (2) & 29CFR1910.141 (H) (Sanitation)

D. Trash Compactor shall have a reinforced concrete base designed to support a rolloff trash truck with a fully loaded trash compactor, total gross weight of 80,000 pounds. Reinforced concrete pad shall be 10’ wide and 25’ long. The trash compactor has dimensions of approximately 22’-11” in length x 8’-0” in width x 8’-8” in height, with an empty weight of 11,300 pounds and a possible full weight of 41,300 pounds. The trash compactor vender will install guide tracks and a stop plate into the concrete pad during installation of the trash compactor.
   General Contractor shall provide the following electrical service within six feet of the concrete pad:
   1. A fused electrical disconnect with 208 volt, 3 phase electrical power.
   2. A 110volt, 20 amp service electrical outlet to power the ozone generator.

A. New and existing demands on utilities in the building area are to be examined. A recommendation as to alignments and new connections are to be submitted at an early design stage of the project. Any impact on the capacity of the existing utilities to the on-site and campus-wide utility network shall be brought to the attention of the University.

B. A complete system design of all new utility extensions from the points of the connection with existing systems to the building site is required. This includes establishing the precise location and size of all underground utilities and/or services in the construction area performing a thorough investigation of all existing utilities, (location and capacities) in order to properly design and locate the new utility services.

C. With the development of building details, the adequacy of all existing utilities based on the anticipated increase in load to serve the new construction must be determined. If deficiencies are present, an upgrade of the insufficient utility systems must be included in the project's scope.

D. New and existing demand shall be coordinated with the Department of **Operations and Maintenance** through DAEC to insure that all issues are considered (adequate capacities at tie-in points and this area of campus, etc.). Calculations showing usage for each utility shall be furnished.

E. The design of water and sanitary utilities are to meet the requirements and approval of the Washington Suburban Sanitary Commission for areas within WSSC jurisdiction.

F. The storm drainage system and components shall be designed in accordance with Maryland State Highway standards. Closed systems shall typically be designed and constructed to adequately convey the ten (10) year storm.

G. Underground Utilities

1. Primary telephone and electrical underground utility lines shall be encased in concrete.

2. Use utility vaults for multiple use utility trenches.

3. Place steam lines under paved surfaces where possible.

4. Use removable concrete pavers over utility lines where posssible.

2.20 WETLANDS AND FLOODPLAIN

The identification of regulated wetlands and areas within the 100 year floodplain areas within the site limits is required in accordance with Maryland Department of the Environment (MDE) or U.S. Army Corps of Engineers (COE) regulations and guidelines. The identification of such areas shall be the first priority of the site design and the existence of these areas shall be brought to the immediate attention of the University.

Any disturbance within a nontidal wetland or its buffer is subject to regulation as is construction within the 100-year floodplain. Approval from the appropriate reviewing agency(s) is necessary for any such disturbance or construction.

3.01 CAST-IN-PLACE-CONCRETE

1. Comply with all applicable provisions of ACI; Refer to CRSI for reinforcing.
2. Vertical drops over 4' are not permitted. Use chute extensions, bottom discharge buckets or tremies.

DIVISION 4 – MASONRY

4.01 UNIT MASONRY (07-10-09)

A. UNIT MASONRY

1. To guarantee uniformity of color and quality, single source suppliers shall be used for cement materials and aggregate. For reference standards refer to provisions of ASCE, ACI & TMS.

2. Brickwork, mortar and jointing for additions shall match the existing building; for new buildings on UMCP campus they shall conform to brickwork on adjacent building(s); Note that UMCP shall approve final selection.

3. No special shapes or colors will be allowed. Brick selected shall be from manufacturers standard line, made from readily available clays and shales and available for an indefinite period.

4. All brick shall be the same color throughout: no "faced" brick will be permitted.

5. Cement masonry units shall be finish grade, fine textured, suitable for painting. Grade and texture shall be uniform throughout the project. Use lightweight aggregate block.

6. Exterior corners of interior partitions, walls, window jambs and door jambs (without wrap-around frames) for C.M.U.'s shall have a 1" radius.

7. Precast lintels shall have the same texture as the block; preferably made by the same manufacturer.

8. Horizontal joint reinforcement shall be "truss" type, galvanized, with deformed wire. Provide prefabrication corners and tees. Exterior wall reinforcement shall be hot-dipped galvanized; interior wall reinforcement may be mill -galvanized.

9. Materials for mortar shall be proportioned by volumetric measure only. Use mixing boxes or similar equipment. "Shovel measure will not be permitted.

10. Mortar may be retempered once only. Mortar must be used within 1½ hours after initial mixing or discarded.

11. Specify conditions and limit's for hot and cold weather masonry work.

12. Provide weather protection for all completed masonry work.

B. BRICK VENEER MASONRY

1. Selected brick should complement or match existing masonry utilized on the campus in style, texture and color. Coordinate brick selection with Capital Projects.

2. Preference is for the use of the originally specified brick when constructing additions that abut an existing brick building.

3. Acceptable manufacturers for selected brick are:

   Category 1:
   a. Redland Brick; Calvert (Cushwa), 103 Georgian
   b. Glen-Gery Brick, Inc.; 250M Modular
   c. Old Virginia Brick; #24 Colonial Full Range Frogged Modular

   Category 2:
   a. Redland Brick; Calvert (Cushwa), 237 Cambridge
   b. Glen-Gery Brick, Inc.; 51DD-X Modular
   c. Old Virginia Brick; Monticello Frogged Modular

4. Identify three (3) manufacturers and product lines in construction specifications for other proposed colors.

5. Brick blend ratios shall be quantified in the specifications. Brick shall be blended at the factory or plant prior to shipping.

DIVISION 5 - METALS

5.01 STEEL

A. STRUCTURAL STEEL

1. Comply with AISC "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings", including commentary and supplements.

2. Comply with AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts."

3. Comply with AWS "Structural Welding Code".

4. All welders shall be qualified per AWS "Standard Qualification Procedure." Provide certification that welders have passed AWS tests within the past 12 months.

5. Testing agency shall inspect erection, bolted and welded connections, and submit reports or inspections and tests to E&A Services. (Certification of independent inspection of shop-welded and bolted connections submitted by fabricator is acceptable.)

B. STEEL JOISTS

1. Comply with SJI "Standard Specifications and Standard Load Tables for Open WEB Steel Joists." Fabricator shall provide SJI certification.

2. Comply with AWS "Structural Welding Code."

3. All welders qualified per 05100, Note 3.

4. All bridging, including end connections to walls, shall be in place prior to installation of floor or roof deck.

5. Testing agency to inspect erection and welded connections bridging, anchorage, etc., and submit reports to A&E Services.

C. METAL DECKING

1. Comply with AISI "Specifications for the Design of Cold-Formed Steel Structural Members."

2. Comply with SDI "Design Manual for Floor Decks and Roof Decks."

3. Comply with AWS "Structural Welding Code."

4. All welders qualified per 05100, Note 3.

5. Welding washers shall be used for all welds.

6. Minimum 20 gauge deck shall be used for spans 4'-6" to 5'-6", regardless of continuity over supports. All deck shall be galvanized.

7. Testing agency to inspect erection and welded - connections and submit reports to E&A Services.

6.01 WOODWORK

A. ROUGH CARPENTRY

1. Lumber Standards: with PS 1. Comply with PS 20; Plywood standards comply

2. Grading for lumber and plywood shall be marked on each piece with type, grade, mill and grading agency (APA, WWPA, SPIB, etc.).

3. Minimum thickness for plywood: Roofing - 5/8", Flooring - 3/4"; Walls -1/2".

4. Pressure-treated Wood: Comply with AWPA Standard C-2 for lumber; C-9 for plywood. Treat with water-borne preservatives per AWPB LP2 for cants, blocking, plates, etc., in connection with roofing and flashing, sills and furring, and other items in contact with masonry or concrete. Kiln-dry after treatment.

5. Fire-retardant Wood Where Required: Comply with AWPA standards with a flame spread rating of 25 or less. Provide UL label for each piece of lumber or plywood.

B. WOOD TRUSSES

1. "Monoplanar" Trusses: Comply with TPI "Design Specification for Metal Plate Connected Wood Trusses" and N.F.P.A. "National Design Specification for Wood Construction."

2. Design must be approved and certified by a structural engineer licensed to practice in Maryland.

3. Lumber Standards: Comply with PS 20. All lumber S4S.

4. Truss connector plates shall be manufactured by a member of TPI, complying with TPI quality standards. All plates shall be hotdipped galvanized, designation G60.

5. Provide a stress diagram showing design loads or a print-out of computer design.

C. ARCHITECTURAL WOOD WORK

1. All custom-made wood and plastic laminate faced casework, counter tops and related mill work items shall comply with AWI "Architectural Wood Work Quality Standards."

2. The level of construction (custom, premium, etc.), materials and finishes shall be spelled out for each individual type of item, properly referenced to AWI specifications.

3. Completely detailed shop drawings shall be required, along with samples of all finish materials.

   Note, that these items are separate and distinct from "Manufactured Case Work."

7.01 FIRESTOPPING (12-2-02)

PART A - GENERAL

1.1 One Sub-contractor shall be responsible for the furnishing and installation of **all** building firestopping. This includes, but is not limited to, the following:

A. Through-penetration firestopping in fire-rated construction.

B. Construction-gap firestopping at connections of the same or different materials in fire rated construction.

C. Construction-gap firestopping occurring within fire rated wall, floor or floor-ceiling assemblies.

D. Construction-gap firestopping occurring at the top of fire rated walls.

E. Through-penetration smoke-stopping in smoke partitions.

F. Construction-gap smoke-stopping in smoke partitions.

1.2 The latest editions to the following publications shall apply as a minimum but not be all inclusive to the design and installation of firestopping.

A. Underwriters Laboratories (UL)

1. UL Fire Resistance Directory (ULFRD)

2. Surface Burning Characteristics of Building Materials (UL 723)

3. Fire Tests of Through-Penetration Firestops (UL 1479).

B. American Society For Testing And Materials Standards: ASTM E-814: Standard Test Method For Fire Tests of Through-Penetration Firestops.

C. Factory Mutual Engineering and Research Corporation (FM), Approval Guide.

D. National Fire Protection Association (NFPA).

1. NFPA 101 -- Life Safety Code

2. NFPA 70 -- National Electric Code

3. NFPA 1 National Fire Prevention Code

E. Maryland State Fire Prevention Code (COMAR 12.03.01 and 12.03.02)

F. Building Officials and Code Administrators International, INC.(IBC).

1. International Building Code (IBC)

Part B - PRODUCTS

2.1 THROUGH-PENETRATION FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Systems or devices listed in the U.L. Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetrant type, annular space requirements, and fire rating involved in each separate instance, and that the system be symmetrical for wall applications. Systems or devices must be asbestos-free.

B. Only systems listed in the U.L. Fire Resistance directory for the U.L. System involved are acceptable.

C. All firestopping products must be from a single manufacturer.

2.2 CONSTRUCTION-GAP FIRESTOPPING OF FIRE-RATED CONSTRUCTION

A. Firestopping at construction gaps between edges of floor slabs and exterior wall construction.

B. Firestopping at construction gaps between tops of partitions and underside of structural systems.

C. Firestopping at construction gaps between tops of partitions and underside of ceiling or ceiling assembly.

D. Firestopping of control joints in fire-rated masonry partitions.

E. Firestopping expansion joints.

F. Acceptable manufacturers and products - those listed in the U.L. Fire Resistance Directory for the U.L. System involved.

2.3 SMOKE-STOPPING AT SMOKE PARTITIONS

A. Through-penetration smoke-stopping: Any system complying with the requirements for through-penetration firestopping in fire-rated construction provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

B. Construction-gap smoke-stopping: Any system complying with the requirements for construction-gap firestopping in fire-rated construction, is acceptable, provided that the system includes the specified smoke seal or will provide a smoke seal. The length of time of the fire resistance may be disregarded.

Part C - INSTALLATION

A. Install penetration seal materials in accordance with printed instructions of the U.L. Fire Resistance Directory and in accordance with manufacturer's instruction.

B. Place firestopping in annular space around fire dampers before installation of damper's anchoring flanges which are installed in accordance with fire damper manufacturers recommendations.

C. Insulated Pipes and Ducts: Cut and remove thermal insulation where pipes or ducts pass through firestopping material. Replace thermal insulation with a material of equal thermal insulating characteristics and equal firestopping characteristics.

7.02 JOINT SEALANTS

All joint sealant materials shall be of the highest quality and shall meet the qualifications for the intended use.

Tailoring of this guide specification is required to fit the type of roof designated to meet the specific design conditions. Additional data and specific guidance for a project shall be obtained from the various manufacturers specified. One copy of the contractor's submittal will be forwarded to FM through Department of Architecture, Engineering, and Construction.

A. General

1. Specify copper or stainless steel flashing.

2. Specify sloped metal caps on parapet walls. Coping shall be minimum 20 oz. copper or 32 gage factory finish aluminum, installed with continuous cleats. Each roof shall be covered by a 20 year, no dollar limit, manufacturer's guarantee covering the complete roofing system including flashing. Longer warranties may be appropriate depending upon the type of roof specified and accepted by FM.

3. Roof top equipment shall be raised a minimum of 18" from top of finished roof to bottom of unit for access during roof replacement and maintenance.

4. Provide minimum 30# live load for roofs.

5. Metal Coping

   a. Specify a slope of one (1) inch slope per foot (to the roof side) on the top of coping.

   b. If parapet wall is to be covered by a metal coping, specify a continuous treated wood blocking, covered by a layer of building paper and metal coping to be cleated on both sides.

6. Gravel Stop and Counter-Cap Flashing

   a. Specify copper or lead coated copper, all seams and miters to be soldered.

   b. Face of metal flashing to be cleated 30 inches on center.

7. Roof Drains, Through-Wall Scuppers and Overflow

Drainage Systems

a. Specify all roof drains and through - wall scuppers (not overflow scuppers) to be sloped 2 ft. on center using taper insulation or taper edge strip for positive drainage. However, through-wall scuppers are not encouraged.

b. Install a copper gravel stop 1 inch x 4 inches and 36 inches square minimum, set in flashing cement around roof drains on built-up aggregate roofing systems. Apply a reflective aluminum coating from gravel stop to drain clamping ring.

c. All through wall scuppers shall empty into a conductor head and downspout.

d. All overflow scuppers shall be set high enough above the finished roof to ensured that water doesn't drain through the overflow with a normal rainfall.

B. Built-up Roofing Specifications

1. Substrate

a. Provide a minimum roof slope of 1/4" to 1/2" per foot using light weight fill or taper insulation toward drainage system (gutters, roof drains, or through wall scuppers).

b. Slope built-up roof 6' square with taper insulation toward roof drain and install gravel stop 3' square minimum.

c. Specify conventional standard 4 ply fiberglass felt built-up roof system with an aggregate finished surface using #7 stone conforming to ASTM # A - 4/7, minimum.

d. Provide walk out access to all roof levels for maintenance personnel by use of penthouse stairs or scuttle trap doors and stairway.

Access ladders from one level to another are required.

2. Insulation

   a. The thickness shall be such that the insulation's only value is equivalent to a minimum of a R-30 value. This value is for the insulation only, not the complete roofing system value.

   b. All insulation shall be installed conforming to U.L./F.M class 120 wind uplift guide.

3. Base Flashing

   a. All base flashing, shall be a minimum of 8 inches high from the finished roof surface.

   b. Mechanically fasten top of base flashing, and seal the top of all base flashing with approved roofing cement and fabric before applying metal counter flashing or metal cap flashing.

4. Finished Surface

   a. Clean gravel or slag (embed in bitumen flood coat) meeting ASTM D 1863, which applies to aggregates specified for use in bituminous roofing.

   b. White mineral surfaced cap sheet over ply sheets of the built-up roofing system.

5. Guarantee

   a. The contractor shall provide the University with a written standard roofer's guarantee, applicable to any leaks or failures due to defective materials or workmanship, occurring in the roof system or flashing within two years from date of completion of the roof work. This does not include any limiting penal sum.

b. The material's manufacturer shall provide the University with a 20 year unlimited labor and material guarantee similar to that offered by Schuller in its "Signature Series, No Dollar Limit, (NDL) Watertite Roofing System".

6. Access

a. Provide access to all roof levels by means of penthouse doors, access ladders, or roof hatch. Provide inorganic walking pads from roof access to all roof mounted equipment.

C. Slate Roofing System

1. Slate shall be 1/4 inch thick Buckingham, Vermont, Evergreen or equal and shall conform to physical requirements of grade S_1 classifications.

2. Winter/Guard or equal shall be installed on hips, ridges, rakes, roof penetrations, eaves, and low pitched roof slopes (between 2/12 and 4/12).

3. Install snow guards on all "A" frame substrate roofing systems to protect entrances and gutters.

4. Guarantee

A written guarantee shall be furnished that states the materials used are in strict accordance with the specifications, and that any and all repairs required on the roof due to defective materials or workmanship furnished under the contract shall be made without cost to the owner for a period of five years.

D. Shingle Roofing System

1. Shingle shall be 25 year class A fiber glass composition.

2. Winter/Guard or equal shall be installed on hips, ridges, rakes, roof penetrations, eaves, and low pitched roof slopes (2/12 and 4/12).

3. Install snow guards on all "A" frame substrate roofing systems to protect entrances and gutters.

4. The contractor shall provide the University with a written standard roofer's guarantee, applicable to any leaks or failures due to defective materials or workmanship, occurring in the roof system or flashing within two years from date of completion of the roof work. This does not include any limiting penal sum.

5. The material's manufacturer shall provide the University with a 25 year unlimited labor and material guarantee for a Watertite Roofing System.

DIVISION 8 – DOORS AND WINDOWS

8.01 DOORS AND FRAMES (12-2-02)

A. Doors

1. Exterior and interior single doors shall be 1-3/4 inch thick, 3 feet wide, and 7 feet high, minimum.

2. Where required for maintenance purposes, the width may be enlarged to 4'-0" wide; however the 7'-0" height shall not be modified.

3. Specify pre-finished, pre-machined, solid wood (staved) core doors, Structural Composite Lumber (SCL) doors or Laminated Strand Lumber (LSL) core doors with finish as required.

4. Particle board core doors are not acceptable.

5. If gypsum core doors are required for fire rating, wood edges shall be increased to provide solid backing for hardware such as hinges, locksets, and door closers or through-bolts shall be used for fastening.

6. All glazing in fire doors shall be a labeled fire rated glass installed in accordance with NFPA 80. Fire doors shall have 3 inch x 33 inch wire glass for a 1-1/2 hours "B" labeled doors. Wire glass shall be square in shape, not diamond.

7. Cross-corridor doors shall be Graintech 18 ga., fire-label where required used in conjunction with Von Duprin Impact exit device.

B. Frames

1. Door frames should be standard metal frames where ever possible; however, to allow for architectural considerations frames can be modified with the prior approval of Department of Architecture, Engineering, and Construction.

2. Hollow metal frames shall have welded corners; 16 gage interior and 14 gage exterior. Include 3 silencers for single doors and 2 silencers for double doors.

3. Storefront assemblies are not desirable. If the highest quality store front assemblies are acceptable by O&M, then a 10” high (minimum) base

and 5” wide stile and 6” top rail are required.

4. All wood and metal doors shall have minimum 5" stiles.

8.02 GLASS AND GLAZING

A. Insulated glass shall be specified to reduce heat gain and heat loss.

This section applies to the Lock Function for the following rooms:

- Offices, Conference Rooms, and Libraries (office function lock, ML2067 or L9453).
- Mechanical Rooms, Custodial Rooms, Storage Rooms, and Computer Rooms (store room function lock, ML2057 or L9080).
- Classrooms and Laboratories (classroom function lock, ML2055 or L9070).
- Where electric strikes are to be used, they must be ML2057 or L9080.

A. Mortise Locksets

1. Only the following manufacturer***s*** will be used for Mortise Locksets.

    a. Corbin/Russwin ML2000 Series (NSM Trim)
    b. Schlage L9000 Series x 06N Trim

2. Lockset Specifications

    a. 2-3/4" backset
    b. 2 piece anti-friction latch bolt with a 3/4" throw
    c. 1" Throw Deadbolt
    d. Deadlock Latch
    e. Escutcheon Trim
    f. Lever Hand
    g. Face plate 1-1/4" x 8"
    h. Strike ASA 4-7/8" x 1-1/4" x 1-1/8" lip

B. Door Closers

Only the following manufacturers will be used for door closers

1. LCN 4040 Series Reg. Arm-Fire Doors
2. LCN 4040 Series Cush -n- Stop Arm-Exterior Doors
3. LCN 1460 Series or 1461 for Handicapped areas-Bathroom, Classroom, and Public area doors.

C. Handicapped Automatic Door Control Closers

1. Only the following manufacturers will be used for door closers.

a. Keane Monroe 2100 Series
b. Keane Monroe #59H Press wall switch
During secure hours, fire egress is maintained manually and automatically but ingress is restricted to authorized card holders only.
c. Must interface with security system.

2. All door closers are to be thru-bolted in doors.

D. Cylinders

1. Only the following manufacturers will be used for cylinders.

a. Best Mortise Cylinder #1E74 (for Mortise Lockset and inside cylinder dogging on Von Duprin panic bars).

b. Best Rim Cylinder #1E72 for panic bars.

c. Schlage Mortise Cylinder (SFIC)
#80-108 (Schlage mortise locksets)
#80-104 (Von Duprin cylinder dogging/mullions)

d. Schlage Rim Cylinder #80-129 (for use on panic devices.

2. All Best and Schlage cylinders and Locksets are to be 7 pin interchangeable cores.

3. All Best and Schlage cylinders to be supplied with brass construction cores.

E. Hardware

Manufacturers shall be as specified for the following pieces of hardware. No substitutes will be accepted.

1. Exit and Panic Devices: Von Duprin Series

a. 99
b. CD99
c. SD-EL99
d. 99-F
e. 9547-F x LBR cross-corridor doors
f. KR4954 keyed mullion
g. KR9954 fire-rated keyed mullion

h. EPT-10 (required w/SD-EL99's)
i. PS-873x2 power supply

2. Device Trims: Von Duprin Series

a. 990EO
b. 990NL
c. 992L
d. 992L-Rigid

3. No surface type vertical rod device.

4. All devices are to be thru-bolt in door.

F. The following manufacturers are acceptable for ALL finish hardware; no substitutes shall be accepted.

1.	Cylinders:	Best or Schlage
2.	Closers:	LCN
3.	Mortise Locksets	Corbin/Russwin or Schlage
4.	Exit Devices:	Von Duprin
5.	Cylindrical Locksets:	Best or Schlage - 7 pin

G. The A/E is responsible for specifying finish hardware in accordance with the above UMCP hardware standards and ADA requirements.

H. All finish hardware shall be keyed to the existing UMCP keying system.

J. Install 8" high (minimum) kick plates on both sides of exterior doors.

A. Aluminum clad wood windows have been designated as the UMCP window standard. Exterior surfaces shall have a 70% Kynar factory finish. Windows that are operable are preferred. Provide insect screens for operable windows and thermal-break frames for all windows.

B. Windows and skylights shall be designed with maintenance and security in mind.

C. Aluminum windows are acceptable as required by the specific design and with prior approval of FM. However, they must be capable of accepting insulated glass up to 1" in thickness with integral muntins and thermal-break frames when approved .

D. Include provisions in accordance with OSHA requirements for cleaning windows.

DIVISION 9 – WALL DESIGN AND FINISHES

9.01 WALL DESIGN AND FINISHES

A. Sound abatement is an important consideration in the design of a project. The wall design of the facility must ensure that all offices, classrooms, and labs will be insulated from unreasonable outside sources of noise. Mechanical and electrical rooms, and other major noise and vibration sources, (including noise generated by vehicular traffic) should be separated from spaces that would be sensitive to such intrusion. Whenever possible, walls should extend to the slab above, other interstitial spaces should be closed, and penetration of utilities should be sealed to provide the desired acoustic isolation. The HVAC system should use ducted returns. Relative to sound attenuation, plenum returns are undesirable. Mechanical and electrical rooms are to be constructed of masonry walls with slab-to-slab construction.

In addition, anticipated noise levels that will be generated by equipment and occupants of the building shall be determined and sound transmission coefficients (STC's) of walls, floors, and other elements of enclosure needed to maintain acceptable noise levels shall be specified. The noise levels within a space should not exceed 40 dB for executive offices and conference rooms, 45 dB for general offices, 40 dB for classrooms, and 55 dB for laboratories. The minimum Sound Transmission Coefficient (STC) levels must be 45 STC between offices, 35 STC between a laboratory and adjacent spaces, and 45 STC between instructional space and all other spaces (measurements with doors closed).

B. It is preferable for partitions to be full height, floor to underside of pad or roof above, in areas requiring security, sound isolation and in compliance with code. Fire-rated walls shall be specified in accordance with code requirements.

C. Durable wall finishes shall be specified to minimize maintenance. Painted drywall is the preferred finish for maintenance reasons. Wall covering is strongly discouraged.

D. Walls specified to receive wallcovering shall be sealed prior to application of wallcovering. Adhesive used shall be as recommended by manufacturer of wallcovering. Extra materials (minimum of 5%) shall be labeled and submitted to customer. Cleaning and maintenance instructions shall also be submitted to customer.

E. Masonry walls with bullnose corners are preferred for academic buildings. Glazed CMU block is recommended for corridor walls with coved base and bullnose corners.

F. Include corner guards on exterior corners in heavy traffic areas.

G. Toilet room walls to have ceramic tile wainscot to a minimum height of four feet above finished floor.

9.02 CEILING FINISHES (07-10-09)

A. Acoustical 2' x 2' lay-in ceiling tiles shall be specified for all interior areas with the exception of restrooms, special use or public spaces.

B. Acoustical ceiling tile shall have the following characteristics:

- Materials: Mineral fiber ceiling panel
- Size: 24” x 24” x 5/8”
- Style: Lay-in, non-directional fissured pattern, square edge
- Color: White
- ASTM E 84 compliance: Class A ; flame spread: 25; smoke developed : 10
- Noise Reduction Coefficient (NRC): 50 (minimum)
- Ceiling Attenuation Class (CAC): 30 (minimum)
- Recycled Content: 20% (minimum)

A. Durable as well as appropriate floor finishes throughout a building are a high priority for maintenance and safety reasons.

B. Interior concrete floor areas, which are scheduled to receive paint, shall be painted and sealed with a non-slip epoxy finish. Concrete floors shall be cleaned and etched prior to painting using muriatic acid as required by manufacturer's recommendations.

C. Resilient tile shall be acceptable for classrooms, offices, corridors, administrative areas, departmental/college areas, elevator cab interiors, fast food service areas, custodial storage rooms, and copy rooms for ease of maintenance. Resilient tile floors shall be cleaned, sealed, and polished by the construction contractor in accordance with the manufacturers' specifications. Vinyl composition tile shall be asbestos free. For any installation involving existing VAT, refer to Section 1, Environmental Health and Safety.

D. Flex-tuff or equal, entrance and vestibule mats shall be installed in all public entrances.

E. The use of carpet is strongly discouraged except for aisles of lecture halls and Dean's/Departmental Chairperson's offices/suites. Provide molded nosing for steps and transition strips between carpet and adjacent material when carpet is specified.

The grade of carpet quality shall be determined by space needs. Specify carpet with the following characteristics, as a minimum and unless project requirements dictate otherwise.

1. A minimum face weight of 24 ounces per yard of commercial quality nylon, type 6.6, solution dyed, with soil resistance.

2. 100% synthetic backing with permanent moisture barrier to eliminate absorption (below grade installations).

3. An electrostatic propensity of 1.5 KV or lower, anti-static.

4. Direct glue down installation using adhesive recommended by carpet manufacturer. Where used, underpad to be either hair and jute or synthetic foam.

5. Fiber Colorfast.

6. 10 year warranty on wear and edge ravel (delamination) and color-fastness to light.

7. Conform to applicable code for flame/fuel/smoke rating requirements in accordance with latest ASTM requirement. Carpet shall meet ADA minimum coefficient of friction of .6 for accessible ramps.

8. Concrete shall be sealed prior to carpet installation.

9. Discontinued products or end-of-runs are unacceptable.

10. Extra materials (5% or 50 square yards maximum) are required for each type and color of carpet specified and shall be delivered to the Department of Operations and Maintenance.

11. Each type of carpet shall be from one dye lot only.

F. Vinyl or rubber rolled goods are acceptable for elevator cab interiors. Preformed stair treads are preferred for stairs. A diamond pattern provides a more maintainable surface and is preferred.

G. Terrazzo is acceptable for vestibules/entrances/lobbies, corridors and food service areas. Walk-off mats should be considered for entrance areas.

H. Quarry tile with double abrasive grain, is acceptable for food preparation areas, serving areas behind counters, laundries, and dishwashing areas. Grout should be sealed.

I. Wood flooring is acceptable for dance floors, handball courts, basketball courts, racquetball courts, gymnasiums, and other sports activity areas and also where required for acoustical treatment.

J. Seamless flooring and coved base shall be acceptable for animal care facilities and "clean" rooms.

K. Coved Vinyl or rubber base are acceptable with resilient tile and/or carpet.

DIVISION 10 - SPECIALTIES

10.01 CHALK BOARDS AND TACK BOARDS

A. Chalkboards and tackboards must comply with UMCP Design Standards for Instructional Spaces in Division 12.

B. Provide one (1) bulletin board outside each classroom.

   1. Model: Claridge #958-W 4' x 4', or approved equal

      Claridge #962-W 4' x 8', or approved equal

      Hardwood Frame - 1-3/4"

   2. Color: #2100 - NuTAN or approved equal.

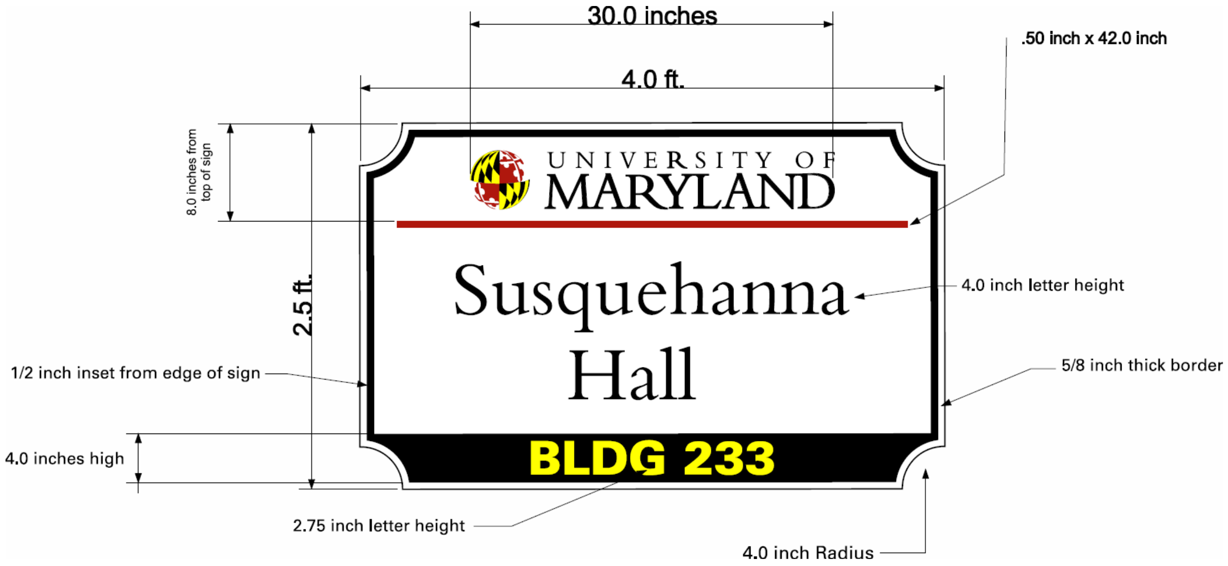
Currently, the UMCP standard sign is to be of the shape, size, and material as specified in the detail drawing. The cast aluminum letters presented are for special building names and are to be used when appropriate and as directed on a project-by-project basis.

1. EXTERIOR SIGN STANDARD

A. Signs are to be installed at main entrance(s) to building at aesthetically appropriate height and to latch side of single door or preferred side of multidoor entry. Location and height to be determined by architect, Project manager, and/or UMCP-facilities management sign shop. Sign(s) are to be used to supplement the architectural prismatic, cast bronze or anodized aluminum raised letters required by university standard at main entrance – on pediment where applicable, over door(s) where not.

B. <u>Exterior Building Sign Specification</u>

1. Sign is to be 48” x 30” or proportional reduction when limited by design.
2. Sign is to be oriented horizontally.
3. Sign is to be fabricated out of ***.080 gauge aluminum white***
4. All corners are be radiuses at 4”
5. Font is to be ***Bembo MT Pro Regular*** or trade equivalent at 6” character height for text. Height may vary pending length of name. Font is to be used at 100% width and auto kerned. Text is to be designation (building, hall, laboratory, etc.) followed by the building number ***font is Univers 55 Bold*** and centered.
6. All applied graphics are to be of black 2 MIL. High performance vinyl film rated at a minimum 7-year survivable exposure. Vinyl films are available from any sign/graphic supplier. An acceptable brand is:
   Avery A9130 – Medium Yellow
   Avery A9345 – Fire Red
   Avery A9090 – Black
7. Provide a ½” thick continuous black border around perimeter of the sign, and cut out of above specified vinyl film.
8. Signs are to be installed using ¼” x 20TPI canal resistant stainless steel machine screws. Screws are to be set in double expansion lead shields at four corners.



2. INSTALLATION SPECIFICATIONS: BUILDING IDENTIFICATION

A. Raised letters at main entrance

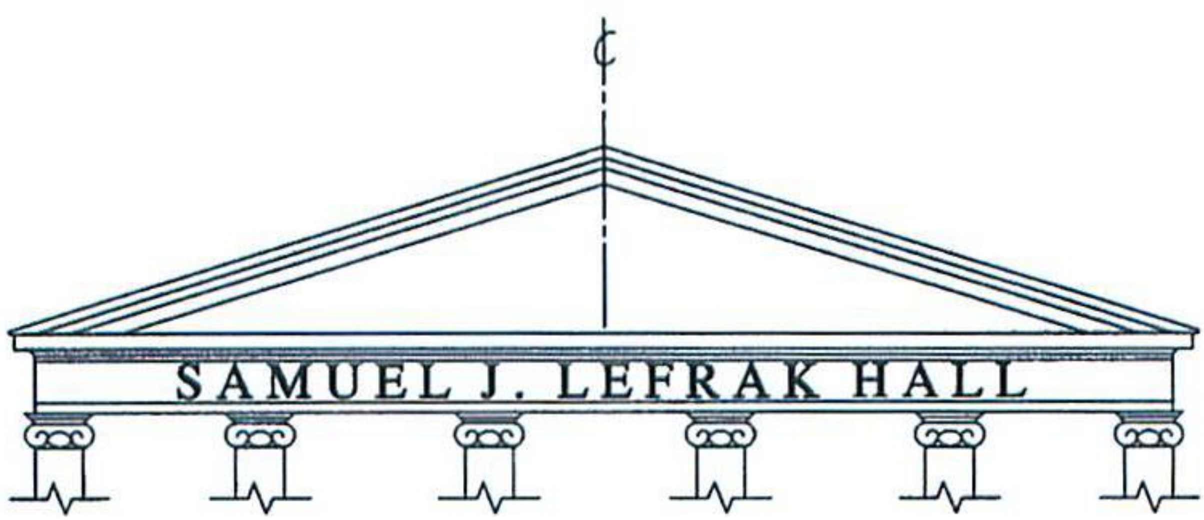
B. Location and mounting techniques to be determined at time of installation

C. Style: Architectural Prismatic

D. Letter size and spacing: As determined by architectural design

E. Construction: cast aluminum with belt satin finish

F. Finish: ***Anodized dark bronze or black satin***



PART I – GENERAL

1.1 All requirements of the State of Maryland and Office of the State Fire Marshal shall apply to the specifications and design requirements, including the following:

A. NFPA National Fire Prevention Code (NFPA 1)

B. Underwriters Laboratories Inc. (UL), Fire Protection Equipment List

C. Maryland Occupational Safety and Health Act

D. National Fire Protection Association (NFPA) 10, Standard for the Installation, Maintenance and Use of Portable Fire Extinguishers (latest edition)

PART II – PRODUCTS

2.1 All dry chemical ("ABC") extingushers shall be: Multi purpose dry chemical stored pressured fire extinguishers, steel cylinder (12 year hydrostatic test interval), all metal valve, handle and syphon tube assembly, readable pressure gauge, red in color, rechargeable, and flexible discharge hose.

1) 10 lb size: U.L. Rating 4A-60B:C, Amerex Model #441 or approved equal shall be installed in all areas unless specifically specified.

2) 5 lb size: U.L. Rating 2A-40B:C, Amerex Model #424 or approved equal shall be installed in all lab areas.

2.2 All dry Chemical ("BC"). Class "BC" purpose potassium bicarbonate (Purple K) stored pressure fire extinguishers, steel cylinder (12 year hydrostatic test interval), all metal valve, handle and syphon tube assembly, readable pressure gauge, red in color, rechargeable, and flexible discharge hose.

1) 10 lb size: U.L. Rating 80B:C, Amerex Model #460 or approved equal shall be installed in all commercial kitchen areas.

2.3 Halon. Halon fire extingushers will not be permitted.

2.4 FIRE EXTINGUISHER CABINETS: All fire extingushers located in areas accessible to the public (ie. corridors, lobbies, public assembly areas and open office areas) shall be placed in a fire extinguisher cabinet.

A. Fire extinguisher cabinets for recessed indoor installations:

1) Cabinets shall be 18 gauge steel, red baked enamel with red trim mounted in a semi-recessed position. Larsens Model #2712 or approved equal.

2) Cabinet doors shall be 18 gauge red steel, mounted on continuous piano hinges. The door shall be provided with a tamper-proof lock, two keys, with break away acrylic panel. When the panel is broken, the cabinet door shall be opened from the inside by tripping the door lever. Larsens Door Style with lock and "Break-A- Way acrylic panel" or approved equal.

3) Cabinet trim shall be 18 gauge red steel or painted red under the painting division. The return trim for the semi-recessed mounting shall not be less than 1¼ inches. Larsens Semi-recessed type suffix "RK, RL, or RM."

4) The minimum interior dimensions shall be 12 inches in width, 27 inches in height, and 8 inches

in depth. Larsens Model #2712 or approved equal.

5) Cabinet key shall be CH751

B. Fire Extinguisher Cabinets for surface mounted locations and exterior areas.

1) Cabinets shall be weather resistant 20 gauge, white or red baked enamel aluminum with break away acrylic panel front with pull handle and aluminum locking bar. Lock shall be tamper proof and supplied with 2 keys. White cabinets shall be lettered in red with the words "FIRE EXTINGUISHER" Larsen's Model #AL 2410 with Break-A-Way acrylic panel or approved equal.

2) Minimum interior dimensions shall be 10 inches in width, 24 inches in height, and 6 inches in depth.

3) Lock key shall be CH751

2.5 MISCELLANEOUS ACCESSORIES

A. Wall Mounting Hangers shall be Amerex Model #1007 or approved equal.

B. Indicating Signs for areas where fire extinguishers will not be readily visible (ie. warehouses, shop areas, large laboratories) shall be red in color with red letters printed inside a white arrow with the word FIRE printed horizontally on top and the word EXTINGUISHER printed vertically below, 4 inches by 18 inches, flexible vinyl with adhesive backing. Seton Model #37809 or approved equal.

PART III - EXECUTION FIRE EXTINGUISHER CABINETS

3.1 Fire extinguisher cabinets shall be provided in sufficient number and location but shall not exceed the minimum requirements of NFPA Standard 10.

3.2 Where construction does not allow the installation of recessed cabinets (penthouses, mechanical rooms, etc.), surface mounted cabinets shall be specified. Surface mounted cabinets shall meet the requirements of II-B above, except that they shall be surface mounted type.

Larsen's Model 2409SMSM or approved equal).

3.3 Cabinets are not required in labs areas, shop areas, and any other area as approved by the University. Fire extinguishers not placed in cabinets shall be mounted on hangers as specified in Section 2.3 of this Specification and as indicated in NFPA 10.

The design shall include an identification and directional system to communicate information essential to the operation of the new facility. The interior/exterior graphic system is to assist individuals moving to and within the facility. Particular attention must be given to the needs of individuals with disabilities to permit their access to the building from parking areas and walkways and to move freely throughout the building.

It is imperative that the interior graphic system meets critical maintenance, replacement, and anti-vandalism specifications with regard to location and method of application, as well as design specifications for material, color, texture, dimensions, and letter type (reference sign detail, pages 8-9). These requirements also apply to painted wall graphics.

The development of the interior signage system and all supplementary graphics specific to the project shall be coordinated with the ***Project Manager***. The specific room numbering assignments are to be conducted by ***Facilities Planning*** at the completion of the Schematic Design Phase. All rooms shall be numbered on the drawings using the University room numbering standard.

The design is to be in accordance with the following references:

A. Interior Room Numbering Standard

In order to properly identify rooms, assign space and maintain a computerized space inventory and key control, the following room numbering and identification system is in use at the College Park Campus.

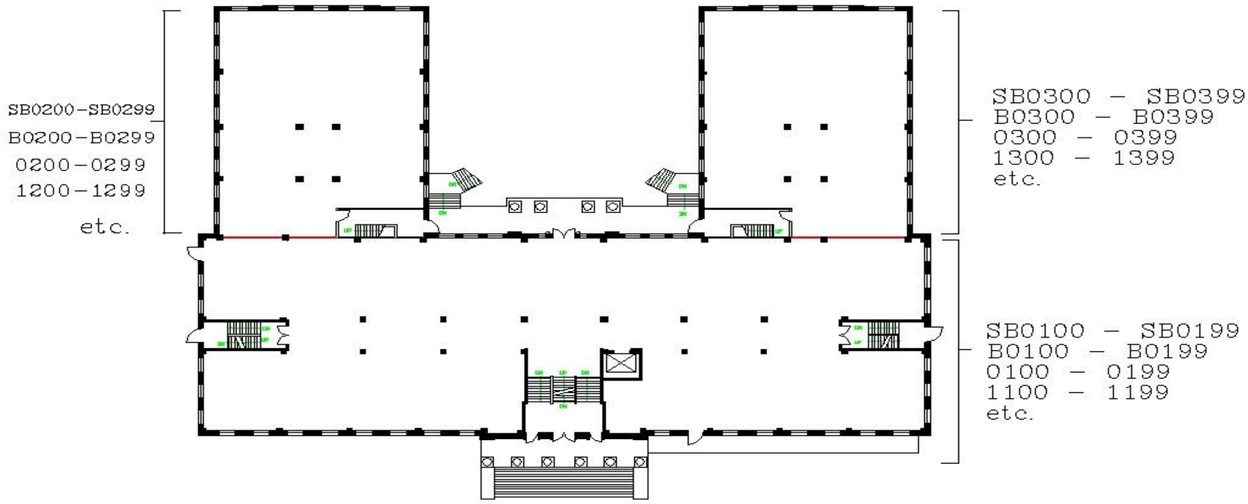


FIGURE 1.

1. Each floor within a building is to be assigned a group of 4-digit numbers. The first digit will indicate the floor of the building, the second will indicate the wing, and third and fourth will indicate the room number in that wing.

2. The four digit number may have an alpha prefix indicating a sub-basement (SB0123), basement (B0123) or mezzanine (M1123), or an alpha suffix indicating a part of one room or space (1123A).

3. Small rectangular buildings will be numbered using 4-digits, where the first digit will indicate the floor, the last two digits shall indicate the room number and the second digit shall be "one".

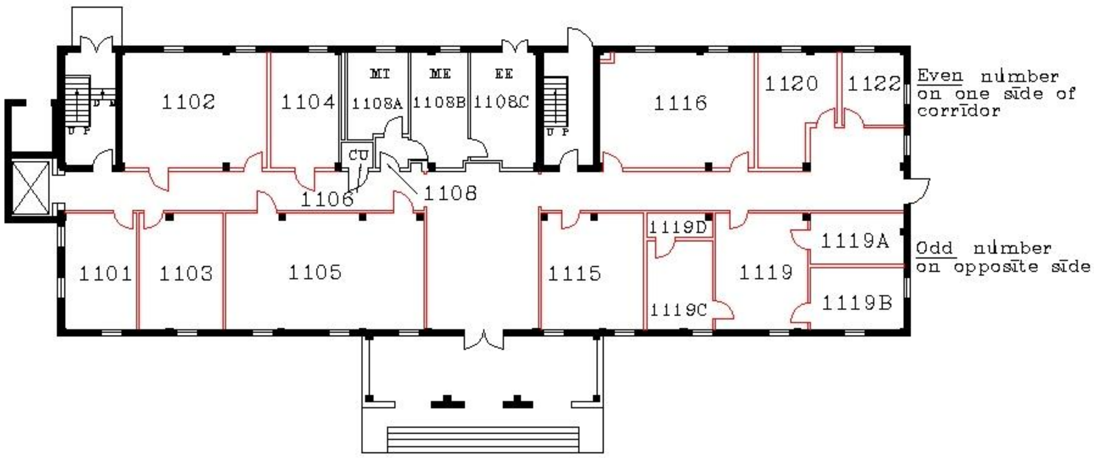


FIGURE 2.

4. Each room entered from a public corridor will have a separate room number. ***Room Numbering shall read with even numbered rooms on one side of the public corridor and odd numbered rooms on the opposite side. (See figure 2.)*** Rooms with more than one door opening into the ***public*** corridor ***shall*** have the same number plate. Where spaces are not entered from a public corridor, but from another space, they will be assigned the same room number with an alpha suffix. ***Room number suffixes shall be assigned in a clockwise direction. If the spaces begin only to the right of that spaces entrance then alpha suffixes shall be assigned in a counterclockwise direction.*** Note: In the alpha suffix system, letters "I" and "O" are not assigned. When the letter "Z" is passed, continue with AA, BB, etc.

5. The room numbering system must be flexible enough to accommodate physical changes which may occur during the life of the building. The most frequent changes will be the subdivision of larger rooms into smaller rooms. In cases where long rooms run parallel with the corridor, a block of numbers will be reserved so

that if future subdivisions do occur, numbers will be available for the spaces without renumbering the entire wing.

6. The numbering system should reflect a general location within the building. This can be done most easily by "stacking" room numbers as much as possible. For instance, room 1101 should be in the same relative position in the building as room 2101 and 3101.

7. All public corridors, lobbies, elevators, lifts, and stairways will be numbered starting from 99 and going down, i.e., 1199, 1198, 1197, 1196, etc. (See FIGURE 3.)

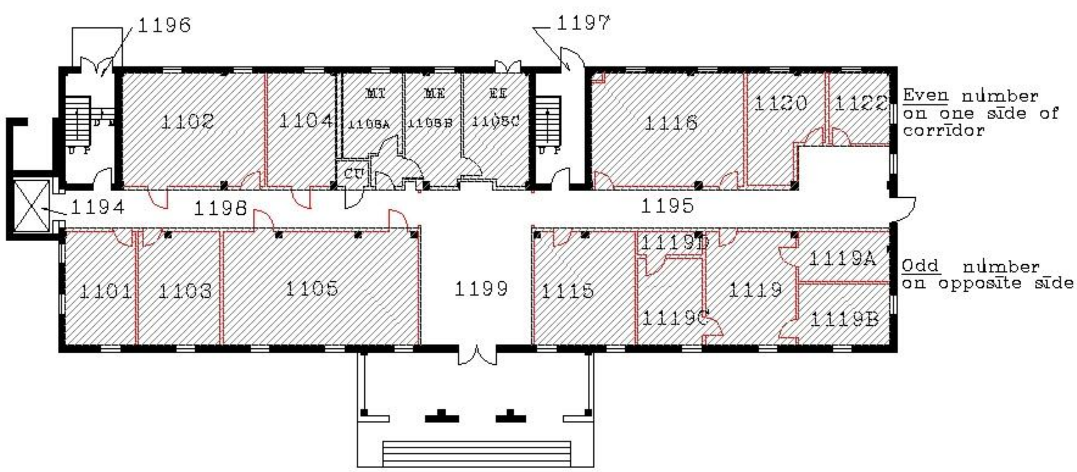


FIGURE 3.

B. Identification System

1. All building support areas will be marked with a sign identifying its room use. Building support areas

include: mechanical, electrical, elevator and telephone equipment rooms, custodial closets, and toilets.

a. For these support spaces all drawings are to reflect the following abbreviations:

- Mechanical equipment rooms - ME
- Electrical rooms, transformer vaults - EE
- Elevator machinery - X
- Telephone equipment - TE
- Custodial closets - CU
- Men's Rooms - MT
- Women's Rooms – WT
- Unisex/Family Restroom - UT
- Bathroom - T

b. All signage for these spaces will be worded as follows to provide uniformity:

- Mechanical equipment rooms - "MECHANICAL EQUIPMENT"
- Electrical rooms, transformer vaults - "ELECTRICAL EQUIPMENT"
- Elevator machinery - "ELEVATOR EQUIPMENT"
- Telephone equipment - "TELEPHONE EQUIPMENT"
- Custodial closets - "CUSTODIAL"
- Men's Rooms - "MEN"
- Women's Rooms - "WOMEN"
- Unisex/Family Restroom – "UNISEX/FAMILY"
- Bathroom - "RESTROOM"

C. Assignment of Room Numbers to New Buildings

Design drawings shall incorporate room numbering in accordance with the UM Room Numbering Standard identified above. Before working drawings are completed, the doors that are scheduled to have room # plates and/or room i.d. signs shall be identified.

At the completion of construction, all "As Built" floor plans (architectural, mechanical, electrical, and structural) shall reflect the room numbers as installed by the contractor.

D. Assignment of Room Numbers for Renovation Projects

Before any renovation begins, ***Facilities Planning*** will mark room numbers on two (2) set of plans in accordance with the Standard Room Numbering and Room Identification System, indicating what room numbers and room identification sign are required. One set will be used to incorporate the information on the working drawings, and the second set will be distributed to Facilities Management O&M Building Security.

At the completion of the renovation, "As Built" drawings, verifying work done and installation of the required room number plates and room identification signs shall be prepared.

The cost for the fabrication and installation of room number plates and room identification signs will be included in the cost of renovation.

E. Interior Room Identification Sign Detail

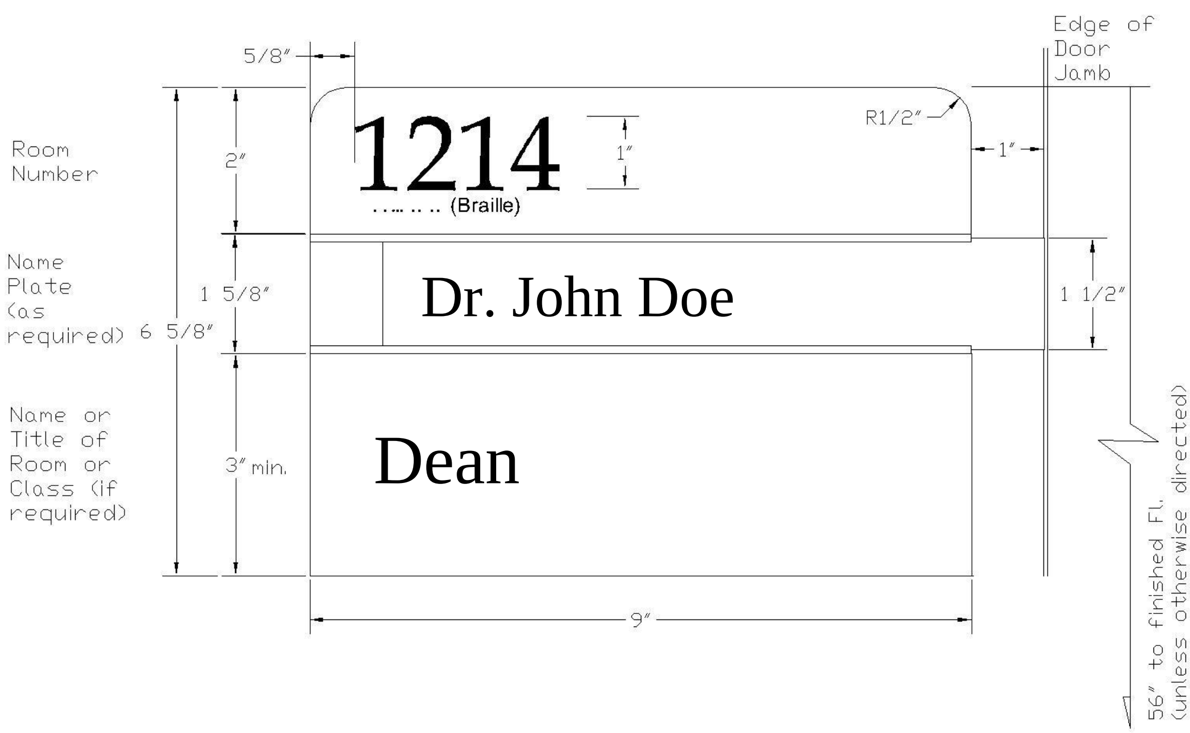


Figure 4 (for non-permanent rooms with removable nameplate)

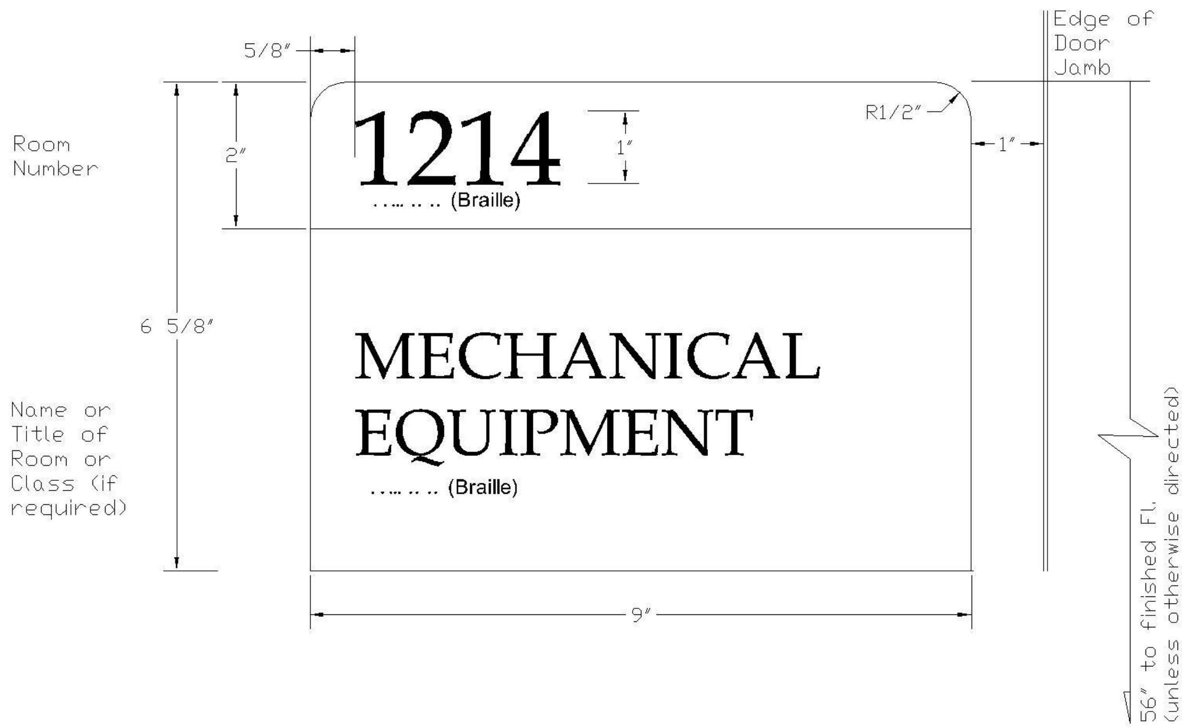


Figure 5 (for permanent assigned rooms)

NOTES:

1) All room numbers shall be engraved in a non-glare ultra-matte finish 1/16" engraving stock (Romark, or equivalent) with 1" tactile characters, raised minimum 1/32" and include Braille cell below the room number. All characters shall be uppercase. (See Figure 4)

2) All permanent assigned rooms shall be engraved in a non-glare reverse engraveable ultra-matte finish 1/16" engraving stock (Romark, or equivalent) with minimum 5/8" tactile characters, raised minimum 1/32" and include Braille cell below verbiage. Restrooms, stairwells, floor designators, mechanical equipment, electrical equipment, telecommunications equipment and elevator equipment fall into this category. All characters shall be

uppercase. (see Figure 5)

3) Non-permanent room names shall be engraved in a non-glare ultra-matte finish 1/16″ engraving stock (Romark, or equivalent). Character height may vary depending on length. Characters shall be upper/lower case. Characters shall be conventional in form. Sizes of plates can be 4 5/8″ x 9″ or 3″ x 9″.(see Figure 4)

4) All nameplates shall be engraved in a non-glare ultra-matte finish 1/16″ engraving stock. Character height may vary depending on length. Characters shall be upper/lower case. Size will be 1.5″ x 9″. Nameplates are to slide into a 1 5/8″ x 9″ aluminum bracket in silver or anodized black or gold pending on scheme and design constraints. Color shall be determined by project manager and approved by the Sign and Graphics Shop before bidding. Font is to be Optima Semi Bold throughout. The project manager and the Sign and Graphics Shop will accept no deviance without prior signed approval.

5) All room numbers, nameplates, and room identification signs will be adhered to 1/8″ thick finish PVC material (Sintra, Celtec, Komacel, Komatex, or equivalent) with 3M VHB Very High Bond Joining Systems #9473 double-sided tape (or equivalent). All signs to be mounted on block wall shall have the entire perimeter of the sign taped with 3M double-sided black tape #4432 (or equivalent). All signs mounted on drywall, wallboard, etc. shall be installed with 1.25″ x #6 counter sunk Phillips head screws.

6) Signs shall be installed one inch from the latch side of the casing jamb to the leading edge unless architectural barrier or overriding design constraint exists.

10.05 MAILBOXES

If required as part of a project, coordination between the user, Department of Operations and Maintenance, and the Department of Architecture, Engineering, and Construction is required to determine specific requirements and acceptable manufacturers.

10.06 RESTROOM REQUIREMENTS (11-21-11)

1.1 GENERAL REQUIREMENTS

A. Restroom facilities must be designed for ease of maintenance.

B. Graffiti resistant finishes shall be specified where possible.

C. Specify all stainless steel or chrome plated brass fittings for long-lasting quality.

D. Each restroom shall have individual exhausts to prevent sound transmission.

E. Ceramic tile shall be installed at floors and walls to a minimum height 4'-0" above finished floor. Provide continuous wood blocking behind an accessory when the toilet accessory partially overlaps the ceramic tile.

1.2 UNISEX / FAMILY TOILET ROOM

A. An accessible unisex/family toilet room shall be provided in all buildings.

B. Locate one toilet on the main entrance level of the building if more than one unisex/family toilet is required by code. Every attempt should be made to collocate this toilet with other multiple-fixture toilet rooms.

C. Fixtures: Provide minimum one (1) water closet, one (1) urinal and one (1) lavatory within the room.

D. Accessories: University standard toilet room accessories and one (1) infant changing station.

1.3 TOILET PARTITIONS

A. Partitions shall be floor mounted overhead braced solid plastic, mounted to walls using continuous wall brackets and continuous hinges. The head rail shall be a heavy-duty anti-grip design to prevent vandalism.

B. Partition shall meet the interior finish requirements of NFPA 101. (Note: The required fire test is ASTM E-84, which is the same as ANSI 2.5, CAN/ULC S102M, NFPA 255, UBC 42-1, UL723; Flame Spread Max. 200 and Smoke Developed Max. 450) Partitions shall have Site Proof doors and ***a*** heat sink at bottom edges.

C. Acceptable manufacturers: Comtec Industries and Rockville Partitions Incorporated.

1.4 TOILET ROOM ACCESSORIES

A. All restroom equipment shall be included in the construction contract. The contract drawings shall locate the equipment and identify any wall support requirements associated with installation.

The following University standard toilet room accessories shall be specified:

1. Toilet Tissue Dispenser: ***Bay West/ Wausau Paper Model Silhouette Revolution 3-Roll OptiCore Bath Tissue Dispenser #80300***. Mount ***the unit between 7" min. and to 9" max. from the leading edge of the Water Closet*** to the center of the dispenser, a minimum of 19 inches ***and maximum of 48 inches*** above the floor ***to the dispenser opening***. Mount dispenser in wheelchair accessible stalls so that the outlet is a minimum of six (6) inches to twelve inches maximum clear above the ***top of the*** grab bar.

2. Sanitary Napkin Receptacle: Rubbermaid Model No. 6140 or Rochester Midland #25125200. Wall mount in each toilet stall in Women's Toilet room, and a minimum 15 inches above the floor in wheelchair accessible stalls.

3. Paper Towel Dispenser: ***Bay West/Wausau Paper #86500 OptiServ Hands-Free*** Roll Towel Dispenser. Mount so that the lever shall not exceed 48 inches ***from above the finish*** the floor.

4. Soap Dispenser: Gojo Touch-Free TFX Dispenser #2730-12(Black). Mount so that the soap outlet shall not exceed 48 inches above the floor.

5. Mirrors: Stainless steel framed mirrors minimum size 18 inches x 36 inches, mounted over each lavatory. Facilities Management will consider continuous mirrors on a case-by-case basis.

6. Electric Hand Dryer: Provide minimum one (1) electric hand dryer in each toilet room.

7. Infant Changing Station: Provide one (1) horizontally mounted infant changing station that complies with ADA in each men's and women's toilet rooms on the first (main building entrance level) floor of all new construction.

   Acceptable manufacturers include: Baby Changing station by Koala Bear Kare and Diaper Deck by American Infant Care Products (AICP), or approved equal. The color to be determined on a project-by-project basis.

1.5 PLUMBING

A. Wall mounted lavatories with drained indentation for soap are preferred. Facilities Management will consider countertop lavatories on a case-by-case basis. Acceptable manufacturers care: American Standard, Kohler or Crane.

B. Public restroom lavatories shall be 29 inches clear from floor to underside of lavatory apron to allow regular ***standard*** lavatories to ***provide accessibility***. Wheelchair lavatories are not to be specified.

C. Water closets shall be floor mounted, with elongated bowl and Sloan Optima Plus Battery-powered, or equal, hard wired flush valves with manual override for water closets, urinals and lavatories. Contact Facilities Management for acceptable manufacturers.

D. Flush valve levers shall be located on ***accessible*** side in wheelchair stalls for easy reach.

E. Urinals shall be wall mounted 17 inches maximum height to the rim in each Men's Toilet room. Provide one (1) minimum in each room and one (1) additional for every ten (10) or more urinals required by code.

F. Provide one (1) floor drain in each restroom. Floor drains shall be located under stall partitions away from foot traffic areas. Slope the floor to drains. Access to trap primers is required.

1.6 ELECTRICAL

A. Provide a minimum of two (2) 120v receptacles on a separate 20 amp ***circuit*** spaced along wall above lavatories and adjacent to wall-mounted mirrors. Specify GFCI receptacles.

B. All requirements shall be designed in accordance with NEC. One (1) light fixture minimum shall be connected to emergency power.

DIVISION 11 - FOOD SERVICE FACILITIES AND EQUIPMENT

11.01 INTRODUCTION

The material contained on the pages that follow, represent the experienced gained for creating new and renovating Food Services Facilities. Specifically, it includes the following material:

Food Service Equipment Specification
General Mechanical Requirements

These standards and guidelines apply to the Department of Dining Services' Facilities as well as any kitchen or pantry that is built to insure safe food handling.

In lieu of separating the above material into its respective CSI section, for ease of access and use, it has been incorporated in one section of this document. It is also important to note that references have been made to other sections of the DCFS.

GENERAL EQUIPMENT:
Equipment and furnishings required to support a project are outlined in the space requirements for the facility program as part of each space use sheet. In addition, the Interiou Design and Equipment unit of DAEC developes a consolidated equipment and furnishings list with the user that is the basis for State Funding. Separate reference documents with University Standards for food services facilities and classroom equipment are available.
Project designers shall ensure that the equipment/furnishings location layout and provision of required services complies with all requirements of the project program, applicable codes and regulations, University Facility Design Standards and manufacturer's recommendations.
Project specifications shall be sufficiently generic to permit competitive bidding and procurement. State procurement practices recognize the social value of purchasing State Use Industries products and encourages their use wherever possible.

PART 1 - GENERAL

1.01 SUMMARY

A. Furnish all labor and materials, tools, equipment and services necessary for and reasonably incidental to complete the food service equipment work as shown on the drawings or specified.

B. Install all specified equipment and equipment furnished by Dining Services.

C. Provide utility hookups required for equipment furnished by Dining Services.

D. Refer to equipment list on the drawings.

1.02 RELATED SECTIONS

A. Plumbing: Division 15

B. Electrical: Division 16

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of food service equipment of types, capacities, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Installers Qualifications: Firm with at least 3 years successful installation experience on projects with food service equipment similar to that required for project.

C. Fabricator's Qualifications: Where indicated, units require custom fabrication, provide units fabricated by shop which are skilled and with a minimum of 5 years experience in similar work. Fabricate all custom equipment items at same shop. Where units cannot be fully shop-fabricated, complete fabrication work at project site.

D. Codes and Standards

1. NSF Standards: Comply with applicable National Sanitation Foundation (NSF) standards and recommended criteria.

2. UL Labels: Where available, provide UL labels on prime electrical components of food service equipment. Provide JL “recognized marking” on other items with electrical components, signifying listing by UL, where available.

3. ANSI Standards: Comply with applicable ANSI standards for electric powered and gas-burning appliance, for piping to compressed gas cylinders, and for plumbing fittings including cylinders, and for plumbing fittings including vacuum breakers and air gaps to prevent siphonage in water piping.

4. NFPA Codes: Install food service equipment in accordance with the following National Fire Protection Codes (NFPA) Codes:

NFPA 54 - National Fuel Gas Code

NFPA 70 - National Electrical Code

NFPA 96 - Removal of Smoke and Grease-Laden Vapors from Commercial Coding Equipment.

5. Health Code: Install food service equipment in accordance with Prince George’s County Health Department applicable regulations.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer’s technical product data and installation instructions for each item; include rough-in dimensions, service connection requirements, performances, materials, manufacturer’s model numbers, furnished accessories, power/fuel requirements, water/drainage requirements, and other similar information.

B. Shop Drawings: Submit dimensioned rough-in drawings, at minimum of scale 1/2" = 1'-0", showing mechanical and electrical requirements. Submit dimensioned fabrication drawings from custom fabricated equipment including plans, elevations, and sections, at minimum scale of 3/4" = 1'-0", showing materials and gages used.

1. Comply with Prince George's County Health Department publication "Requirements and Guidelines for Submitting Plans for Cooking Exhaust Ventilation Systems".

2. Shop drawings for equipment with sneeze guards shall indicate that the guards will provide adequate protection of the food from customer contamination.

C. Maintenance Data: Submit maintenance data and parts lists for each item of food service equipment. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual in accordance with requirements of Division 1.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver food service equipment in factory-fabricated containers designed to protect equipment and finish until final installation. Make arrangements to receive equipment at project site, or to hold in warehouse until delivery can be made to job site.

B. Store food service equipment in original containers, and in location to provide adequate protection to equipment while not interfering with other construction operations.

C. Handle food service equipment carefully to avoid damage to components, enclosures, and finish. Do not install damaged food service equipment; replace and return damaged components to equipment manufacturer.

1.06 PROJECT CONDITIONS

A. Take field measurements to assure accurate fit of fabricated equipment.
B. Check electrical characteristics, and water and gas pressure. Provide pressure regulating valves where required for proper operation of equipment.

C. Electrical Requirements: Provide motors and heating elements for the following electrical characterisitcs, if not otherwise indicated:

1. Motors 1/2 HP and smaller: 120/1/60.

2. Motors 3/4 HP or larger: 208/3/60.

3. Heating Elements 1500 Watts and smaller: 120/3/60.

4. Heating Elements over 1500 Watts: 208/3/60.

5. Refer to equipment schedule and manufacturer's standard electrical requirements.

1.07 SPECIAL PROJECT WARRANTY

Warranty on Refrigeration Compressors: Provide 3 year written warranty, signed by manufacturer, agreeing to replace/repair, within warranty period, compressors with inadequate and defective materials and workmanship, including leakage, breakage, improper assembly, or failure to perform as required provided manufacturer's instructions for handling, installing, protecting, and maintaining units have been adhered to during warranty period. Replacement is limited to component replacement only, and does not include labor for removal and reinstallation. Warranty shall start on date of Substantial Completion.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Stainless steel: AISI Type 304. Provide non-magnetic sheets, free of buckles, waves, and surface imperfections. Provide No. 4 polished finish for any surfaces which will be exposed.

1. Provide self-adhesive protective paper covering on polished surfaces of stainless steel sheet work, and retain/maintain until time of final testing, cleaning, start-up, and substantial completion.

B. Galvanized Sheet Steel: ASTM A 526, except ASTM A 527 for extensive forming: ASTM A 525, G90 zinc coating, chemical treatment.

C. Sheet Steel: ASTM A 569 hot-rolled carbon steel.

D. Stainless Steel Tube: ASTM A 554, Type 304 with No. 4 polished finish.

E. Aluminum: ASTM B 209 sheet and plate, ASTM B 221 extrusions, 0.40 mill clear anodized finish where exposed, unless otherwise indicated.

F. Plastic Laminate: NEMA LD3, general purpose high-pressure type 0.05" thick except 0.042" thick for post-forming, smooth texture, and white unless otherwise indicated. Comply with NSP 35.

G. Plastic Materials and Components: Except for plastic laminate, provide plastic materials and components which comply with NSF 51.

H. Hardwood: Red oak NHLA First Grade with knots, holes, and other blemishes culled out, kiln dried at 8% or less moisture, waterproof glue, machined, sanded, and finished with NSF-approved oil sealer.

I. Solid Surface Product: Corian as manufactured by

DuPont Co.

J. Sound Deadening: Heavy-bodied resinous coating, filled with granulated cork or other resilient material, compounded for permanent, non-flaking adhesion to metal in 1/8" thick coating.

K. Sealants: ASTM C 920, Type S Grade NS, Class 25, Use NT. Provide sealant that when fully cured and washed meets requirements of Food and Drug Administration Regulation 21 CFR 177.2600 for use in areas where it comes in contact with food.
   1. Colors: As selected by Architect and approved by the University from manufacturer’s standard colors.

   2. Backer Rod: Closed-cell polyethylene rod stock, larger than joint width.

L. Gaskets: Solid or hollow (not cellular) neoprene or PVC; light gray, minimum 40 Shora A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

2.02 FABRICATION OR EQUIPMENT

A. Tops: Fabricate of “Corian” as manufactured by DuPont. Where tops are adjacent to walls or adjoining equipment, turn up 6" unless otherwise indicated.

B. Framing: Mount tops on 1-1/2" x 1-1/2" x 1/8" galvanized angle iron, or 4" wide x 12 gage galvanized channels.

   1. Run framework around entire perimeter of unit, and cross brace on 30" centers. Fasten framing to underside of top surfaces with 1/4" studs welded at approximately 12' centers. Provide each stud with suitable chrome-plated lockwashers and cap nuts, and make stud lengths such that cap nuts can be made up tight bringing top down snugly to framing.

C. Legs and Cross Rails: Construct legs of 1-5/8" OD x

16-gage stainless steel tubing, with fully enclosed stainless steel bullet shaped adjustable foot with minimum adjustment of 1" up or down without any threads showing. Fasten legs to NSF approved 6" high stainless steel gusset with top completely sealed by means of stainless steel plate. Weld gusset continuously to bottom of unit framing.

1. All counter mounted food service equipment weighing in excess of 80 pounds shall be mounted of NSF approved 4" legs.

D. Cabinet Bodies: Construct of 20 gage stainless steel, with end panels formed with round corners for free standing units, and square corners for fixtures which adjoin walls or other fixtures. Provide 90 degree retentions on end panels at front and rear, turned in toward body of cabinet and welded for reinforcement. For cabinets with open shelving, provide double wall inner panels. Weld ends to horizontal angle or channel member to form integral cabinet base. Provide backs of same material as ends, with vertical edges turned in to match edges of ends. Weld making flush joint.

E. Inserts: Where cold pans and other inserts are to be installed in cabinet bases, provide apron full depth of insert and of same material as bodies with reinforced openings as required. Form in openings as required. Form in openings on all sides.

F. Shelves: Construct of 14-gage stainless steel.

1. Bottom Shelves: Extend forward and turn down at front so as to be flush with front facing of cabinet.

2. Fixed Intermediate Shelves: Weld to front stiles and to 14 gage stainless steel brackets so that shelf is 1" away from back and ends of cabinet.

3. Adjustable Shelves: Channel on all 4 sides, weld corners and mount on removable stainless steel standards.

G. Cold Pans: Fabricate from 14-gage stainless steel lining and 20-gage stainless steel casing. Cove interior horizontal and vertical corners. Insulate sides, ends, and bottom with material thermally equal to 2" thickness of fiberglass. Seat 1/2" diameter copper cooling coils to underside of cold pan, and seal in themosastic material. Turn down counter top 1" into pan. Install completely concealed 1" wide plastic breaker strip. Install 1" chrome plated drain with plug. Provide 1/2" high false bottom of 14-gage perforated stainless steel in removable sections.

H. All annular openings in unit construction shall be sealed to within 1/32".

2.03 PLASTIC LAMINATE CASEWORK

A. General: Fabricate plastic laminate casework in type and styles indicated, with hardware and accessories. Provide exposed and semi-exposed surfaces and edges (self-edged) with plastic laminate covering on particle board cores. Semi-exposed surfaces with exposures equivalent to no more than underside of shelves may be surfaced with plastic laminate backer sheet. Provide painted plywood or hardboard for concealed panels.

2.04 PREFABRICATED KITCHEN EQUIPMENT

A. Provide custom prefabricated equipment as shown on the drawings and attached to this section.

B. Equipment shall be manufactured by Yorkcraft or approved equal.

2.05 FIRE SUPPRESSION SYSTEM

(Reference Section 13900 Fire Suppression & Protection Systems)

A. Provide pre-engineered, liquid agent, UL listed, cartridge-operated type with fixed nozzled agent distribution piping.

B. System shall have automatic detection and actuation from local or remote manual stations.

C. Release Mechanism

1. Shall contain actuator assembly, regulator, expellent gas hose and one 3 gallon chrome plated tank enclosure and cover.

D. Agent: Potassium Carbonate.

E. Fusible link rating shall be provided to conform to operating temperature of hood.

F. Provide UL listed Mechanical gas line shut-off valve.

G. Selection: Ansul Model 12-102 or approved equal.

PART 3 - EXECUTION

3.01 INSPECTION

A. Rough-In Work: Installer must examine roughed-in mechanical and electrical services, and installation of floors, walls, columns, and ceilings, and other conditions under which food service work is to be installed; verify dimensions of services and substrates before fabricating work. Notify Contractor of unsatisfactory locations and dimensions of other work, and of unsatisfactory conditions for proper installation of food service equipment. Do not proceed with fabrication and installation until unsatisfactory dimensions and conditions have been corrected in manner satisfactory to installer.

3.02 INSTALLATION

A. General: Set each item of non-mobile and non-portable equipment securely in place, level, and adjusted to correct height. Anchor to supporting substrate where indicated and where required for sustained operation and use without shifting or dislocation. Conceal anchorages where possible. Adjust counter tops and other work surfaces to level tolerance of 1/16" maximum offset, and maximum variation from level or indicated slope of 1/16" maximum offset, and maximum variation from level or indicated slope of 1/16" per foot.

1. Where indicated, or required for safety of equipment operator, anchor equipment to floor or wall. Where equipment is indicated to be anchored to floor, provide legs with adjustable flanged foot. Install 2 anchors on each foot.

B. Field Joints: Complete field-assembly joints in work (joints which cannot be completed in shop) by welding, bolting and gasketing, or similar methods as indicated. Grind welds smooth and restore finish. Set or trim gaskets flush, except for “T” gaskets as indicated.

C. Enclosed Surfaces: Treat spaces that are inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at rate of 4-oz. per square foot.

D. Closure Plates and Strips: Install where required, with joints coordinated with units of equipment.

E. Cut-Outs: Provide cut-outs in food service equipment where required to run plumbing, electric, gas, or steam lines through equipment items for final connections.

F. Sealants and Gaskets: Install all around each unit to make joints air-tight, watertight, vermin-proof, and sanitary for cleaning purposes. In general, make sealed joints not less than 1/8" wide, and stuff backer rod to shape sealant bead properly, at 1/4" depth. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint. At internal-corner joints, apply sealant or gaskets to form a sanitary cove, or not less than 3/8" radius. Provide sealant-filled or gasketed joints up to 3/4" joint width; metal closure strips for wider joints, with sealant application each side of strips. Anchor gaskets mechanically or with adhesives to prevent displacement.

G. Piping: Install necessary piping from relief valves on kettles and steamers to exhaust in manner to avoid steam coming in contact with operating personnel, and in accordance with applicable codes. Install required piping from indirect drain connections to floor drains.

H. Prefabricated equipment shall be installed in strict conformance to manufacturer's installation instructions and approved submittals.

3.03 FIELD QUALITY CONTROL

A. TESTING: Delay start-up of food service equipment until service lines have been tested, balanced, and adjusted for pressure, voltage, and similar considerations; and until water and steam lines have been cleaned and treated for sanitation. Before testing, lubricate each equipment item in accordance with manufacturer's recommendations.

Test each item of operational equipment to demonstrate that it is operating properly, and that controls and safety devices are functioning. Repair or replace equipment which is found to be defective during operation, including units which are below capacity or operating with excessive noise or vibration.

3.04 CLEANING

A. After completion of installation, and completion of other major work in food service areas, remove protective coverings, if any, and clean food service equipment, internally and externally. Restore exposed and semi-exposed finishes to remove abrasions and other damages; polish exposed-metal surfaces and touch-up painted surfaces. Replace work which cannot be successfully restored.

1. Prior to date of substantial completion on food service equipment work, buff exposed stainless steel finishes lightly, using power buffer and polishing rouge or grit of No. 400 or finer.

B. Final Cleaning: After testing and start-up, and before time of substantial completion, clean and sanitize food service equipment, and leave in condition ready for use in food service.

3.05 CLOSE-OUT PROCEDURES

A. Provide services of installers technical representative, and manufacturer's technical representative where required, to instruct Owner's personnel in operation and maintenance of food service equipment.

1. Schedule training with Owner, provide at least 7-day notice to Contractor and Architect/Engineer of training date.

11.03 GENERAL MECHANICAL REQUIREMENTS FOR FOOD FACILITIES

PART 1 - SCOPE

1.01 All work under this section shall be subject to the GENERAL CONDITIONS for the entire work. Requirements included under this section shall apply to all work under Division 15. Check each section for detail requirements.

1.02 The work of all sections of Division 15 includes furnishing and installing the material, equipment, and systems completed as specified. The mechanical installation when finished shall be completed and coordinated, whole, ready for satisfactory service.

PART 2 - EXTENT

2.01 The Contractor shall examine the premises and observe the conditions under which the work will be done or other circumstances which will affect the contemplated work. No allowance will be made subsequently in this connection for any error or negligence on the Contractor’s part.

2.02 The Contractor shall coordinate the work of the mechanical trades with the work and equipment specified elsewhere in order to assure a complete and satisfactory installation.

2.03 Whenever the term “provide” is used, it shall mean “furnish and install in place, complete in all details”.

2.04 Manufacturer’s catalog numbers or type of equipment, where specified herein are used for reference only. Similar products of approved equal equipment will be acceptable. The Engineer will evaluate all proposals and determine which, in his opinion, is acceptable.

2.05 All work shall be in accordance with the latest applicable codes and regulations of the various regulatory bodies of the State of Maryland, the National Fire Prevention Association, and all other boards or departments having jurisdiction. Any items or requirements are permitted under the code and shall take preference.

PART 3 - PERMITS

3.01 The Contractor shall procure all the necessary and usual permits, certificates of inspection, etc., which are required by the authorities having jurisdiction over this work, pay for all fees and charges connected herewith, including connection charges, and deliver same to the University.

PART 4 - SHOP DRAWINGS AND MATERIAL

4.01 Complete shop drawings and materials lists shall be submitted by the Contractor for the approval in accordance with the requirements of the GENERAL CONDITIONS. No work shall be fabricated or ordered by the Contractor until approval has been given.

4.02 The Contractor shall submit for approval within 15 days of signing of contract, a schedule showing make, type, and manufacturer's name and trade designation, of all pieces of material and equipment. This schedule shall be accompanied by the Manufacturer's specifications and shall give dimensions, kind of material, finish, etc., and such other detailed information as may be required. When approved, such schedule shall be an addition to the specifications herewith in that no variation will be permitted except with the approval of the Engineer.

4.03 Complete shop drawings, showing dimensions, materials, arrangements, and other pertinent data shall be submitted; for materials and equipment readily identified in standard publications of various manufacturers, full descriptive catalog or other data shall be submitted.

PART 5 - MATERIALS

5.01 All materials shall be new, the best of their respective kinds, suitable for the conditions and duties imposed on them at the building and shall be of reputable manufacturers. The description, characteristics, and requirements of materials to be used shall be in accordance with qualifying conditions established in the following sections.

PART 6 - WORKMANSHIP

6.01 All materials and equipment shall be installed and completed in a first class, workmanlike manner and in accordance with the best modern methods and practice. Any materials installed which shall not present an orderly and reasonably neat and/or workmanlike appearance shall be removed and replaced when so directed by the University. The removal and replacement of this work shall be done when directed in writing by the Contracting Officer, at the Contractor's expense.

PART 7 - STANDARDS

7.01 Where the following standards, codes or specifications are referred to in the MECHANICAL DIVISION, the reference is to the particular standard, code, or specification, together with all amendments and errata applicable at the time bids are taken.

7.02 ABBREVIATIONS

ADC	Air Diffusion Council
ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers
ASTM	American Society of Testing of Materials
BOCA	Building Officials Code Association
NFPA	National Fire Protection Association
U.L.	Underwriters Laboratories
WSSC	Washington Suburban Sanitary Commission

PART 8 - DRAWING IN GENERAL

8.01 The general arrangement of mechanical ductwork and new dishwashing machine shall be as shown on the Contractor’s shop drawings. Detailed drawings of proposed departures due to actual field conditions or other causes shall be submitted for approval and such changes shall be accomplished at no additional cost to the University. The Contractor shall carefully examine all contract drawings and shall be responsible for the proper fitting of materials and equipment in each location as indicated without substantial alteration. In as much as the drawings are generally diagrammatic and because of the small scale of the drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. The Contractor shall carefully investigate the structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such fittings, valves, transitions, accessories, etc., as may be required to meet such conditions, at no additional cost to the University. The right to make any reasonable change in location of sprinkler heads, routing of piping, valves, up to the time of roughing-in, is reserved without involving any additional expense to the University.

PART 9 - ELECTRICAL WORK

9.01 All electrical work regardless of the Section of these specifications under which it is performed or specified, shall conform to the applicable requirements of DIVISION 16 - ELECTRICAL. Electric heaters requiring electrical service shall be furnished complete with all internal wiring, controls, etc., as a part of that equipment under the section in which it is specified.

PART 10 - WORK SCHEDULE

10.01 The Contractor shall coordinate, plan, and schedule all work to meet the work schedule as specified.

PART 11 - CUTTING AND PATCHING

11.01 Under this section, the Contractor shall be responsible for cutting and patching necessary for the installation of his work. Cutting shall be done in a neat and workmanlike manner and no structural members shall be cut before receiving prior approval of the Engineer. Concrete walls and floors shall be core bored for piping. Patching shall be done by mechanics of the trade involved. All patch work finishes shall match the existing adjacent surfaces in finish and texture.

11.02 During the floor and wall cutting operations, all equipment in the immediate area and the area below shall be covered with heavy gauge plastic sheets so as to protect equipment from dust and water damage applicable to work.

PART 12 - DEMOLITION

12.01 Unless indicated otherwise, all pipes, valves, fittings, and equipment that are removed shall become the property of the University. The University has the right to examine the materials. Those not accepted shall be the responsibility of the Contractor for disposal.

12.02 The Contractor shall at all times keep the premises free from accumulation of waste materials and rubbish. At the completion of work, the Contractor shall remove all rubbish, tools, scaffolding, and surplus material from and about building and leave the area completely clear and clean.

PART 13 - OPERATING AND MAINTENANCE MANUALS

13.01 The Contractor shall furnish the University's Department of Physical Plant with three (3) manuals containing operating and maintenance instructions of the new dishwashing machine installed under this contract property indexed in a 3-ring binder.

13.02 At the conclusion of installation, the Contractor shall train the University Operating Personnel in the satisfactory operation and maintenance of all items of the new dishwashing machine. Notify the Owner in writing at least 7 working days in advance prior to demonstration.

13.03 Operating and maintenance manual must include the following:

1. Description of Machine
2. Operation/maintenance of machine
3. Shop drawing
4. Servicing, spare parts lists
5. Names and addresses of spare parts suppliers
6. Test reports
7. Certificates
8. Warranties
9. Narrative of System Operation

PART 14 - OUTAGES

14.01 The Contractor shall coordinate all outages affecting the operation of the facility with the University's Construction Project Manager. The Construction Project Manager shall be notified at least (10) working days in advance of any disruption in the existing sprinkler system, fire alarm, water, electrical or other service necessary for proper operation of the facility. Outages for water service tie-in shall be scheduled three (3) weeks in advance. Duration of the outage shall be kept to a minimum and may require work in evenings or weekends.

PART 15 - AS-BUILT DRAWINGS

15.01 Upon the completion of work - the Contractor shall furnish to the DAEC's Construction Manager and Project Engineer two (2) sets of blue line white prints of As-Built Drawings showing the actual location of sprinkler heads and related piping work.

PART 16 - TESTS

16.01 All tests required in DIVISION 15 shall be performed.

16.02 The Contractor shall demonstrate that all systems and equipment are operating satisfactorily. The University shall be notified at least seven (7) working days in advance of all tests and the tests shall be conducted to the University's entire satisfaction. Any imperfections or leaks found during the tests shall be corrected by repair or replacement and tests repeated until all defective pieces of equipment have been replaced and all systems and equipment operating in a satisfactory manner.

PART 17 - GUARANTEES

17.01 The Contractor shall guarantee all materials and installation work for two (2) years from the date of satisfactory completion.

PART 18 - PROTECTION

18.01 The Contractor shall be responsible to protect existing installation from any damage caused by the Contractor's equipment/machine and labor.

18.02 The Contractor shall be responsible to protect ductwork, equipment and other materials in the premises against any damage. Plastic covers and/or other suitable protective shields to be used to keep all items clean and free from debris or dirt.

A. Tablet Arm Chairs

1. Model No.: #1797-TA Bundle Chair

2. Color: Golden Oak

3. Manufacturer: E & I Cooperative Services
155 Northpoint Ave, Suite #114
Highpoint, NC 27260
or equal.

B. Instructional Chairs

1. Model No.: #1718-Solid Oak

2. Color: Golden Oak

3. Manufacturer: E & I Cooperative Services
155 Northpoint Ave, Suite #114
Highpoint, NC 27260
or equal.

C. Instructor Table Top and Attached Legs

1. Table top

a. Model No.: #16693-Laminated Standard Desk Top

b. Color: Golden Oak

c. Manufacturer: Allied International
2920 Y St., N.E.
Washington, D.C. 20024
or equal.

2. Attached legs

a. Model No.: #FTL-1, Fixed Height Table Legs
Overall Height: 29"
Tubular Steel Thickness: 1-1/4"

b. Color: Beige Enamel
c. Manufacturer: Kreuger Co.
300 D St., S.W.
Washington, D.C. 20024
or equal.

D. Audio Visual Screens

1. Model: Bretford Series, Draper Luma, or equal side tension type.

   Measurements: 70" X 70"
   96" X 96"

2. Model: Bretford Series, Draper Luma II, or equal side tension type.

   Measurements: 10' X 10'
   12' X 12'

3. Frame Color: Black

4. Screen Color: Matt White

MULTIPLE FIXED SEATING

A. Maintenance is of the highest priority for multiple fixed seating. From a maintenance perspective, the favored design for fixed seating is:

1. One piece molded chairs with field mounted seat and back pads.

2. High impact polyproplene, fiberglass or similar shell body.

B. Subject to compliance with specific requirements, qualified manufacturers include, but are not limited to:

1. American Desk Manufacturing Co.
2. American Seating
3. Irwin Seating Co.
4. Krueger International (KI)
5. Hussey Manufacturing
6. JG Furniture Systems, Inc.

C. Preferred Materials include:

1. One piece molded seat and backrest made of high-impact polyproplene, fiberglass, or similar shell body.

2. Fabricated fixed seating with chair surfaces molded to body contours for maximum comfort without upholstery.

3. Field installed seat and back upholstery.

4. Heavy-duty construction with ribs to reinforce points of stress. Rolled edges for comfort and strength.

5. Fold-away tablet arm assemblies attached to the right side (10% to accommodate left-handed users) of individual chairs with 100 square inches of plastic laminate writing surface on medium density fiberboard or hardwood plywood core with wood grain or dark mahogany finish, and all edges well rounded. Tablet arms are to be securely attached to cast iron or steel hinges and swivel mechanism for positive support in open position. Semi-automatic return feature to stored position to below arm block is to be specified.

6. Mounting requirements include:

   a. 14 ga. 1-1/2" x 2" seamless steel column welded to 6" x 8" steel floor mounting flange. Flange to have 9/16" holes in corners and bolted to floor with four (4) 3/8" bolts.

   b. Fabricated chairs of one piece cast iron to have integral mounting provisions and anchoring points for seat pivots, backs, and arm rests.

   c. Fabricated chair of heavy gage rectangular steel tubing to be welded securely to steel mounting plate. Seat, back, and arm rest connections to be welded to tubing.

WINDOW TREATMENTS

A. Mini-blinds shall be included in the equipment contract.

B. Neither vertical window blinds nor draperies are acceptable window treatments.

See UM Classroom Design Manual (Guidelines for Designing, Constructing, and Renovating Instructional Spaces at the University of Maryland) and Technical Standards (Technology Classroom Equipment Specifications)

13.01 FIRE ALARM SYSTEMS (07-10-09)

PART 1 - GENERAL

1.1 REQUIREMENTS -- The latest editions to the following codes and standards shall apply as a minimum but not be all inclusive to the design and installation of fire alarm systems:

A. Maryland State Fire Prevention Code (COMAR 12.03.01 and 12.03.02)

B. National Fire Protection Association (NFPA) 101 - Life Safety Code

C. Building Officials and Code Administrators International, INC. (BOCA) National Building Code

D. NFPA 1 National Fire Prevention Code

E. NFPA 70 - National Electrical Code

F. NFPA 72 - National Fire Alarm Code

G. NFPA 80 - Fire Doors and Windows

H. NFPA 90A - Standard for Air Conditioning and Ventilating Systems

I. NFPA 101 - Life Safety Code

J. NFPA 170 - Fire Safety Symbols

K. ANSI/ASME A17.1 -- Safety Code For Elevators and Escalators as adopted by the State of Maryland.

L. Americans with Disabilities Act (ADA)

1.2 SYSTEM DESCRIPTION

A. All new fire alarm and detection systems shall be analog/addressable systems.

B. The system and components shall be the product of a single manufacturer.

1.3 QUALITY ASSURANCE -- The system and all components shall be listed by Underwriters Laboratory (UL) for fire protective signaling service (local and remote station, emergency communication and relocation equipment, and protective signaling systems) under UL 864.

1.4 SEQUENCE OF OPERATION

A. <u>Manual Pull Station:</u> Activation of any manual pull station shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and the remote annunciators. All manual pull station signals shall be automatically transmitted to UMCP Department of Facilities Management, Work Control via CCMS as an "Alarm" signal.

B. <u>Smoke Detector</u>: Activation of any smoke detector shall start the alarm verification mode. When the smoke detector latches into the alarm mode the fire alarm system shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and at the remote annunciators. All smoke detector alarm signals shall be automatically transmitted to UMCP Work Control via CCMS as an "Alarm" signal.

1. Elevator Recall - Smoke detectors at elevator landings, in elevator machine rooms, and in elevator shafts shall also recall the elevator(s) to the designated floor or to the designated alternate floor as required by the elevator safety code.

2. Door release - Smoke detectors used to shut smoke or fire doors shall release the detector's associated door. Smoke detectors used to shut a door in a fire-rated stair enclosure shall release all of the doors in the stair enclosure. Each smoke detector used for door release shall be provided with an alarm verification feature and shall indicate a supervisory signal only.

3. Suppression System Activation - Smoke detectors used to activate a fire suppression system (Pre-action sprinkler system, deluge system, or special extinguishing system) shall be crossed-zoned. Cross-zoning of detectors reduces the allowable spacing for the smoke detectors by ½.

C. Heat Detector: Activation of any heat detector shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and at the remote annunciators. All heat detector alarm signals shall be automatically transmitted to UMCP Work Control via CCMS as an "Alarm" signal.

1. Elevator Shunt-trip - Heat detectors in elevator shafts, and in elevator machine rooms shall also operate the shunt trip circuit breaker for the elevator main line in accordance with the elevator safety code.

2. Suppression System Activation - Heat detectors may be used in conjunction with smoke detectors to activate a fire suppression system (Pre-action sprinkler system, deluge system, or special extinguishing system).

D. Water Flow Alarms: Activation of a water flow alarm shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and at the remote annunciators. Each individual water flow switch shall have a distinct address. All water flow alarm signals shall be automatically transmitted to UMCP Work Control via CCMS as a "Water Flow" signal.

E. Valve Tamper Switch: Activation of a valve tamper switch shall initiate a supervisory alarm at the system control panel and at the remote annunciators. Supervisory audible and visible alarms at these locations shall be distinct from either alarm or trouble conditions involving the same or related devices. Each individual tamper switch shall have a distinct address. All valve tamper alarms shall be transmitted to UMCP Work Control via CCMS as a "Valve Tamper" signal.

F. Duct Smoke Detector: Activation of a duct smoke detector shall initiate a supervisory alarm at the system control panel and at the remote annunciators. A duct smoke detector activation shall also initiate an air handling unit shutdown as required by NFPA 90A. All duct detector alarms shall be transmitted to UMCP Work Control via CCMS as a "Trouble" signal.

G. Fire Pump Supervisory Signals: In buildings with fire pumps, individual supervisory signals shall be provided for the following conditions:

1. Fire pump running

2. Fire pump loss of power in any phase

3. Fire pump phase reversal

Activation of a fire pump supervisory signal shall initiate a supervisory alarm at the system control panel and at the remote annunciators. Each set of contacts in the fire pump controller shall have a distinct address. All fire pump supervisory signals shall be transmitted to UMCP Work Control via CCMS as a "Trouble" signal.

H. High/low air pressure signals: Buildings with dry-pipe or pre-action sprinkler systems shall provide a supervisory signal for system high and low air pressure. Activation of a high/low air signal shall initiate a supervisory alarm at the system control panel and at the remote annunciators. Each pressure switch shall have a distinct address. All high/low air supervisory signals shall be transmitted to UMCP Work Control via CCMS as a "Trouble" signal.

I. Trouble Signals: Loss of primary power, short circuit, open faults, ground faults, missing detectors, abnormal detector status (e.g.: dirty detector, replacement incompatible with the defined address), disabled devices and abnormal control functions shall initiate audible and visible trouble signals at the control unit and remote annunciators. Audible trouble signals shall sound until silenced. Silenced trouble signals shall be continuously indicated by a textual message and a trouble LED until restored to normal operation. The trouble LED shall remain illuminated until all abnormal conditions are cleared. Upon a return to normal operation, the audible trouble signal shall resound until restored to normal position. Subsequent trouble events shall resound audible trouble signals until silenced. All trouble events shall automatically be transmitted to UMCP Work Control via CCMS as a "Trouble" signal.

J. Smoke Control Systems:

1. Stair Pressurization System -- Stair pressurization systems shall be activated for any alarm signal in

the building. Stair pressurization systems shall also be manually activated at the annunciator panel with a key operated switch.

2. Atrium Smoke Removal Systems -- Atrium smoke removal systems shall be activated by any atrium waterflow switch or atrium smoke detector. Atrium smoke removal systems may also be manually activated at the atrium smoke removal control panel with a key operated switch.

K. Special Door Locking Arrangements:

1. Delayed Egress Locks -- Doors with delayed egress locks installed in accordance with NFPA 101 shall unlock upon actuation of the fire alarm system.

2. Stair Enclosure Doors -- Stair doors that do not permit re-entry in accordance with NFPA 101 shall unlock upon actuation of the fire alarm system.

PART 2 - COMPONENTS

2.1 CONTROL PANEL

A. The fire alarm and detection system shall be microprocessor based, power-limited, supervised, 24 VDC, non-coded system. The system shall be capable of providing the following functions:

1. Integral clock/calendar

2. Alarm verification (assigned by detector address)

3. Three-pulse temporal pattern evacuation signal

4. Functional walk-test of all initiating and signaling devices.

The following manufacturers and systems, shall be acceptable:

1. Cerberus Pyrotronics - Model MXL

2. Simplex Time Recorder - Model 4100 or 4120

3. Notifier - Model AM2020

2.2 Fire Alarm Annunciator: Textual annunciation shall be provided at the control unit and remotely in a location as approved by UMCP/DAEC. The textual display shall consist of an 80 character supertwist alphanumeric display, which shall include a 32 character user defined message for each device or function. All events displayed on the textual display shall also be recorded on an integral, 40-column, thermal strip printer.The connection between the remote annunciator and the system control panel shall be electrically supervised. A building graphic shall be provided above each remote annunciator. Each building graphic shall include the building outline, all stairs, all exterior doors, all elevators, the location of the fire department connection, the location of the fire alarm control panel, the location of the main sprinkler valve, a North arrow, a "You Are Here" indicator, and the four sides of the building (Side 1, Side 2, Side 3, & Side 4) as indicated by UMCP/DAEC.

2.3 Supervision: Style 4 (Class B) supervision of all initiation devices is required. Notification appliance wiring shall also be Style Y (Class B).

2.4 Power Supply: Primary power shall consist of a two-wire 120 VAC branch circuit from the emergency power distribution panel. The branch circuit disconnect shall be arranged and protected to prevent inadvertent disconnection and ensure optimum reliability. Standby power consisting of rechargeable batteries shall be provided. Batteries shall be capable of powering the system in the normal (standby) mode for 24 hours followed by 5 minutes of operation in the alarm mode (15 minutes for a voice system).

2.5 Passwords and Security: Access to control unit and remote annunciator switches wiring and power supplies shall be restricted by keyed-alike locks. Passwords shall be the same as the assigned University Building Number.

2.6 VOICE/ALARM SYSTEMS

A. Each voice/alarm system shall be capable of providing the following functions:

1. User defined automatic voice evacuation message. Message shall be in a fmelae voice.

2. Public address at control unit and at remote

location(s) as required by UMCP/DAEC.

B. Public Address: During some events and emergencies it may be desirable to disable the voice alarm system and direct occupants over the fire alarm speakers. In the public address mode, the voice alarm signals will be used to transmit instructions. The public address function shall be capable of manually overriding all other signals and users. A hand-held push-to-talk microphone shall be provided at the control panel and each remote panel. Microphone shall be supervised from disconnection. An audio control switch module shall be furnished to provided manual control of audio functions. These switches and associated LED indicators shall be supervised from disarrangement or failure. Audio power amplifiers shall be furnished with self-contained filtered 24VDC power supply, transformer, and amplifier monitor circuits. Amplifiers shall provided an output with a frequency response of 120 Hz to 12000 Hz. A sufficient quantity of amplifier capacity to operate all system speakers simultaneously plus 20 percent spare capacity shall be provided.

2.6 ALARM INITIATING DEVICES

Alarm initiating devices consist of conventional and analog detectors and manual stations connected to the system control unit via Style D or Style 6 (Class A) circuits.

2.7 Duct Smoke Detector Assemblies: Duct smoke detector assemblies shall consist of an analog duct detector (ionization or photoelectric) and an air duct sampling assembly with sampling tube and detector housing. Each duct smoke detector shall be provided with a remote alarm lamp and keyed test switch located in a visible and accessible location.

2.8 Addressable Manual Station: Manual stations shall be red in color, non-coded, double-action, nonbreak-glass type mounted in a semi-flush backbox. Manual station covers shall be hinged and secured with a lockset. Lockset shall be keyed the same as the control unit lockset. Manual pull stations installed in areas subject to damage, vandalism, and/or false alarms shall be protected by a STI Stopper II as manufactured by Safety Technology International, Inc.

2.9 Addressable Heat Detectors: Addressable heat detectors shall be plug-in type with base. The detector base shall be of the twist lock type with screw terminals for field wiring. Heat detectors shall be of the rate compensated type.

2.10 NOTIFICATION APPLIANCES

Alarm notification appliances shall consist of audible and visual signals for public signaling of fire. All notification appliances subject to damage and/or vandalism shall be protected by an STI Fire Alarm Signal Damage Stopper as manufactured by Safety Technology International, Inc.

PART 3 - EXECUTION

3.1 QUALIFICATIONS

System design and installation shall be supervised by an experienced fire alarm technician or fire protection engineer with not less than five years experience with fire alarm systems. Shop drawings shall be prepared and signed by a NICET Level III or IV certified engineering technician or a registered fire protection engineer. The signature of the technician or engineer constitutes an affidavit that the statements, representations, and information presented in the submittal constitute a complete operational system conforming with applicable state codes and recognized engineering practices. All field installation work shall be continuously supervised by a NICET Level II or III fire alarm system technician.

3.2 FIRE ALARM CONTROL PANEL (FACP)

A. LOCATION: The FACP shall be located in:

1. Buildings with automatic sprinkler system: In the same room as the sprinkler system alarm check valve.

2. Buildings without sprinkler system: In the main electrical room.

B. LOCKSET: The lockset for the FACP shall be keyed for a "B" key, CAT15, or a "T45" key.

C. BATTERY BOX: Auxiliary batteries shall be stored in a battery box located adjacent to the FACP. The lockset for the battery box shall be keyed the same as the FACP.

3.3 ANNUNCIATOR PANEL

Annunciator panels shall be located at the main entrance to the building, in a public area such as a lobby, and in plain view unobstructed by the opening of doors or other parts of the building. The lockset to gain access to the annunciator panel shall be keyed the same as for the FACP. Annunciator panels with reset functions that are not keyed activated shall be provided in a tamper proof locked cover to prevent unauthorized tampering.

3.4 INITIATING DEVICES

A. Manual Pull Stations: Manual pull stations shall be provided at the following locations:

1. At the exit from each floor at the stair enclosure exits on the corridor or room side located not more than 5 feet from the stair door.

2. At each door opening to the exterior of the building.

3. At the exit from each High-Hazard Occupancy (High-Hazard as defined by NFPA 101).

4. Manual pull stations shall be located so that the travel distance to any station from any point in the building does not exceed 200 feet.

5. At each exit from an Assembly Occupancy (Assembly Occupancy as defined by NFPA 101).

6. Telephone and electrical rooms in high-rise buildings.

7. Where required by NFPA 72.

Manual pull stations shall be installed 42 to 54 in. above the finished floor. All manual pull stations shall be located to be readily accessible, unobstructed, and visible.

B. Smoke Detectors: Analog smoke detectors shall be installed in accordance with NFPA 72 at the following locations:

1. At each elevator lobby as required by the elevator safety code.

2. In each elevator machine room as required by the elevator safety code.

3. At the top of each sprinklered elevator shaft and bottom of each sprinklered elevator shaft as required by the elevator safety code.

4. At un-enclosed vertical openings as required by NFPA 101.

5. At atriums for smoke removal systems as required by NFPA 101.

6. High-value and high-risk areas such as art galleries, archival records storage, musical instrument storage rooms, library stack areas, and computer rooms.

7. At doors with magnetic hold-open devices.

8. For activation of a pre-action sprinkler system and other special fire suppression systems.

9. In all fire pump rooms.

10. At each FACP.

All smoke detectors shall be programmed for a 30 second alarm verification cycle.

C. <u>Duct Smoke Detectors:</u> Duct smoke detectors shall be provided for mechanical unit shutdown as required by NFPA 90A.

D. <u>Heat Detectors:</u> Heat detectors shall be provided in accordance with NFPA 72 at the following locations:

1. In all sprinklered elevator machine rooms within two feet of the sprinkler head as required by the elevator safety code.

2. At the top of each sprinklered elevator shaft and bottom of each sprinklered elevator shaft within two feet of the sprinkler head as required by the elevator safety code.

3. In any unsprinklered storage room, mechanical room and electrical room.

4. As required for activation of a pre-action sprinkler system and other special fire

extinguishing systems.

E. Interface Modules (Monitor): Addressable interface modules shall be provided to monitor any conventional (non-addressable) alarm notification appliance. Such as:

1. Non-addressable heat detectors.

2. Non-addressable smoke detectors.

3. Valve tamper switches, and sprinkler system butterfly valves.

4. Water flow switches.

5. Pressure switches.

6. Fire pump supervisory alarms.

7. Kitchen Suppression System Activation.

F. Interface Modules (Control): Addressable interface modules shall be provided within three feet of the device being controlled for the control of the following auxiliary functions:

1. HVAC Shutdown: of respective air handler upon activation of associated duct smoke detector.

2. Door Holders: release doors automatically upon activation of associated smoke detector.

3. Door Lock Release: unlock all doors with special locking arrangements as required by NFPA 101.

4. Elevator recall: recall elevators as required by the elevator safety code.

5. Elevator Shunt Trip: operate the shunt trip circuit breaker for the elevator main line in accordance with the requirements of the elevator safety code.

G. Water Flow Detectors: Water flow detectors shall be provided to monitor sprinkler systems for waterflow. Water flow detectors shall be provided for the following:

1. At each alarm check valve (Pressure switch).

2. At each dry-pipe valve (Pressure switch).

3. At each pre-action system valve (Pressure switch).

4. At each sprinkler or standpipe system riser.

5. One flow switch per sprinkler system zone on each floor.

See the UMCP design guidelines for sprinkler and standpipe system for more specific information on water flow detectors.

H. Sprinkler/Standpipe Valves: Provide supervision for each sprinkler/standpipe system control valve.

I. Fire Pump Supervision: For each fire pump provide individual supervision of the following fire pump alarms:

1. Fire pump running.

2. Fire pump loss of power in any phase.

3. Fire pump phase reversal.

J. High/Low Air Pressure Supervision: Provide supervision of low and high air pressure for each dry-pipe system and each pre-action system.

3.5 OFF-SITE SUPERVISION

Provide in or adjacent to the control panel all equipment necessary to connect the fire alarm system to the University Fire Alarm Monitoring System (UFAMS). UFAMS uses a Keltron Active Radio Newtork System to transmit data from the fire alarm control panel to receivers at the University Security Operations Center and the Work Control Center. Each fire alarm control panel shall have a Keltron RF750F8 Transceiver installed. The dry contact outputs in the fire alarm control panel shall activate dry contacts in the transceiver to transmit the following signals:

A. Fire Alarm System in Alarm.
B. Valve Tamper.
C. System Trouble.
D. Waterflow.
E. Fire Alarm System Power Off.
F. Hi & Low Air Pressure on Dry pipe & preaction sprinkler systems.
G. Fire Pump Run
H. Fire Pump Fault

Note: DES Code Services or FM Life Safety Systems may direct that other signals be transmitted.

All addressable fire alarm systems shall have, in addition to the RF750F8 transceiver, a Keltron “Datatap” card, configured for the specific model of fire alarm system. The Datatap transmits point specific information from the fire alarm system via the fire alarm system printer port. Operations & Maintenance Life Safety Systems maintains configuration information for all fire alarm systems that meet the requirements of the DCFS.

All resident hall fire alarm systems must have an integral digital alarm communicator transmitter (DACT) with a single telephone line that will communicate with the Keltron Digital Alarm Communications Receiver (DACR).

3.6 SPARE PARTS

The fire alarm system contractor shall supply the University with a minimum of one replacement for each six devices (or fraction thereof) installed of the following devices:

A. Analog Smoke Detectors.

B. Addressable Manual Stations.

C. Interface Modules (monitor).

D. Interface Modules (control).

E. Horn/Strobe Signals.

F. Speaker/Strobe Signals.

G. Strobe Signals.

H. Duct Smoke Detectors.

I. Door Hold Open Devices.

J. Addressable Heat Detectors.

3.7 SIGNS

Provide and install 5 inch by 7 inch engraved red plastic signs with white lettering (helvetica or sans serif type) above each manual pull station. Secure signs to surface with pan head screws and suitable anchors. These signs shall read as follows:

IN CASE OF FIRE EMERGENCY!

1. PULL FIRE ALARM
2. LEAVE BUILDING
3. CALL FIRE DEPARTMENT
   DIAL 9-1-1

The fire alarm is **NOT** connected to the fire department.

Notify 405-2222 immediately if fire alarm system is disabled.

3.8 WIRING

All field wiring shall be installed in conduit. Conduit and boxes shall be sized according to National Electrical Code(R) requirements based on the number of conductors. Initiating device circuit wiring shall be two-conductor, twisted with integral shield and ground. Notification appliance circuits shall be minimum 14 AWG. Primary power (AC) branch circuit conductors shall be minimum 12 AWG. All conductors which are terminated, spliced, or otherwise interrupted shall be connected to terminal blocks. Make all connections with pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.

A. Identification: Fire alarm circuits shall be identified by red junction box covers stenciled in white letters "FIRE ALARM."

3.9 SYSTEM TESTING

All initiating and notification appliances, control equipment, accessories, and auxiliary functions shall be tested in accordance with NFPA 72 acceptance test procedures.

3.10 TRAINING

Provide complete certified factory technical training for a minimum of two of the University's select representatives. The University's select representatives shall, upon completion of the above training, be factory qualified to perform complete maintenance and repair of the fire alarm system. The contractor shall assume the responsibility to coordinate with the University the location and time required for the above certified factory technical training.

13.02 FIRE-SUPPRESSION AND PROTECTION SYSTEMS

A. CODE REQUIREMENTS

All requirements of State of Maryland and the Office of the State Fire Marshal shall apply to the specifications and design requirements, including the following:

A. NFPA 1 National Fire Prevention Code

B. Underwriters Laboratories Inc. (UL), Fire Protection equipment list

C. Factory Mutual Approval Guide

D. Maryland Occupational Safety and Health Act

E. NFPA 13 - Standard for the Installation of Sprinkler Systems

F. NFPA 13D - Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and manufactured Homes

G. NFPA 13R - Standard for the Installation of Sprinkler Systems in Residential occupancies up to and Including Four Stories in Height

H. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems

I. NFPA 15 - Standard for the Installation of Water Spray Fixed Systems

J. NFPA 20 - Standard for the Installation of Centrifugal Fire Pumps

K. NFPA 70 - National Electrical Code

L. NFPA 72 - National Fire Alarm Code

M. NFPA 101 - Life Safety Code

N. NFPA 170 - Fire Safety Symbols

O. NFPA 231 - General Storage

P. NFPA 231C - Rack Storage of Materials

Q. NFPA 1963 - Fire Hose Connections

R. UMCP Design Criteria Facilities Standards Manual for Architecture and Engineering Services (DCFS)

S. Washington Suburban Sanitary Commission (WSSC) - Plumbing and Gas Fitting Regulations

B. PIPING

A. Connection shall be made to the UMCP on-site water system. The connection between -system piping and underground piping shall be made with a cast iron flanged piece, properly fastened.

B. A backflow preventer shall be installed in accordance with WSSC regulations. The backflow preventer shall be listed by UL for fire protection use.

C. All piping exposed installed outside, or otherwise exposed to weather, shall be externally galvanized.

C. VALVES

A. All valves on connections to water supply to sprinklers shall be UL listed butterfly type indicating valves except for the following which shall be O.S.& Y:

1. All indicating valves on the supply side of the backflow preventer.

2. The indicating valve immediately adjacent to the backflow preventer on the system side.

3. All indicating valves on the suction side of the fire pump.

4. Where indicated on the contract drawings.

B. Post Indicator Valve - when indicated on the contract drawings, a gate valve on incoming water service shall be operable by a UL listed post indicator valve with tamper switch. Post indicator valve shall be installed a minimum of 40 feet from the building.

D. PIPING ACCESSORIES

A. No sprinkler piping is to be supported from any mechanical or electrical devices and/or equipment (ducts, lights,etc.). No,chains, wire or perforated band iron will be permitted for hangers. Hanger assemblies installed outside, or otherwise exposed to weather, shall be externally galvanized.

B. Install iron pipe sleeves of ample diameter at all points where pipes cut beams or floors or walls, so sized and installed that sprinkler pipes will not bend.

1. Install sleeve before walls or concrete work is built or poured, with sleeves being flush with wall surfaces.

2. Sleeves for underground pipes shall be caulked with oakum and molten lead and be watertight.

E. SPRINKLERS

A. Sprinklers that may be subject to mechanical damage due to their location (under stairwells, low hanging sprinklers in corridors, storage rooms, under ducts, etc.) shall be provided with guards listed by UL for the model and type of sprinkler used.

B. Sprinklers under open grating shall be provided with approved shields.

F. FIRE DEPARTMENT CONNECTIONS

Each fire department connection shall be the flush type. Free standing type fire department connections shall only be installed when approved by UMCP/DAEC and shall be located a minimum of 40 feet from the building. Each fire department connection shall have two (two) 2-1/2 inch inlets with threads conforming to the American National Fire Hose Connection Screw Thread as defined in NFPA 1963, equipped with UL listed screw caps with pin lugs and chains. The Fire department connections shall be not less than two feet and not more than 3 feet 6 inches in elevation, measured from the ground level to the center line of the inlets. Two fire department connections are required when two or more risers are provided.

G. DRAINS AND TEST PIPING

A. All risers, including the alarm check valve, shall be equipped with drains with sizes as specified in NFPA 13. The alarm checkvalve drain ("main drain") shall be piped to the outside of the building at a point free from causing water damage. Where this arrangement is not practical, the drain shall be piped to a floor drain or sump approved for the purpose by the Departments of Physical Plant and the UMCP/DES.

B. All drains and test piping shall piped to the outside of the building at a point free from causing water damage. Where this arrangement is not practical, the drain shall be piped to a f loor drain or sump approved for the purpose by the Departments of Physical Plant and the UMCP/DAEC.

H. DRY PIPE SYSTEM

Dry systems shall only be installed when adequate heat or insulation can not be provided to prevent sprinkler piping from freezing.

A. An air compressor (Reliable Model A or equivalent) with an automatic air maintenance device (Reliable Model B-1 or equivalent) shall be, installed and sized in accordance with NFPA 13.

B. A separate test connection shall be provided in accordance with NFPA 13 to test the dry-pipe system alarms.

J. PRE-ACTION SYSTEM

Pre-action systems shall only be installed where required by UMCP/DAEC and the facility program.

A. The pre-action valve shall be activated by rate compensated heat detectors or cross-zoned smoke detection as approved UMCP/DAEC. Refer to section 13.1.

K. FIRE PUMP, MOTOR AND CONTROLLER

A fire pump shall only be installed when the existing water supply is not adequate to meet the required sprinkler demand.

L. EXCESS PRESSURE PUMP

An excess pressure pump shall be installed on all systems that do not have a fire pump. The excess pressure pump shall be Gamewell or equal 1/4 HP motor 120v single phase, 60 HZ.

M. DRY STANDPIPE SYSTEM

A. Dry standpipe systems shall be the manual - -dry type as defined by NFPA 14.

B. Each standpipe riser shall be installed with a UL listed 2½ inch NST fire department hose valves with screw caps on each floor in an accessible, protected, and readily visible location in accordance with NFPA 14.

C. Each dry standpipe riser shall have a drain sized and located in accordance with NFPA 14. Each drain shall be piped outside the building in accordance with item 2.10.B of this section.

D. All dry piping shall be installed so that the entire system may be drained. The number of auxiliary drains shall be kept to a minimum.

E. All dry piping, hangers and fittings shall be galvanized.

F. Each dry standpipe shall be provided with an air and vacuum valve installed at the top of each riser. The air and vacuum valve shall be a 1 inch APCO Series 140 air and vacuum. valve, manufactured by Valve and Primer Corporation or approved equal.

N. PROTECION

Protection: All exposed piping devices (non-brass and chrome) are to be painted with two coats of bright red paint. Painting to conform to the protective coating section of the specifications.

O. QUALIFICATIONS

System design and installation shall be supervised by an experienced sprinkler system technician or fire protection engineer with not less than five years experience with sprinkler systems alarm systems. Shop drawings shall be prepared and signed by a Class III Sprinkler Contractor licensed in the State of Maryland or a registered fire protection engineer. The signature of the technician or engineer constitutes an affidavit that the statements, representations, and information presented in the submittal constitute a complete operational system conforming with applicable state codes and recognized engineering practices. All field installation work shall be performed by a Class III Sprinkler Contractor licensed in the State of Maryland.

A. All installations/or removals must be in accordance with the requirements of OSHA, Federal, and State EPA regulations, COMAR, The Maryland Department of the Environment and the International Mechanical Code. Also Reference Section 1, Environmental Health and Safety in facility design for UST regulatory considerations/citation. The contractor shall be responsible for all required inspections and permit applications.

B. When at all possible, natural gas service or above ground fuel tanks are preferred over underground storage tanks.

C. Tanks shall be constructed of double wall fiberglass reinforced plastic (FRP) for underground use and double wall steel for above ground tanks.

D. Piping shall be either FRP or copper depending on size.

E. Material used in construction of the tank shall be compatible with the substance to be stored.

F. Low level alarm signal to DDC or Hawkeye as appropriate, and a high level alarm on a local horn or bell mounted at or near the tank vent approximately 8 foot above grade.

G. If the fuel storage tank is not located in the mechanical room with the generator set, then a remote level gauge near the generator is required.

H. Manholes, over-fill level alarms and/or other over-fill protection nozzles shall be provided as required.

I. Abandoned tanks must be removed and disposed of by the Contractor.

13.04 WET CHEMICAL FIRE EXTINGUISHING SYSTEMS

PART 1 - GENERAL

1.1 The installation of new wet chemical fire extingushing systems shall comply with the following:

A. FACTORY MUTUAL ENGINEERING AND RESEARCH CORPORATION (FM) Approval Guide

B. NFPA 17A -- Wet Chemical Extinguishing Systems

C. NFPA 70 -- National Electrical Code

D. NFPA 72 -- National Fire Alarm Code

E. NFPA 96 -- Ventilation Control and Fire Protection of Commercial Cooking Operations

F. UNDERWRITERS LABORATORIES INC. (UL) Fire Protection Equipment Directory

G. UL 300 -- Fire Testing of Fire Extinguishing System for Protection of Restaurant Cooking Areas.

1.2 Qualifications

Installation drawings, shop drawings, and as-built drawings shall be prepared, by or under the supervision of, an individual who is experienced with the types of works specified herein, and is currently certified by the National Institute for Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level-III certification in Special Hazard System program. Contractor shall submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings.

PART 2 - PRODUCTS

2.1 PRE-ENGINEERED WET CHEMICAL FIRE EXTINGUISHING SYSTEMS

Systems shall comply with NFPA 17A and NFPA 96, except as modified herein. Piping and accessories within the hoodshall be stainless steel or chrome plated. All other piping shall be galvanized malleable iron or galvanized steel, painted to match the adjacent surface chrome or nickel plated or stainless steel or black steel painted to match the adjacent surface. Exhaust hoods with grease extractors UL listed or FM approved are not required to have protection downstream of the grease extractors. Provide systems for protection of new or existing cooking equipment, including exhaust hoods and ducts for cooking equipment requiring protection by NFPA 96.

2.2 SYSTEM CONTROLS

Each system shall be mechanically actuated by fusible links and by remote manual actuation stations connected to the extinguishing system release mechanisms by stainless steel cables. Arrange each system to automatically shut off the flow of fuel and electrical power to cooking appliances as indicated [and to automatically actuate the building fire alarm fire alarm system as indicated. Electrical power to hood exhaust fans shall not be shut off unless specifically required by the UL listing or FM approval.

2.3 IDENTIFICATION SIGNS

Provide red rigid plastic signs with engraved 6 mm (0.25 inch) high white lettering at each remote manual actuation station. Sign legends shall be "Fire Extinguishing System" followed by a brief description of the equipment protected.

PART 3 - EXECUTION -- Tests and Inspection

A representative of UMCP DAEC will witness formal tests and approve systems before acceptance. Submit a written request for formal inspection at least 7 working days prior to inspection date. An experienced technician regularly employed by the system installer shall be present during the inspection. At the inspection, repeat any or all of the required tests as directed. Provide plastic containers, hose fittings, and hose at each nozzle to capture the wet chemical and discharge each system to demonstrate uniform distribution of the wet chemical among the nozzles. Furnish compressed air, nitrogen, wet chemical equipment, and personnel for the tests. Refill and reset systems after tests have been completed.

A. General

1. Circulation patterns and anticipated usage of the building shall determine the appropriate types and number of elevators required to ensure a fully functioning building. At a minimum, each floor or area of the building shall be served by at least one passenger elevator with a 3500 lb. or greater capacity. Any new building, three stories or more, in which at least one elevator is planned, shall have a passenger elevator that can accommodate a horizontally carried and positioned 6 foot 8 inch rescue litter, serving each floor or area of the building that exceeds one floor or level above or below the exit floor.

2. Provide State-of-the-art microprocessor based control systems with remote monitoring, independent service, firefighter's service, inspection, access, and automatic two-way leveling. The system shall provide a comprehensive means to access the computer memory for diagnostic purposes and shall have permanent indicators to indicate important elevator statuses as an integral part of the controller. Company specific proprietary systems are not acceptable. Only equipment that is supported by the manufacturer to all elevator maintenance companies without regard to affiliation or the lack thereof will be acceptable.

3. The installer may either connect into an existing compatible campus wide remote monitoring system or provide all labor and materials, including software, required to install a system compatible with their Controller. The remote monitoring system shall be capable of monitoring multiple elevators and/or groups of elevators simultaneously and each elevator or group of elevators shall be simultaneously monitored from at least two remote locations outside the building on campus. In addition, the remote monitoring system shall include a dial in modem and software so that the system may be monitored from an off-campus site.

4. Provide State-of-the-art microprocessor based drive control systems, either Variable voltage variable frequency ac motor drives or solid state dc motor control systems are required. These systems, like the controller, shall be nonproprietary.

5. All motors used in elevator systems shall be factory guaranteed to be a minimum 90% efficient at full load at the rpm that it is being operated. The motor shall be designed for its respective service and duty. The motor shall be designed to develop high starting torque with low starting current, with all parts capable of meeting the severe requirements of elevator service. The name plate of the motor shall identify the motor efficiency, rpm, voltage, full load amperes, frequency, and duty of the motor.

6. If any diagnostic tool or equipment is required to set up, adjust, or trouble shoot the system, or any part of the system that one of each of these tools or equipment will be provided with each elevator purchased including complete instructions for its use.

7. The Firefighter's Service key-switch shall be operated by the EPCO MFD-1 key and that all other key-switches and locks shall be Best 7-pin cylinder key-switches and locks.

8. The building shall be designed so that no thoroughfare to other areas, including the roof, is required through the elevator machine room.

9. Insulation applied to walls or structural members of or within the elevator shaft or machine room shall be encapsulated to prevent flaking and peeling.

10. Elevator system power and car lighting power, shall be provided through a shunt trip circuit breakers with 135 degree heat detectors located in the machine room, the top of the elevator shaft, and the elevator pit. The heat detectors shall be positioned within 18 inches of any sprinkler head or heads in these areas.

11. Sprinkler pipes entering the elevator machine room or the elevator shaft shall be branch lines only, serving that space only and not continuing to another area. A sprinkler shutoff valve shall be provided immediately outside the space and its location shall be marked or a sign shall be provided at the sprinkler head denoting the valves

location.

12. Paint elevator machine room walls with white semigloss enamel paint. Paint the elevator machine room floor and the elevator pit floor with gray floor enamel. In each case use the paint manufacturer's recommendations and directions for the preparation and application of their product.

13. Elevators shall have telephones with hand-free operation containing an integral automatic tone dialer. Telephones shall be field programmable without the need for special tools or programmers and comply with the latest ADA guidelines. Reference Division 16, Telecommunications Systems, Elevator Phone for acceptable Talk-A-Phone Co. Model #EPT-100E manufacturer. If the phone is to be programmed to our Work Control, the emergency message shall be defeated or blocked.

14. The Elevator car lighting disconnect shall be fed from a shunt trip circuit breaker in the emergency lighting panel.

15. All elevator related electrical disconnects shall be marked with the panel #, the circuit #, and the room # or location of the circuit breaker from which it is fed.

16. All elevator pits that are below grade shall be fitted with a sump and a functioning sump pump system to remove ground water to the storm drain system. An “oil minder control system” shall be incorporated (see STANCOR web site) on hydraulic elevators with the control and alarm in the Elevator Machine Room. The alarm contacts shall be connected to the CCMS if available.
17. Provide hoistway access escutcheons or devices on all hoistway doors without regard to the number of elevators in the group.

B. Shafts

All elevator shafts and pits that are below grade shall be sealed and waterproofed with an effective barrier system on the exterior walls and below the pit floor. Install back draft dampers in all elevator shaft vents with access to the dampers.

C. Hydraulic Elevators

1. Hydraulic elevators shall have a scavenger pump and a sump pump with an “oil minder control” (see STANCOR web site) to prevent oil from being pumped into the storm sewer system and to prevent water from being pumped into the oil reservoir.
   The controls shall be located in the Elevator Machine Room. The alarm contact shall be connected to the CCMS if available in the building.

2. The Hydraulic jack shall be of double wall construction and shall be encased in a schedule 40 pvc jacket with waterproof seal at the pit floor and waterproof, high pressure seal at the bottom.

3. Underground hydraulic piping shall be avoided if in any way possible. If it is unavoidable, the piping be shall coated and wrapped to prevent corrosion and encased in schedule 40 pvc piping.

4. The Machine Room shall be designed with an oil containment barrier system surrounding the pump unit to prevent hydraulic oil from escaping from the room.

D. Roller Guides

1. All elevators shall be equipped with constant contact roller guides on the top and the bottom of the car frame.

2. Elevators with rated loads of 4000 lbs. or less shall have 3 point roller guides (3 rollers per guide) and elevators with rated loads above 4000 lbs. shall have 6 point roller guides (6 rollers per guide).

3. All car and hoistway door sills shall be constructed of nickel silver. Aluminum sills either cast or extruded are too soft and are not acceptable.

E. Cabs

1. Passenger elevator cab interior lighting shall be a

minimum of two energy efficient florescent lamps controlled by energy efficient electronic ballasts. The lighting system shall consist of 1-1/2" stainless steel tee's and 1-1/2" stainless steel ell's permanently welded into a solid framework grid. The lighting grid shall be suspended from the ceiling of the cab at a height of no less than 90 inches from the floor to the bottom of the grid. The ceiling grid shall support milk white lighting diffusers of no greater than 2 ft. x 2 ft. in size and shall be designed to align with the top emergency exit. Exposed surfaces of the grid shall be ground and polished to a # 4 satin finish.

2. Freight elevator cab interior lighting shall be a minimum of two energy efficient fluorescent lamps controlled by energy efficient electronic ballasts. the lighting fixtures shall be flush mounted to the ceiling of the cab with appropriate dress rings or molding to provide a neat appearance. The lamps and ballasts shall be removable from the interior of the cab.

3. Freight elevators shall be equipped with power operated hoistway doors and car doors or gates and shall satisfy the requirements of ANSI/ASME A17.1 rule 207.4.

4. Position indicators shall be provided inside the cab and at all landings or levels that lead directly to a building exit. The position indicator shall contain 2 inch high 16 segment red LED's on a black background, covered by a deep red acrylic lens. The position indicator shall also have up and down arrows included in the display to indicate the direction of travel.

5. Elevator car doors shall be equipped with full length, infrared, curtain type sensing units in lieu of safety edges and photo ray devices.

6. Elevator cab shall be provided with protection pads and hooks on three walls. Hooks shall be provided in the Elevator Machine Room to store pads when not in use.

F. Maintenance/Operating Manuals

1. Complete wiring and single line diagrams showing

the electrical connections, functions, components, and sequence of operation of all apparatus connected with the elevator system shall be provided in triplicate prior to initialization of work.

2. Three complete sets of neatly bound operating and maintenance instructions shall be furnished specifically for elevator installations. The maintenance instructions shall include detailed information, with sufficient illustrations to prevent misinterpretation. The maintenance instructions shall include complete detailed data sufficient to adequately service the entire system, troubleshoot, repair, and order replacement parts. Each manual shall also contain a copy of the instructions and programs required to install, set-up, and adjust the elevator system or any part of the system, including passwords of all levels.

PART ONE

I. General

Because only a small portion of HVAC design is code-driven, and because the choice of HVAC design concepts bears heavily on maintenance cost and energy cost, the University has certain preferences, and expects to see them reflected in designs submitted our consultants. By not doing so, the designer risks rejection of the concept and a requirement to rework without additional compensation.

The intent of this document is not to dictate the design concept but the interplay of first cost, performance, maintenance and operating cost related to the mechanical systems remains the responsibility of the designer. If the University’s preferences are at variance with the application in design, the onus is on the designer to bring this to the attention of the University.

Neither is it the intent to discourage creativity. Alternatives are welcome. In fact, depending on the circumstances of project funding, State regulations may require life cycle analysis of several alternatives for HVAC systems. When such comparative analysis is required, the concepts, systems, and components described herein by those favored by the University must be among the alternatives analyzed.

Unless specifically directed otherwise by the program document, the following HVAC standards and preferred design concepts apply to all projects on the College Park campus of the University of Maryland.

A. Design Conditions - Heating and Cooling

Perform the HVAC load calculations based on the following outside conditions

Summer -95 degrees design drybulb,78 degrees wet bulb
Winter - 0 degrees drybulb (colder than the ASHRAE 99% value)

Select cooling towers at 78 degree design wet bulb (the ASHRAE 1% value)

Design for the following Inside conditions:

Summer 74 degrees drybulb +/-2 degrees (Operating range of 72-76)
Winter 70 degrees drybulb +/-2 degrees (Operating range of 68 - 72)

B. Humidity control

1. Summer: Unless noted to the contrary in the program document, inside relative humidity is not to be directly controlled - the University recognizes that dehumidification is a byproduct of the cooling process.
However, it is required that cooling equipment and systems be selected and sized to produce 50% rh + / - 5% in the conditioned space when design outside conditions prevail , and other design parameters are fulfilled.

   HVAC system concepts noted for poor humidity control at part load conditions are subject to rejection. Such systems include, but are not limited to:

   a. Systems which allow outside (ventilation) air to pass over inactive cooling coil surfaces.

   b. Capacity control schemes which allow coil temperatures to rise above that required for dehumidification.

   c. Systems which do not continuously dehumidify all ventilation (outside) air.

2. Winter: The university standard is to add no moisture to the air stream. When the program document indicates that humidity control in winter is required, it is expected that humidification equipment will be sized with respect to the envelopes ability to accommodate elevated levels of interior air dewpoint.

   Conditions that result in condensation on inside surfaces, visible or concealed must be avoided. The University's intent is to avoid microbial growth on interior surfaces. (see Equipment humidification).

C. Ventilation

1. CFM/person is the university standard for quantification of ventilation rates.

   Population density will be defined in the program document. Otherwise, refer to ASHRAE Standard 62. Reasonable assumptions (diversity, etc) are encouraged in determining the population for purposes of determining the ventilation air quantity, but the assumptions must be documented and understood by the Using agency.

2. Unless the specific application or the applicable building code mandates higher ventilation air quantities, HVAC designers must respect the most current revision of ASHRAE standard 62, while pursuing reasonable first cost, energy-efficient HVAC design noted in ASRAE 90.1-1999 (or most recent edition). Where aspects of energy use and air quality are in conflict, air quality shall take precedence.

3. Note: In attempts to use ASHRAE standard 62 interpretations to reduce the volume of ventilation air, it will not always be possible to assume scenarios of continuous ventilation, non-continuous occupancy. A representative of the Using agency must agree to the occupancy scenarios.

4. The application of CO2 sensors is encouraged where appropriate to minimize cooling, dehumidification, and heating of outside ventilation air.

D. Duct liner

Acoustical (fiberglass) duct liner is preferred as the economical alternative to oversized ducts (low velocities) and mechanical sound control devices. However, the duct liner product, and the application techniques, must be specified with the intent to avoid IAQ problems. Examples include, but are not limited to:

a. Special coatings to eliminate the erosion of liner particles

b. Special Installation practices (buttered edges, etc.) to deter erosion of particles

c. No liner may be used in areas where the liner may become wetted during normal system operation, or in abnormal weather conditions.

d. Locate adequately sized and spaced access openings in duct to facilitate periodic inspection and cleaning

E. Equipment redundancy, spare capacity and back-up power

a. Redundancy - Generally, because of cost control, redundancy is mandated only in the case of critical systems and/or equipment, identified as critical in the program document.

Regardless of the system redundancy requirements of the program document, the design shall provide for redundancy in the following items of mechanical equipment, if such equipment is a part of the project design and if the need for redundancy has not been expressly waived by the program document :

1. Condensate (steam) return units: Duplex pumps with automatic alternators are required. The design shall be such that design flows will be handled by a single pump with 33% run time.

   This equipment shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator.

2. Package sump pumps (storm water): The design shall incorporate duplex pumping with automatic alternators. The design shall be such that design flows will be handled by a single pump with 33% run time.

   This equipment shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator.

   The equipment covered by this provision does not refer to residential-type submersible pumps, powered from 120 VAC receptacles.

3. Sewage Ejectors - A single sump is acceptable. Incorporate duplex pumping with automatic alternators. The design shall be such that design flows will be handled by a single pump, with 33% run time.

   This equipment shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator.

4. Submersible sump pumps in elevator pits, etc. There is no requirement for redundant pumps. However, a high water alarm shall be installed, connected to the CCMS, and the submersible pump shall be powered from the emergency generator, if an emergency generator is part of the project. It is not the intent of this provision to create a requirement for an emergency generator. Submersible pumps shall not be used in “pits” where exposed to temperatures above 100 degrees F. (See Division 14.01)

5. Chilled water pumps - In single chiller applications, a second, full sized pump/motor assembly shall be designed. The second pump shall be designed for manual valving in and starting after a failure of the main pump. It is permissible to use the spare pump as a standby pump for an associated single condenser water pump.

   The use of parallel pumping arrangement for purposes of creating spare capacity (with the second pump) is not allowed.

6. Primary chilled water pumps. In multiple chiller / dedicated pump applications, one spare primary chilled water pump *motor* shall be specified.

7. Secondary chilled water pumps. Where used, secondary chilled pumps will typically be a

single pump, VFD controlled. If the water flow rate is such that two pumps are indicated, the designer shall bring this to the attention of the University for discussion in the schematic design phase. Unless two pumps are needed to handle design flow, a second, standby secondary pump is required, with a dedicated VFD. The second pump shall be designed for manual valving in and manual starting after a failure of the main pump system. Generally, the University prefers end-suction pumps, but this preference may be waived in the interest of limiting the number of pumps.

8. Condenser water pumps. In single chiller / tower applications, a second condenser water pump, full size shall be designed. The second pump shall be designed for manual valving in and starting after a failure of the main pump.

   The use of parallel pumping for purposes of creating spare capacity is not allowed.

   It is permissible to use the spare condenser water pump as a standby pump for a single chilled water pump. Note: In multiple chiller/pump applications, with a dedicated condenser water pump in each condenser water circuit, a spare pump motor shall be specified, stored on site in corrosion-resistant packaging.

9. Primary hot water pumps - In single boiler applications, a second, full sized pump/motor assembly shall be designed. The second pump shall be designed for manual valving in and starting after a failure of the main pump. The use of parallel pumping for spare capacity will be disallowed. Note: In multiple boiler /dedicated HW pump applications (such as in primary/secondary pumping) one spare primary hot water pump motor shall be specified, stored on site in corrosion-resistant packaging.

10. Secondary hot water pumps. Where used, secondary hot water pumps shall typically be a

single pump, VFD controlled. If the water flow rate is such that two pumps are indicated, the designer shall bring this to the attention of the University in the schematic design phase. A second, standby pump shall be designed, with a dedicated VFD. The second pump shall be designed for manual valving in and manual starting after a failure of the main pump system. Generally, the University prefers end-suction pumps, but this preference is waived in the interest of limiting the number of pumps.

11. Control air compressors. A single tank is acceptable. The design shall incorporate duplex air compressors / motors with automatic alternator. The design shall be predicated on one third run time for one compressor, with the second compressor designed as a full standby. There is no requirement for redundancy in the refrigerated air dryer or oil filter system.

F. Spare Capacity - Generally, equipment shall be sized at half capacity and used in multiples of two. Allowance for load growth beyond that specified below will be stated in the program documents.

1. In the case of local heating boilers, size each boiler for the full calculated boiler load.

2. In the case of steam boilers intended for use only during the annual steam outage, there is no requirement for spare capacity or redundancy.

3. Chilled water cooling coils and filter banks - size the coil for 450 fpm face initial velocity to allow for air quantity growth to 550 fpm. Size the fan (but not the fan motor) for the resistance at the future (higher air) flow.

G. Firestopping. The designer shall note in the specifications that firestopping of floor and wall penetrations related to the trades in division 15 of the specifications is to be specified, furnished and installed under another section of the specification.

The division 15 specification shall require that the subcontractors furnish, when transmitting prices to the prime contractor, a list, with sizes, of all openings to be firestopped.

A. General

The University encourages the HVAC consultant to employ energy-efficient design, consistent with the project budget. The University desires to maximize all opportunities to participate in funding assistance from utilities, including rebates, design fee subsidies, and other incentives to stimulate energy-efficient design. Also, the University recognizes that, depending on the circumstances of project funding, State regulations may require life cycle analysis of alternative HVAC systems. When such comparative analysis is required, at a minimum, the following systems shall be presented as alternatives.

The intent is for the University to receive state of the art, energy-efficient HVAC design, but not necessarily at a first cost premium.

1. Being committed to the SCUB (**S**atellite **C**entral **U**tility **B**uilding) concept, the University's preference is for chilled water based systems. The HVAC designer is required to rule out using chilled water concepts capacity before relying on DX equipment.
2. Air handlers with air-cooled package chillers are preferable to field-piped (spilt system) direct expansion (DX) systems. Among other shortcomings, the university perceives that the direct expansion approach is relatively inflexible because cooling load growth and changes in space layouts are a given at the campus.

   Field-piped DX evaporators with condensing units will be rejected unless, in the schematic design phase, the case can be made that a nuance of the application or of the site requires a DX approach.

3. When field piped DX systems are employed, it shall be incumbent upon the engineer of record to develop the details of the field - piped refrigeration system layout and show the details on the bid documents. (oriented around

the equipment which is the basis of design) The intent is for all bidders to be able to include in the price the equipment, accessories and specialties needed for proper operation and compressor protection.

a. If field-piped DX systems above 7.5 tons are employed, refrigerant piping layouts shall be included in the bid documents. Refrigerant piping layouts shall be oriented around the equipment which is the basis of design and shall be complete in all details, including face and row split arrangements, pipe sizes, pipe pitch, and all required refrigerant control components and specialties identified by model number. Face split only coils, because of the bypassed air at low loads, will be rejected unless the designer, in the schematic design phase, can make a case that the application requires the technique.

b. For DX split systems above 20 tons, and for any size field-piped DX application handling 100% outside air, refrigerant piping layouts, including an isometric view, shall be included in the bid documents. The refrigerant piping layout shall be specific to the equipment which is the basis of design; the layout shall be complete in all details, including, but not limited to: face and row split arrangements, pipe sizes, pipe pitch, suction riser detail, insulation, vibration isolation, and trap details. Thermostatic control valve size, orifice size, and all other required refrigerant control components, accessories and specialties shall be identified by model number on the drawing. The maximum and minimum evaporator coil loads shall be stated and the bid documents shall include a certification by an officer of the (basis of design) compressor manufacturer that the piping layout is approved for the particular application.

c. The DX equipment specification shall require compressor and coil to be by the same manufacturer. The rationale here is that the compressor manufacturer is typically a design resource.

d. The specification shall require that, if other than the basis of design is submitted, the submittal will be accompanied by an equivalent piping drawing and compressor manufacturer certification.

e. Submittal data will be required to include ARI coil selections at various load points. The load points will include, but are not limited to the following:

- Full cooling load
- Outside temperature at 75 degrees db, 75 degrees wb, no solar load
- Outside temperature 2 degrees ABOVE that which will produce mixed air at 55 degrees (cooling without compressor operation)

At other than full load points, the designer shall comment on refrigerant velocity in tubes and critical pipe sections with regard to oil return to the compressor.

4. Water-cooled or evaporative cooled condensing shall be the basis of design unless the case can be made, in the schematic design phase, that the application mandates air-cooled condensing equipment.

5. It is acceptable for capacity ratings of air-cooled refrigeration equipment to be based on operation at 95 degrees ambient, but the air-cooled equipment must be capable of operating continuously in the highest temperatures to be expected on campus, in the particular equipment location.

6. All buildings are candidates for SCUB service (central chilled water). Accordingly:

   a. If an on site chiller is the basis of design, select air handler cooling coils, delta t, etc., in anticipation of a future conversion to SCUB service. Rationale: SCUB produced chilled water can be expected to be delivered to the building at no colder than 45 degrees.

   b. Avoid chilled water systems which rely on glycol.

7. When cooling coil freezing is a risk, unless all piping is within mechanical spaces, avoid the use of glycol in chilled water systems. The intent is to avoid glycol-containing pipes in occupied spaces; local heat exchangers may be required. In safeguarding against cooling coil freezing, first rule out glycol/water preheat coils or electric / steam preheat coils. Arrange non-freeze steam coils for positive gravity condensate drainage. Annual draining of coils is not an acceptable design solution.

8. Winter cooling without refrigeration may be either 100% outside air (airside economizer) or condenser water based free cooling.

   a. With air side economizers, barometric relief is the preferred means of relieving building pressurization. Where return air fans are used, take particular note to avoid overpressurization of the building. Acceptance testing will, among other aspects of HVAC operation, require proof of system operation with 100% outside air with no adverse effect on building pressurization.

   b. When 100% outdoor air is used for winter cooling, the control system shall also employ enthalpy cycle cooling for cooling with 100% outside air with the refrigeration system operational when outside air humidity allows.

c. When heat exchangers are used to produce free cooling chilled water from cooling tower water, the design shall incorporate provisions to accommodate the following:

1) Avoid elevated chilled water temperatures during the waterside economizer operation.

2) Include a means of maintaining chilled water at design temperature while extending the operating hours of the water side economizer. A chiller in series with the free cooling heat exchanger is a method which would not necessarily be rejected.

3) Assure that the system can revert to chiller operation immediately, i.e. without waiting for cooling tower loop temperature (condenser water) to rise.

d. Regardless of the presence of a waterside economizer, the design shall incorporate provisions for purging the building with high volumes of outside air while the construction materials are outgassing.

9. Heating

a. Hot water is the preferred space heating medium. Electric resistance heat will be rejected unless a case for it can be made in the schematic design phase.

b. Heating systems with steam terminal units in occupied spaces will be rejected.

c. Where glycol is used, restrict glycol use to piping within mechanical rooms. This may require the use of local heat exchangers. The intent is to have no glycol-containing pipes in / above occupied spaces.

d. When the envelope heat loss exceeds 400 btuh per linear foot of building perimeter, the designer must justify why heat is not being added at floor level.

10. Using ceiling plenums to convey return air is strongly discouraged for other than Variable Air Volume (VAV) system designs and may result in a design submission being rejected. The rationale is:

a. IAQ - The very low velocities of plenum-conveyed return air tend to allow particulate matter to precipitate out rather than be removed at the filters. Also, if roof or other leaks occur, mold growth can develop - and mold spore propagation can occur - in the return air stream. For VAV system designs, care in coordinating up to including but not limited to slab or roof insulation shall occur.

b. Sound transmission. By definition, the above ceiling plenum has no vertical separation between spaces. Cross-talk between adjacent spaces is a near certainty. For VAV systems, return grilles shall be specified with above ceiling elbow open to plenum at full square foot dimension of return opening.

c. Similarly, use of mechanical rooms as return air plenums is prohibited.

B. New Construction

1. Educational and office space.

   a. Note the HVAC references in Division 12 of the DCFS: Design Standards for Instructional Space.

   b. A thermostat in every classroom is the University standard. Offices with similar thermal profiles can be grouped in accordance with good design practice.

   c. Ventilation: Decoupling the ventilation function from the cooling and heating functions is the University standard, where practical. The intent is to centrally cool, dehumidify heat and filter the mandated amount of ventilation (outdoor) air, then deliver the ventilation air at room temperature to all occupied spaces, while accomplishing space temperature control with generic (i.e. relatively low cost) terminal equipment. Other concepts will be rejected unless, in the schematic design phase, a project-specific case can be made that the decoupled ventilation concept is not feasible.

It is preferred that the central ventilation air handler(s) incorporate state-of-the-art devices (dessicant dehumidification, heat pipes, etc.) to minimize energy consumption in the face of high dehumidification and heating loads. Recognizing the inevitability of budget constraints, the University does not mandate such devices, but the HVAC designer shall layout the equipment to allow the future retrofit of such devices.

d. If other than decoupled ventilation systems are proposed, the ventilation air quantity must be independently controlled such that it does not fall below the minimum during air handler operation.

e. CO_2 sensor - controlled variable volume ventilation in each high density space is encouraged, but not required.

f. Generally, do not consider recovering heat from normal quantities of toilet exhaust. If building exhaust air quantities exceed normal toilet exhaust, consider heat recovery, at the decoupled ventilation unit or elsewhere.

If heat recovery is warranted, but is not to be constructed at the outset, the designer shall make provisions to terminate exhaust in reasonable proximity to intake to allow future design and installation.

g. Unit ventilators will be rejected unless, in the schematic design phase, a project-specific case can be made that the use of this concept is required.

h. Fan coil units (4-pipe) as a means of space temperature control will not be rejected. Using the fan-coil units to introduce and condition outside ventilation air is not acceptable.

2. Laboratory space.

a. Generally, the comments for classroom and office spaces apply; plus:

b. The specifics of the application will govern. However, the University has preferences:

- Variable volume exhaust and makeup systems with Direct Digital Controls

- Heat recovery

c. Consider locating mechanical equipment in equipment mezzanines, etc. with special consideration to facilitate the required periodic maintenance, especially filter changes. (Bag-in, bag-out filter change methodology is preferred). Avoid equipment located outside. When this is unavoidable, pay particular attention to protecting the surrounding roof. Do not discharge condensate to the roof.

C. Major renovations of older buildings.

Generally, a major renovation is expected to allow for an additional 30 year cycle of use. Concepts not conducive to this are likely to be rejected. The designer should be guided accordingly.

1. Educational and Office space

a. Provisions for new construction apply. In addition:

b. Ventilation by operable windows is not favored by the University, but the concept may be acceptable under project-specific conditions if:

1. It is shown by the designer during schematic design to meet the intent of the latest version of ASHRAE standard 62 and if:

2. 4 pipe fan coil units are employed and the designer allows for the ventilation load in the fan-coil unit sizing (at high fan speed) and allows for the outside air load in chiller sizing.

3. The designer makes provisions (space allocation for ducts, equipment) for the future design and installation of a decoupled ventilation system.

4. All occupied spaces, in fact, have windows. If ventilation spaces have to be designed to ventilate some spaces, the designer must show why it is not feasible to incorporated decoupled ventilation throughout.

2. Laboratory space.

Educational and office space preferences apply.

New construction guidelines apply to the greatest extent practical.

D. Small scale renovations of existing buildings

1. Classroom and office space

a) With regard to classrooms, note the HVAC references in section 12 of the DCFS: Design Standards for Instructional Space.

b) Regardless of project size, the University□s preference is for chilled water - based cooling systems. Often, existing chillers will have spare capacity. This should be pursued, within the limits of practicality, to reduce cost, even when the project budget envisions a dedicated chiller.

The onus is on the HVAC designer early in the design phase, to ascertain whether spare capacity is available in existing chillers, unless it has been stated in the program that such a search is not required (by virtue of prior University research). University personnel will cooperate to a reasonable extent.

c) The University preference for chilled water does not extend to water-cooled chillers in the smaller sizes implied in this discussion. Air-cooled package chillers are acceptable. In such applications, moderate oversizing of chillers for possible future use will not automatically be rejected.

d) Consider also chilled water piping header concept, sized with expansion in mind, with valved and capped taps to facilitate future chiller tie ins. Consider chilled water surge tanks to improve control with a small volume of water in the piping circuit and spare chiller capacity.

e) As a practical matter, on the smaller applications, the University expects that it may have to accept ventilation to be combined with cooling and heating. The designer shall make provisions to avoid coil freezing with the often high outside air percentages resulting from current ventilation requirements. DX equipment is not an acceptable provision solely to avoid coil freezing.

2. Laboratory space

a. Generally, provisions for classroom and office applications apply.

b. It is recognized that, without an existing make-up air system, 100% outside air applications will often be necessary.

c. The designer shall make provisions to avoid coil freezing with the high outside air percentages (including 100%) resulting from laboratory air flow requirements. DX equipment is not an acceptable choice merely to avoid coil freezing. The onus is on the HVAC designer to rule out small package chillers because of the inherent problems with DX applications, and the construction cost premiums required to prevent them; to wit

Light load operation
Operation at outside temperatures above design
Oil return at light load operation
Nuisance tripouts

Achieving practical redundant refrigerant circuits. The need for hot gas bypass energy / maintenance implications. The need for specialized refrigerant specialties multiple circuited coils, accumulators, electric unloaders. The need for multiple accessible hermetic compressors.

d. Variable volume supply and makeup systems with Direct Digital Controls are preferred, but given the diseconomies of scale, the HVAC designer may successfully make a case for constant volume reheat. If reheat is inevitable, design to minimize it, emphasize hot water (made with campus steam) over electric resistance heat, and allow space for retrofitting more efficient concepts in the future.

A. General

1. Electric motors

a. "Premium efficiency" motors are the university standard for motors larger than 3/4 horsepower(to be distinguished from high efficiency).

Where utility (Pepco) rebates are in effect, Premium efficiency motor is intended to mean the efficiency required to earn the utility rebate in effect at the time.

In the absence of utility rebates, the Pepco definition of "premium efficiency" motors will define the University's standard for minimum efficiency

b. Power factor correction capacitors are required.

B. Specific

1. Electric centrifugal chillers

Carrier, York, Trane, McQuay are generally acceptable

Water-cooled condensers are mandated above approximately 100 tons, but the designer may make a case for air-cooled versions.

Approved refrigerants are HFC 134a, HCFC 123, HCFC 22.

The provisions of ASHRAE standard 15 shall apply to the chiller installation.

Microprocessor-based controls are required

2. Absorption cycle refrigeration shall not be considered unless, in the schematic design phase, the case can be made that the application requires it.

3. Cooling towers

a. Select towers for operation at 78 degree wet bulb.

b. VFD control of tower capacity is the university standard.

c. The cooling tower specification shall require that the cooling tower be CTI certified, and shall require the vendor (through the contractor) to state the cost of a CTI - certified field capacity test on demand by the University, the cost of which is to be initially paid by the vendor. The specification shall further state that, should such a test be demanded - and the test shows that the correct capacity is being produced, the University will reimburse the vendor for the quoted cost of the test. The bid documents shall require the contractor to expose the quote for the test.

d. The specification shall require stainless steel sumps and strainer to extend the service life of this component.

e. Specify as an alternate (a low priority alternate in the MD DGS system) proprietary coatings, materials, etc. on the rest of the tower.

f. Unless a water-side economizer is used, to operate towers in below - freezing temperatures is not the norm, but the tower selected shall be capable of part load operation in sub-freezing ambient temperatures. The university understands that it may be required to purchase field-installed accessories when and if sub-freezing tower operation later becomes necessary.

g. Steam is generally available on campus, but the standard is electric sump heaters. Sump heaters shall be powered from the emergency generator.

h. Multiple towers are the standard, arranged and piped such that one can be drained and maintenance performed while others continue to operate.

4. Chilled water coils. The university standard is copper tube, aluminum fin. To extend performance, specify added rows rather than closer fin spacing to assure that the coils are cleanable.

   a. Regardless of whether an on site chiller is employed in the design, select coils anticipating SCUB-related entering chilled water temperatures in the future.

   b. Select coils at 450 fpm to allow for growth in air quantity. Do not apply a growth factor to fan and drive selection, but the air handler must be capable of being upgraded to 550 fpm.

   c. Drain pans shall be specified to be completely drainable, with no standing water. Where intermediate drain pans are used, they shall be arranged for complete draining, with no standing water and no condensate carry-over from pans or interconnecting piping. Stainless steel drain pans are not required.

   d. The specification shall state that the coil manufacturer shall coordinate the coil design with the fan installation. The specification shall state that the coil manufacturer is required to install baffles at the coil as may be required to prevent areas of high coil face velocity causing moisture carry-over.

      Larger fan motors, if required as a consequence of such modifications are the responsibility of the coil manufacturer.

      The specification shall state that the university will test the coil for moisture carry-over while dehumidifying with coil entering air at the highest conditions expected in the campus area (higher than the design conditions) . The acceptable result is no moisture carry-over.

5. Humidification equipment. Where required by

the program document, steam humidification is the standard. Produce low pressure steam for humidification with a steam generator fired by high / medium pressure central steam, supplied with domestic water. Where central steam is not available, produce low pressure steam with a gas steam boiler. If natural gas is unavailable, use electric steam generators.

6. Heat tracing cable. Shall be specified such that the furnishing and installation of all control components is the responsibility of the control contractor. The specification shall mandate a UM - witnessed test to prove continuity before the wiring is installed and again before the wiring is covered with insulation.

   Heating cable with integral thermostats will be rejected. The intent is to control the heat tracing cable from a control panel with input from a global signal from the CCMS (with a back-up sensor). Heat tracing cable shall be powered from the emergency generator. Avoid using heat tracing cable whenever possible.

7. Valves: refer to Plumbing.

8. Pumps

   a. Bell and Gossett shall be the basis of design.

   b. In-line pumps are not desired except for fractional horsepower circulators.

      Pumps shall be capable of being serviced without disturbing piping connections or motors.

   c. The University prefers base mounted, end suction pumps, but this preference may be waived in the interest of limiting the number of pumps.

   d. Unless the application requires otherwise:

      - Pump motors shall not exceed 1750 RPM.

- Impellers shall be selected to be no more than 5% below the point of maximum efficiency.

- Impellers shall be selected at no more than 85% of volute diameter.

- Pump motor horsepower shall be selected with a service factor of no less than 15% greater than the motor rating.

e. A means of vibration isolation shall be provided for all pumps. Transmission of pump-related sound throughout the piping systems and/or the building will be cause for requiring redesign and rebuilding, at the expense of the designer.

Note: the location of the pump has a bearing on the type of vibration isolation. For example, a case can be made - by the designer - that vibration isolation bases might be eliminated in the case of a pump located on a slab-on-grade.

f. Hot water pumps shall utilize seals capable of operating at 250 degrees F.

9. Heat exchangers

Plate-and-frame type are preferred by the University, and the designer should make provisions early in the design process for the space required.

Tranter, Alfa-Laval are acceptable brands, subject to performance.

The specification shall quantify the minimum surface area.

The heat exchanger specification shall require the vendor (through the contractor) to state the cost of a certified field capacity test on demand by the University, the cost for which is to be initially paid by the vendor. The specification shall further state that, should such a test be demanded - and the test shows that the correct capacity is being produced, the University will reimburse the vendor for the quoted cost of the test.

The bid documents shall require the contractor to expose the quote for the test.

The test must be performed by, and certified by an AABC certified air and water balance firm (not the balancing contractor for the project), and sealed by a Maryland registered Professional Engineer (Mechanical)

10. Variable Speed Drives: Variable speed drives are preferred on applicable motors 5 horsepower and greater. Drives shall be by Graham (VLT-6000), ABB (ACH-400), or YORK (AM-V). No substitutes).

PART 1 – GENERAL

1.01 SUMMARY

A. The University of Maryland has a campus-wide Central Control and Monitoring System (CCMS) to manage energy systems and monitor fire alarm systems and energy usage.

PART 2 – PRODUCTS

A. The University's CCMS front end will support STAEFA MS1800 control systems (or latest version) within the buildings. Johnson Metysis DDC systems may be acceptable in new building/additions construction pending owner approval.

PART 3 – EXECUTION

3.01 CONTROL SYSTEMS

A. Generally, the University prefers simple control systems and concepts. Control systems shall be DDC. Exceptions may be made for projects when mechanical portion of project is under $50,000. DDC systems must be integrated into the University's building automation system front end (CCMS).
B. The DDC control system shall be used along with electric/electronic actuators. Pneumatic actuators are required on larger valves in "cooling plant" applications where the speed of operation is important.
C. DDC systems in renovation projects shall be an extension of the existing building DDC if one exists.
D. Provide entry of all software and database additions required to interface with the existing CMS. The University will provide the communication media between buildings via the campus Ethernet. Coordinate with the University for connection.

3.02 VALVE CONTROL

A. Steam pressure station valves shall not be connected to the building DDC system. Steam reducing stations shall use self regulating valves.
B. Straight through control valve operation, facilitating primary/secondary pumping is desired where practical.

3.03 NUMBERING

A. To avoid duplication with existing mechanical equipment ID numbers, for all renovation or addition designs to existing buildings, the designation numbers assigned to mechanical equipment such as AHUs, Pumps, Chillers, Exhaust Fans, etc., shall be coordinated with the campus building automation group (CCMS/HVAC). The numbers assigned to new equipment shall be consistent throughout all drawings and documentation.

3.04 15 DAY TEST

Among other commissioning events, a "15 day acceptance test" is required.

A. Once the control hardware installed within the building has been thoroughly tested, the database has been properly entered into the field controllers, communication between the remote work station and the building field controllers has been confirmed and the appropriate programming code has been compiled, debugged and downloaded to the field controllers, the building CCMS and HVAC systems will be put on a 15 consecutive day test period.
B. During this period the CCMS contractor shall be responsible for maintaining proper communications with the remote workstation as well as maintaining proper operation of the CCMS

and HVAC equipment within the building with all of the appropriate controls set to CCMS control (remote).

C. The contractor shall also be responsible during this period, for collecting and maintaining historical trend information gathered from numerous status, temperature, pressure and humidity points on the building CCMS system.
D. These points will be selected by the university's HVAC staff.
E. The points will be selected to provide information on whether or not the HVAC systems are operating properly and maintaining building space conditions as designed.
F. If, for any reason, the field controllers loose communication with the remote workstation (with the exception of the campus Ethernet system going off line) or the building CCMS or HVAC equipment fails to operate properly, the contractors shall be responsible for fixing the respective problems.
G. If the operation of the building HVAC systems or communication with the remote workstation is interrupted for a period of greater than 24 consecutive hours, the 15 day test will stop and will be started again from day 1 as soon as the CCMS and HVAC systems are operating properly.
H. At the conclusion of the 15 day period, the historical trend data will be reviewed by the university's HVAC shop to determine whether or not the equipment has been operating properly.
I. If this information shows numerous significant periods of time when HVAC was not operating properly or fails to maintain correct building conditions, the test will be declared a failure and must be repeated as required until the systems are demonstrated to operate properly for 15 consecutive days.

3.05 AIR FLOW MONITORING

A. The University prefers NOT to use Air Flow Monitoring devices as part of the sequence of operation on Air Handlers. The following two applications should be considered for use to eliminate the need for Flow stations.
    1. On VAV Air Handling Units, a Mixed Air Differential Pressure sensor should be used to control minimum outside air. The High side of this sensor shall be piped outside the building. The Low side shall be piped to the Mixed Air Chamber after the return air entry. Exhaust Air Damper and Return Air Damper shall modulate together to maintain a mixed air chamber differential pressure relative to outside air that will assure proper amounts of outside air at all fan speeds. Specify an adjustable preliminary mixed air differential pressure set point, and require that the final set point shall be provided by the air balance contractor.
    2. The speed of the return fan shall be controlled by the same Analog Output Signal from the DDC controller as the Supply Fan. The speed signal to the return fan shall be offset so that the return fan shall run approximately 10% slower than the supply fan. This offset shall be field adjustable using a variable resistor and the proper setting of this resistor shall be determined by the air balance contractor.

The University is committed to energy-efficient design within the limits of budget constraints. The HVAC designer is required to be alert to opportunities to reduce first cost with less-than-optimal concepts (but within the bounds of good practice and applicable energy codes), yet allow for the future retrofit to state-of-the-art energy-efficient equipment and concepts.

Expanding: The University anticipates executing an arrangement with a performance contractor such that no cash retrofits funded by provable future energy savings could be routine.

When a future retrofit opportunity has been identified, and the University agrees, the HVAC design must allow for the future installation (adequate space, etc.).

The HVAC design must also allow provisions in the base design (pressure/temperature taps, flowmeter stations, etc.) for measurement techniques which will be used to establish a baseline of energy use, then to quantify the post-retrofit savings.

A. Generally, the provisions of WSSC apply, as well as industry standard good design practice for educational institutions. The plumbing designer must reflect the University's need, to the greatest extent practical, to perform maintenance and repair to system components without interruption to educational activity.
Provide at least one Electric Water Cooler (EWC) on each floor in accordance with ADA requirements.
Examples of maintenance sensitive design practices include, but are not limited to, location of cleanouts, access panels, layout of distribution systems, location of isolation valves, etc. The University has the right to reject design drawings and/or shop drawings which violate the intent.

For example, unacceptable plumbing design - subject to rejection is a layout is such that an entire multi-floor riser has to be secured to isolate one toilet room.

B. Certain hardware standards apply.

1. Piping:

Gas lines 5 psi or over 2" shall be of all welded black steel construction inside of the building, connected to emergency shut-off valves. Valves are to be clearly labeled. Gas lines from valve to lab table or appliances may be screwed black steel with screw type fittings for 3/4" and smaller. All building gas piping must be labeled (below ceiling).

The University standard for DWV piping within buildings is cast iron. Connection method is the contractor's option, but no-hub is prohibited underground.

Piping shall not be:

a. Buried beneath the lowest floor level (except for soil pipe.)

b. Run in concrete floors. If pressure piping placement under slab is unavoidable then the piping must be run in a steel pipe sleeve so leakage can be channeled off, and clearance provided so repairs can be made

c. Direct burial of steam piping is not acceptable. A conduit system shall be provided.

2. Color code all piping valves and fixtures in accordance with the University's color schedule (depicted elsewhere in this document).

3. Provide flexible copper tubing with removable key cut-off valves at all lavatories and sinks.

4. Valves

a. All control valves shall be listed in a schedule on the drawing showing identification number, body size, port size, if applicable, whether normally open or closed, spring range, and CV.

b. HVAC and plumbing system valves less than 2-1/2" shall be ball type, and greater than 2-1/2" shall be OSY.

c. All valves installed at heights greater than six feet shall have chain activators provided.

d. Butterfly valves shall be used only for automatic isolation, temperature control, and automation functions. Use Globe, Angle and "Y" valves for throttling services. Gate valves are not acceptable.

e. All valves in copper piping systems 2-1/2" or smaller shall be ball, single piece type unless otherwise noted.

f. Chilled water and heating water valves in underground systems shall have as an enclosure a concrete valve box with sufficient space to maintain and operate valves.

15.07 FIRE SPRINKLERS

The University recognizes the contribution of sprinklers to life safety. However, the cost to install them in renovation projects often dictates that they be forsaken, to be substituted with other measures to bring renovation projects into minimal code conformance.

Unless stated to the contrary in the program, the decision to not incorporate sprinklers into the mechanical design must be based on a total project cost approach.

The cross-discipline comparative cost analysis, as a minimum, must address:

The presence/absence of a University installed standpipe system, which minimizes the cost of the sprinkler system

The need to remove ceilings to install other work

The extent and cost of other fire code-mandated work, the need for which would be eliminated were a sprinkler system to be incorporated.

Programmatic needs which conflict with alternative (not sprinkler) solutions to code issues added fire rated walls, doors, additional stairwells, areas of refuge, smoke exhaust systems, restrictions on use, etc.

PART 1 – GENERAL

1.01 Summary

A. This section outlines the requirements for the design of mechanical systems, including but not limited to mechanical, plumbing, and fire protection.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

3.01 Alternative HVAC System Designs (New Building and Renovations over $1 million) The designer shall complete the following on new building and major renovation (over $1 million) designs. The following evaluation shall be submitted at schematic design.

A. Evaluate a minimum of three alternative HVAC systems that are in compliance with energy requirements. Propose a recommendation form the three evaluated.
B. Provide a written analysis of the calculated loads for the proposed new HVAC system.
C. Provide a conceptual single-line of the proposed HVAC system. Identify the capacity and locations of major equipment items including cooling towers, chillers, pumps, fans, air handling units, compressors, and related items.
D. Provide a life-cycle cost analysis for each HVAC system. This analysis shall include capital cost, operating cost, maintenance costs, and anticipated level of performance, with comparisons made between the proposed system and the two alternative systems. The designer shall provide a simple payback schedule.
E. If existing systems are utilized, identify the capacity of those existing systems, based on an examination of the Facility's record Drawings, and inspection of the existing system, and test reports.

3.02 Design References

A. Mechanical Designs shall comply with codes and standards including, but not limited to the following (or the latest version);
ASHRAE 62-2001
ASHRAE 55-1999
ASHRAE 15-2002
BOCA and/or IMC
ARI 550/590-98
ASHRAE 110
ARI 360
ASHRAE 90.1-1999

3.03 Equipment Specifications

A. When the designer specifies equipment installation to be "In accordance with the manufacturer's direction," the specification shall list the applicable manufacturer's publication, title, and date. The specification shall state which instructions in that publication, if any, do not apply to the particular application.
B. The specification shall require that, if equipment other than that which is the basis of design is submitted, the submittal will be accompanied by the applicable manufacturer's installation instructions, again with instructions that do not apply clearly noted.

C. "Interrelated Systems" will be so identified on the design documents. With regard to submittals of the components of interrelated mechanical, electrical, life safety and/or other systems, the specification shall include words to the following effect:

1. “The design documents depict a coordinated system comprised of equipment which is selected as the basis of design, but is not intended to exclude others. Submission of any one component other than that which is the basis of design is considered to be a substitution of the entire Interrelated System and the submittal must be identified by the Contractor to be:

   An interrelated system
   A substitution

2. The Contractor, as part of the submittal, must provide supporting documentation to show that the submitted equipment has been coordinated to the same extent as the equipment, which is the basis of design. All coordination for substitutions shall be the responsibility of the Contractor to coordinate. Increases in project cost shall be borne by the Contractor where deviation are a result of Contractor substitution.

3.04 Piping Identification

A. Piping shall be identified via painting or color coding. Within mechanical space, the entire pipe and insulation system shall be identified and color coded as indicated below. Where exposed throughout the entire building, the piping and insulation system shall be marked as indicated below. The University standard for Piping identification and color coding:

1. Chilled Water		
Primary		
Supply	PCHWS	Imperial Blue 34
Return	PCHWR	Imperial Blue 34
Secondary		
Supply	SCHWS	Blue Tint #9637
Return	SCHWR	Blue Tint #9637
2. Dual Temperature Water		
Supply	DTWS	Safety Green
Return	DTWR	Safety Green
3. Utility Hot Water Heating		
Supply	HWS	Accent Yellow
Return	HWR	Accent Yellow
4. Steam		
High Pressure	HPS	Aluminum
Intermediate Pressure	IPS	Aluminum
Low Pressure	LPS	Aluminum
5. Steam Condensate		
High Pressure	CHP	Safety Orange
Intermediate Pressure	CIP	Safety Orange
Low Pressure	CLP	Safety Orange
6. Condenser Water		
Supply	CWS	ANSI Safety Gray
Return	CWR	ANSI Safety Gray
7. Domestic (Potable) Water		
Cold	DWS	Spring Green #9728
Hot	DWH	Spring Green #9728 (w/Dark Green Band)
Hot Recirc	DWHR	Spring Green #9728 (w/Dark Green Band)
8. Fire Protection	---	Red #9903
9. Fuel Oil	FO	Safety Black
10. Vacuum	V	Platform Gray #9454

11. Compressed Air	CA	Light Gray #9454
12. Drain	---	Traffic Signal Green #9722
13. Hazardous Waste	---	OSHA Safety Purple
14. Gas	Gas	Safety Yellow

The above colors are based upon Duron "Dura Clad" (Alkyd Gloss Enamel Modified With Urethane) Industrial Maintenance Finishes

3.05 Design Conditions

A. The following information should be clearly shown on the drawings, expanded or modified as required by the application. Where values are indicated they should be the basis of the design.

1. Occupied:
   a. Summer Outside — 95°F db, 78°F wb
   b. Summer Inside — 74°F (+/- 2°F) db, 50% rh
   c. Winter Outside — 0°F db
   d. Winter Inside — 74°F (+/- 2°F) db
2. Unoccupied
   a. Summer — 85°F db
   b. Winter — 68°F db
3. Total Cooling Capacity Avail. — (Tons)
4. Total Cooling Max. Demand Load — (Tons)
5. Chilled Water Delta T — 12°F minimum
6. Total heating Capacity — (BTUH)
7. Total Heating Max. Demand — (BTUH)
8. Hot Water Delta T — (degrees F)
9. Population — (# of persons)
10. Ventilation (outside) air handled by the equipment:
    a. occupied — (cfm)
    b. unoccupied — (cfm)
11. Domestic Hot Water, Capacity Available — (gph)
12. Domestic Hot Water Max. Demand Load — (gpm)
13. Domestic Hot Water Temperature Rise — (degrees F)
14. Total Water Supply Fixture Units — (Fixture units)
15. Cold Water Supply Fixture Units — (Fixture units)
16. Hot Water Supply Fixture Units — (Fixture units)
17. Drainage Fixture Units — (Fixture units)
18. Design Street Water Pressure — (psig)
19. Steam, Capacity Available — (#/hr)
20. Steam Max. Demand Load — (#/hr)
21. Steam Design Pressure (high) — (psig)
22. Steam Design Pressure (low) — (psig)
23. Gas, natural, demand load (max.) — (cfh)
24. Gas, natural, street pressure — (wg)
25. Gas, natural, service demand — (cfh)

3.06 Load Calculations

A. Design Development (DD) Submittals – Initial design documentation supportive data, load calculations utilizing block loads, and a summary of the system proposed shall be provided.

B. First Construction Document (CD) Submittal (50% or earlier) – Design documentation supportive data, final equipment load calculations, and a summary of the system proposed shall be provided.

3.07 Design Components

A. Shall include all of the following
1. Control logic diagrams

2. System schematics
3. Points lists
4. Component descriptions
5. Sequence of operation
6. Flow diagrams
7. Building Riser diagrams for supply, return, and exhaust systems

3.08 Drawings

A. The A/E shall prepare and submit for review and approval, drawings at schematic, Design Development, 50%, 95%, and 100% completion.
B. All elements of the Work shall be properly coordinated to insure that there are no conflicts between disciplines or between the drawings and the specifications.
C. In general, abbreviations should be avoided except those which are generally understood and accepted and listed in the legend and symbols list.
D. Drawings shall be drawn using AutoCAD 2000 or a later version and provided in electronic format with the 100% submittal.
E. Mechanical drawings shall indicate university assigned room numbers, and have column line designations.
F. Mechanical areas – The designer shall provide a layout (¼" = 1 foot scale or larger) of all of the following rooms, to ensure that the equipment will fit in the allotted space.
    1. Mechanical rooms
    2. Electrical rooms
    3. Restrooms
    4. Kitchens
    5. Labs
    6. Clean rooms
    7. Areas with a large quantity of mechanical piping or equipment
G. Congested areas – The designer shall identify potential congested areas where mechanical, electrical, plumbing, and fire protection piping and/or equipment are to be installed, and shall provide appropriate cross sections (at a minimum of ¼" scale).
H. Service clearances – The drawings shall indicate the manufacturers recommended service clearance requirements around all mechanical equipment.
I. Plumbing Drawings – the designer shall provide plans (1/8" = 1 foot scale or larger) that provide:
    1. Indicate all piping on the floor-level in which it will be installed.
    2. Indicate the locations of main waste lines, stacks, and vents as well as all service mains, including those for water, air, gas, and vacuum.
    3. Indicate all pieces of equipment – including but not limited to, pumps, tanks, generators, pressure reducing valves, and other appurtenances—showing their location and required piping connections.
J. Site utility Plans – The designer shall provide a site plan (1" = 40 foot scale or larger) that shows the following;
    1. The routing of proposed new external utilities from each new building to each point of connection to the facilities utility systems. Indicate all utility lines that are to be abandoned, removed, or rerouted.
    2. All existing utilities within the project site based on both the information provided by the university and the designer's field investigation.
    3. Pipe runs shall indicate pipe type and size, and shall show all valves, fixtures, etc.
K. Mechanical Drawings – The designer shall provide plans (1/8" = 1 foot scale or larger) that provide:
    1. The location of each piece of equipment including, but not limited to; air handling units, chillers, cooling towers, pumps, converters, expansions tanks, boilers, fans, fan coil units, and other equipment.
    2. All ductwork.
    3. Indicate all piping runs (including type and sizes). Show all valves, fixtures, etc.
    4. Show all areas served for each air handler on small scale drawings, with cross-hatched areas to differentiate between air handling units.

L. Plumbing, HVAC, and sprinkler drawings shall be presented as three separate drawing sets.

3.09 Specifications

A. Specifications shall include the requirement for the contractor to provide Operation and Maintenance manuals. Manuals shall be supplied with each major piece of equipment. O&M manuals shall include all applicable design calculations used in sizing components. Wiring diagrams, spare parts lists, vendor contact numbers, warranty information, and certificates shall be included.

15.09 SCUB CONCEPT (6-01)

The University, with a central steam distribution system and an electric distribution system, has standardized on a concept called the Satellite Central Utilities Building (SCUB).

At strategic locations around campus, steam and electricity is used to produce chilled water, hot water and sometimes, domestic hot water. From the SCUB, these services are delivered to the surrounding buildings. SCUBs are either stand alone buildings, or integrated into new campus buildings.

The program document will make it clear whether a SCUB is to be part of the design. In the event that it is, standards and guidelines for SCUB design will be given to the designer.

- Variable flow, new construction
- Decoupling via Plate & Frame heat exchangers
- Selections shall be made by:
  1. Alpha-Laval
  2. Tranter
  3. Bell & Gosset
  4. Mueller
  5. No substitutions allowed.

Discussion of what could be alleged to be cost premiums resulting from these standards.

Generally, the baseline standard is that of Institutional design, not commercial design.

Part One HVAC

I. General

A. HVAC Design Conditions

The prohibition of control schemes which vary the cooling coil temperature rules out using the more common, low cost control schemes; but these have generally been discredited as institutions seek to avoid litigation related to Indoor Air Quality (IAQ).

Related is:

B. Ventilation - Granted, the University's adherence to ASHRAE Standard 62 is beyond the requirements of typical local codes. For example, the ASHRAE standard rules out using windows for ventilation of remodeled campus buildings unless the ventilation can be demonstrated (a defacto prohibition of this typical low-cost approach). Local codes atypically do not incorporate this demonstration provision. However, in litigating IAQ issues, liability has been assessed in cases where local codes allowed less stringent ventilation practices, but the professional HVAC designers were aware of the more stringent provisions of the ASHRAE standard.

(Note that "decoupled ventilation" is promulgated as the University's preferred method. The first cost implications of this are worth noting:

a. If designed simply, i.e. not incorporating heat-reclaim and other costly enhancements, the decoupled (stand-alone) ventilation unit is typically a small portion of the total HVAC system first cost. Most of the total HVAC system first cost relates to the other, heating/cooling functions.

To quantify: If the sheet metal ventilation duct system is taken to be the element which would not otherwise have been installed, the first cost premium is around $0.60/ s.f. (1999 dollars); less than 2 of 1% of the total cost to construct a typical campus building.

And there are compensating savings which approach, and may exceed, the premium cost. Using this (relatively high cost) approach to ventilation allows the use of simple, low cost, easy to maintain heating/cooling components elsewhere throughout the HVAC system (including fan-coil units).

To illustrate, in the case of a fan-coil unit system, the avoided costs include :

- The cost to create openings in the outside wall for ventilation air.
- The cost of the associated louvers
- The cost to upsize all the air side terminals to handle the ventilation cooling, dehumidification and heating load
- The cost of more sophisticated fan-coil unit controls (decoupling the ventilation allows fan cycling (no automatic control valve) for space temperature control.

b. Further, the University, at a later date, can solicit proposals from performance contractors to replace / augment the decoupled ventilation units in order to reduce the operating energy cost. Typically, performance contractors receive their payment from the savings, which can be demonstrated by measurements before and after.

The first cost premium situation and the offsetting savings - varies with each application. Generally, our position is that no first cost premium is involved. In addition, the litigation cost avoidance is a benefit.

Part One - Duct liner

Control of sound in HVAC systems is necessary. It is accomplished by one of the following methods:

a. Mechanical means such as oversized, more costly ducts (for low air velocity), sound traps inserted into ducts custom fabricated sound attenuators. The premium cost implications are obvious.

b. “Noise cancellation” electronically generated sound, the Amirror image of the offensive noise - propagated such that it cancels the offensive noise. Again, the premium cost implications are obvious

c. Acoustical (fiberglass) duct liner.

Note - Fiberglass liners which erode and discharge particles into the HVAC supply air stream, have been implicated in IAQ problems. Also, fiberglass duct liner which becomes wett can harbor colonies of microbial growth, with IAQ liability implications.

Fiberglass, including fiberglass duct liners, has not been declared an IAQ issue, so the University chooses to not impose an outright ban on the use of the material. The University reserves the right to ban the product in special cases, and the program will state this.

Instead, the University requires that all duct liner, where used, be polymer coated.

The University’s requirement for coated fiberglass liners parallels the industry trend toward standardizing on this variation on the formerly common (uncoated) duct liner material.

Uncoated fiberglass duct liner will shortly become unavailable, so the cost premium for the coated variety is, we suggest, a moot point.

The limitation on the application of even coated fiberglass duct liner (where the application is subject to wetting) mandates alternative (closed cell foam)

materials, at a premium of around $2.50 per s.f. of liner, but the premium applies only to a very limited area of the entire duct system.

To quantify: In a 100,000 s.f building renovation project, with a $15, 000,000 budget (1999 dollars), 300,000 s.f. of duct surface area would be typical. Of that, 10% of the liner area is likely to be subject to wetting, thus prescribed to be a more expensive, closed cell product.

30,000 s.f. at $2.50 / s.f. = $75,000; less than one half of one percent first cost premium to the project. $75,000 is also less than the cost of the typical mechanical means of HVAC noise control such as low speed fans, large ducts, insertion sound traps (attenuators) etc.

The avoidance of IAQ liability, we submit, compensates for the slight cost premiumPart One HVAC systems

General

Prohibition on ceiling plenums and mechanical rooms used as return air plenums.

Installing a system of return air sheet metal ductwork throughout the building is the alternative. Such a system adds around $2.50/s.f. to construction cost, approximately 1.6% of the total construction cost.

However, it is difficult to consider this a premium:

a. Ceiling plenums are common in commercial applications, where flexibility in office layouts is a paramount concern. Space layouts in institutions are more permanent and institutions generally rely on return air ducts, and use HVAC concepts that support them.

b. Absent a return air duct system, speech privacy between adjacent spaces must be developed, and the cost of accomplishing this can exceed $2.50 / s.f.

Part Three Sprinkler systems

In cases of new construction, the life safety code mandates sprinklers, so there is no cost premium.

The “premium cost” issue arises in the case of considering sprinkler systems in the smaller renovation projects - where the renovation cost is less than the cost of a new building - i.e. the codes do not mandate sprinklers and the University is free to use a minimal compliance to codes strategy in the (understandable) pursuit of lowest cost construction.

The point is that sprinkler systems, even where not specifically required by code, can sometime avoid the cost of other, often costly, architectural modifications to meet code in renovation projects.

By way of illustration, it is not unusual for a renovation project to pose the following design (and cost) dilemma:

- Double loaded corridors requiring a fire rating of the corridor walls

- Non rated doors opening to the corridor

- A required retrofit to rated corridor doors, with door closers to establish and maintain the fire rating. Open fire rated doors are not fire rated

- A programmatic requirement to keep the fire rated corridor doors open, begetting:

- A need for electric door hold-open devices, tied into the fire detection/alarm system is expensive and a tripping hazard

  In similar cases on campus, installing a sprinkler system has been shown to cost the same, or less, than making all the required architectural modifications for code and program compliance.

  Furthermore, in the stairwells of many older campus buildings, there will already exist a (University-installed) fire standpipe. This amounts to a head start on the cost of a sprinkler system installation.

Thus - Before opting for no sprinklers to control cost, the University will exercise and require the A/E to exercise - due diligence to examine the total cost of code compliance.

The adjusted differential cost even if a premium - may be tolerable in light of the other life safety advantages afforded by sprinklers.

15.11 METERS, WATER FLOW AND ENERGY (BTU) (12-2-02)

PART 1 – GENERAL

1.01 SUMMARY

A. This section outlines the requirements for the furnishing of equipment and installation of water flow and energy (BTU) meters.

1.02 SUBMITTALS

A. Product Data: Include detailed manufacturer's specifications for each component specified. Include data sheets reflecting the model numbers, features, ratings, performance, power requirements, and dimensions. The information provided shall be in sufficient detail to confirm compliance with the requirements outlined in this specification.

PART 2 – PRODUCTS

2.01 METER

A. Furnish and install a Thermal Energy Metering System or flow meter for each of the locations specified.

B. The meter shall be a clamp-on design employing non-intrusive ultrasonic flow metering.

C. The meter shall be digital microprocessor based utilizing both "Transit-Time" flow measuring technique and "Doppler Fourier".

D. The meter shall have an accuracy of 0.02 degrees F.

E. The flow meter shall have the ability to calculate and display the following values
   1. volumetric flowrate
   2. flow velocity
   3. total flow
   4. liquid sonic velocity
   5. liquid aeration/cavitation
   6. Reynolds Number

F. The energy (BTU) meter shall have the ability to calculate and display the following values
   1. volumetric flowrate
   2. flow velocity
   3. total flow
   4. liquid sonic velocity
   5. liquid aeration/cavitation
   6. Reynolds Number
   7. energy/BTU rate
   8. total energy
   9. supply temperature
   10. return temperature
   11. differential temperature

G. The flow and energy (BTU) meter shall have internal memory of at least 1 megabyte for storage of data on a continuous basis and the ability to store application data for a minimum of 1000 points as a "datalogger".

H. Downloading of the "datalogger" information to personal computers (PCs) shall not require proprietary software to be installed on the PC, but will utilize standard "off-the-shelf" "windows" software.

I. The energy (BTU) meter shall provide self and application diagnostics to isolate any fault conditions due to either equipment failure of abnormal process conditions.

J. The flow and energy (BTU) meter electronics shall be powered by 110/120 VAC 60Hz.

K. The flow and energy (BTU) meter shall have an accuracy of ± 1% of flow over a ± 40 fps flow range.

L. Repeatability shall be 0.1% of flow with a flow sensitivity of .01 fps (minimum) at any flowrate, including no flow conditions.

M. The flow and energy meter shall also possess the following capabilities:
    1. Cavitation and Aeration Detection1
    2. Internal Pipe wall Build-up Detection
    3. Security password protection for individual sites.
    4. Reverse Flow and Empty Pipe Detection
    5. Direct Digital Temperature measurement via precision matched 1000ohm Platinum RTD pair and four-wire cable connection
    6. Certified for CE Mark (EMI immunity and compatibility standards).

N. Flow meter shall be a Controlotron Model 1010N (or latest model) or approved equal.

O. Energy (BTU) meter shall be a Controlotron Model 1010EDN (or latest model) or approved equal.

2.02 COMMUNICATIONS

A. The meter system shall communicate with and be compatible with the University's Central Control and Monitoring System (CCMS) using Lonworks LAN (FTT10ALAN) as well as 4-20 MADCV (isolated) output.

PART 3 – EXECUTION

Not used

15.12 MECHANICAL EQUIPMENT ROOM REQUIREMENTS (09-30-04)

PART 1 – GENERAL

1.01 SUMMARY

A. Mechanical rooms shall be designed with maintenance requirements and adequate safety provisions in mind. Equipment must be fully accessible to allow for proper servicing, including adequate space to disassemble all pumps, motors and chillers. Provide access for all required trap primers. This section addresses minimum requirements for the design of mechanical and electrical rooms. It shall be noted, specific code requirements more stringent shall apply. This section is intended to supplement and clarify the University's requirements, not supersede code requirements.

PART 2 – PRODUCTS

Not used

PART 3 – EXECUTION

3.01 DRAWINGS

Access requirements required for below grade ME

A. Main mechanical rooms which house chillers, pumps, steam to water converters, plate and frame chilled water heat exchangers and associated appurtenances should be located at grade level. Should a main mechanical room be located below grade, a vehicular ramp with an appropriately sized door should be provided to facilitate equipment replacement. Where the installation of an exterior mechanical room drive way and loading dock is not possible, a service well including permanent rigging beam with electric hoist shall be provided. Exterior roof top air handlers are to be avoided. For other roof mounted equipment, provide exterior roof walkways to allow servicing of equipment accessible through standard door ways with permanent stairs or built-in ladders. For large equipment, removable louvers or wall panels shall be provided.

B. Air conditioning condensate lines shall drain to storm drains. Dumping of air conditioning condensate on roofs shall be avoided. Refer to the WSSC Plumbing Code for the proper drainage requirements.

C. Provide at least one (1) sanitary floor drain for every 144 square foot in each equipment room. Locate drains away from walking areas and not beneath equipment. Slope floor to drain. Air conditioning condensate lines within mechanical rooms shall be collected and piped to the storm drains systems via open site funnel drains.

D. Provide thermostatically controlled mechanical ventilation in all mechanical and electrical equipment rooms.

i. Ventilation shall be provided to insure air exchange, including fresh supply air and exhaust, to atmosphere.
ii. Exhaust shall not be re-circulated to building ventilation systems.
iii. Mechanical/Electrical equipment rooms (MER) shall be permitted to utilize outside louvered dampers, adequately sized to provide fresh air supply where MER exhaust fan(s) are used.

iv. Ventilation quantities shall be, at minimum, equal to 0.5 cfm per square foot of machinery room area. Specific code requirements more stringent shall apply. This section is intended to supplement and clarify the University's requirements, not supersede code requirements.

v. Air quantities shall insure a maximum temperature rise of 18ºF above inlet air temperature or a maximum MER temperature of 104ºF. Where required, MER cooling shall be required to adhere to identified temperature requirement.

vi. MER equipment rooms shall be provided, when required, to provide minimum heating of MER to meet a winter heating set point of 65ºF adjustable.

E. Where refrigeration equipment is installed, adherence to all requirements identified in ASHRAE Standard 15 shall be adhered to.

i. The University, Facilities Management, HVAC Systems (authority of jurisdiction) identifies a requirement to provide refrigerant specific alarms.

ii. In lieu of SCUBA provision, remote visual/audible alarming at all MER entrances shall be installed. Individual alarms shall be provided with a reset and clear signage identifying to campus community to contact: HVAC Systems, ext. 57052, Work Control, ext. 52222. Signage shall be located outside MER entrance. Reset shall be installed within MER directly behind signage.

iii. Refrigerant alarms shall only reset (automatically) when refrigerant concentrations fall below levels identified for each refrigerant as referenced by ASHRAE Standards 34 and Standard 15.

F. Equipment rooms shall not be used for outside or return air plenums.

G. Each component of an air handling system shall be spaced so there is ample room on all sides for inspection and maintenance (filter removal, bearing replacement, coil replacement, cleaning, etc.) as defined in the equipment manufacturer's information. At minimum, service clearance around equipment shall be maintained at 42". All air handlers shall provide for clear "coil pull clearance dimensions as required.

H. Each piece of mechanical equipment shall be provided with equipment service clearance around the equipment as identified by the manufacturer's literature. When service clearances are not available, service clearance around mechanical equipment shall be at minimum 42" (e.g., pumps, strainers, water heaters, heat exchangers). Chillers shall be provided at minimum 6 foot service clearance on all sides for access. Tube pull space shall additionally be provided on at least one side of the evaporator and condenser. Chiller manufacturer clearance data shall be reviewed for maximum service clearance dimensions on all sides and on top of chiller. Mechanical HVAC engineer shall identify on the drawings, with dotted lines or other clearly identifiable method, all service clearance dimensions (e.g., chiller tube pull clear area shown on mechanical plan as an area to be avoided for installation of mechanical equipment).

I. There shall be a minimum of 42" clearance around electrical equipment control points (e.g., breaker panels) and heat-producing equipment (e.g., water heater). Specific code requirements more stringent shall apply. This section is intended to supplement and clarify the University's requirements, not supersede code requirements.

J. Suspended equipment shall be provided with permanent platforms for maintenance including appropriate access to platforms.

K. M/E room shall have fire suppression systems unless specifically exempted by the code authority having jurisdiction.

L. Walls of equipment rooms, when located on occupied floors, shall be sound attenuated (application specific).

M. Equipment and piping shall be laid out in a manner that will not require equipment to be removed to get to another piece of failed equipment.

N. For below grade mechanical rooms, provide a dual sump pump, set as required. Connect to emergency power system.

O. Provide convenience outlet within twenty-five feet of each piece of equipment.

P. Provide 40 fc (minimum) of uniform lighting, when measured at a height 5' off the finished floor, throughout room. Provide task lighting at control panels. Specific code requirements more stringent shall apply. This section is intended to supplement and clarify the University's requirements, not supersede code requirements.

Q. Main MER entrance shall be provided with a card reader access system to be installed, modified, or upgraded in the project, then all mechanical rooms in the project shall have card readers installed at all entrance doors.

R. All electrical control systems (breaker panels, switchgear, transformers, etc.) must be labeled with the arc flash analysis rating.

S. Emergency egress requirements.

   i. Shall comply with the State Fire Prevention Code, the current National Electrical Code and the current edition of the National Electrical Safety Code.
   ii. Any door in a M/E room that is not a direct pathway from the building must be prominently labeled "NO EXIT".
   iii. Electrical rooms shall have not less than two (2) doors for egress.

T. Emergency lighting will be present in all M/E rooms in compliance with the State Fire Prevention Code, the current National Electrical Code, and the current edition of the National Electrical Safety Code.

U. M/E rooms with electrical equipment operating at or over 600 volts (OSHA High Voltage definition) will incorporate the following additional design specifications.

   i. High voltage equipment will be isolated from other areas of the building in separate and secured room(s). No mechanical or electrical control systems, except those directly servicing or serviced by the high voltage equipment, shall be installed in these rooms.
   ii. Access to and egress from these rooms must be directly to the outdoors or building corridors. Any exception to this must be specifically reviewed and approved by the University, Facilities Management Operations Department and Environmental Safety Code Services.
   iii. Doors to rooms containing high voltage equipment will be signed per OSHA and National Electrical Code requirements.

iv. Rooms will incorporate a sufficient number and type of access/egress means to comply with the current editions of the National Electrical Code and the National Electrical Safety Code.

v. Access/egress means must be constructed per the requirements of the current editions of the National Electrical Code and the National Electrical Safety Code for high voltage rooms.

vi. No material or storage structures shall be installed in high voltage rooms.

vii. Electrical systems shall be designed with appropriate isolation devices to permit maintenance in a de-energized state.

viii. Any equipment additions/modifications or structural alterations in high voltage rooms must be reviewed and approved by the University Engineer and Environmental Safety Code Services.

V. M/E rooms with electrical switch gear at least six feet in width and with current capacity of at least 1200 amperes will incorporate the following additional design specifications.

i. Rooms will incorporate a sufficient number and type of access/egress means to comply with the current editions of the National Electrical Code and the National Electrical Safety Code and NFPA 70E-2004.

ii. Any equipment additions/modifications or structural alterations in these rooms must be reviewed and approved by the University, Facilities Management Operations Department and Environmental Safety Code Services.

PART 1 – GENERAL

1.01 Summary

B. This section outlines the requirements for the design of electrical systems.

PART 2 – PRODUCTS

A. All service entry equipment shall be UL listed for such application and an AIC rating shall be required for each component of the equipment. Series ratings for fault capabilities are not acceptable.

PART 3 – EXECUTION

3.02 Design References

A. Electrical Designs shall comply with applicable codes and standards including, but not limited to the following (or the latest version);
NFPA
OSHA
MOSH

3.02 Design Calculations

A. For both Normal and Emergency power a separate document of Electric Design Calculations, shall be submitted and shall include, but not be limited to;
1. Short circuit calculation and coordination (for new panels, transformers, and switch gear)
2. KVA by switchboard
3. KVA by panel
4. KVA of lighting
5. KVA of receptacles
6. Feeder voltage drop
7. Peak demand (maximum)
8. Diversity factor
9. Lighting illumination levels (interior and exterior)
10. Emergency power KVA
11. Emergency Power Peak Demand
12. Lightning protection (Risk Analysis per NFPA 780)
13. Generator sizing
14. UPS sizing
15. Transformers
16. Switchboards
17. Grounding system
18. OSHA 1910 ARC Flash Calculations

B. Design calculations and data sheets shall be set out in a systematic manner to enable an accurate assessment of the equipment/system proposed and submitted in a separate binder. Initial design calculations shall be submitted at the design development stage. Revised calculations shall be submitted at the 50% construction document stage. Complete final calculations shall be submitted at 95% construction document stage. All calculations shall be presented on applicable forms and all literature used in the determination of the calculations shall be referenced.

C. On Design-Build projects, all calculations shall be submitted with the 50% Construction Documents.

D. Identify the demand factor used for each type of load for estimating the service size. Also, identify the connected load and the demand loads.

E. Load analysis shall be for all equipment connected to emergency generator. All loads connected shall be considered continuous.

3.03 Computer Calculations

A. When computer calculations are included with design calculations the following documentation shall be furnished as a minimum:
   1. A synopsis of the computer program(s) stating briefly; required input; method of solution; approximations used; second order analysis incorporated; specifications or codes used; cases considered; output generated; extent of previous usage or certification of program(s) and program(s) author.

3.04 Drawings

A. The A/E shall prepare and submit for review and approval, drawings at schematic, 50%, 95%, and 100% completion.

B. Electrical drawings shall indicate university assigned room numbers, and have column line designations.

C. Service clearances – The drawings shall indicate the manufacturers recommended service clearance requirements around all electrical equipment.

D. All elements of the Work shall be properly coordinated to insure that there are no conflicts between disciplines or between the drawings and the specifications.

E. In general, abbreviations should be avoided except those which are generally understood and accepted and listed in the legend and symbols list.

F. The power, signal, cable TV, A.V., Security, and communications layouts shall be shown on one set of drawings, and the lighting layout shall be shown on a different set of drawings. Use standard symbol conventions.

G. Drawings shall be drawn using AutoCAD 2000 or a later version and provided in electronic format with the 100% submittal.

H. Floor Plans (Scale: Not less than 1/8 inch= 1 foot 0 inches). The A/E shall:
   1. Provide a single-line electrical distribution diagram showing primary service to substations and secondary service to distribution switchboards, motor control centers, and panel board for power and lighting. This diagram shall include and show the permanent as well as temporary points of connection to external utilities such as high-voltage, telephone, and all signal systems.
   2. Electrical drawings shall include circuit #'s (PNL #, Breaker #).

I. Large-Scale Drawings (Scale: Not less than ¼ inch=1 foot 0 inches).The A/E shall provide a layout of all equipment rooms to ensure that the proposed equipment will fit in the allotted space. Large scale Drawings are required for: electric rooms, lecture halls, computer rooms, telecom closets, other rooms serving multimedia functions.

J. Electrical schedules shall be included on the drawings, with load values in KVA, and it shall include the following information:
1. schedule name
2. location
3. mounting
4. main device
5. bussing
6. interrupting capacity (integrated rating)
7. voltage
8. phase
9. connected lighting load
10. connected power load
11. connected receptacle load
12. expected demand

K. Each circuit shall include the following:
1. circuit number
2. description of load served
3. wire size
4. connected load
5. circuit breaker size
6. room number

L. All switchboard and panel board legend information shall be typed and shall include room numbers for locations of loads being served, as well as CB number and panel where device receives power.

M. All power, lighting ,and distribution panels, switchgear, MCC's, transformers, and switches (disconnect and transfer) shall be labeled with room number, circuit number, and panel or device number for the power source feeding the device.

N. All medium voltage manholes shall be drawn in a fold-down detail.

O. Performance data for electrical equipment shall be shown on the drawings. If the data is also included in the specification it shall be carefully edited for conflicts.

P. Demolition shall not be shown on the same drawing(s) with new work.

3.05 Design Conditions The following information should be clearly shown on the General ` Information:
Drawing. Additions and deletions may be required if package unit equipment is incorporated in the design of facilities.

A. Electrical
Primary
Secondary

Loads:
- Lighting
- Devices
- Mechanical
- Total Peak Demand
- Total Connected Load

B. Emergency Power

3.05 Specifications

A. Specifications shall include the requirement for the contractor to provide Operation and Maintenance manuals. Manuals shall be supplied with each major piece of equipment. O&M manuals shall include all applicable design calculations used in sizing components. Wiring diagrams, spare parts lists, vendor contact numbers, warranty information, and certificates shall be included. Fire alarm O&M manuals shall provide a riser, wiring, annunciator diagram, and catalog cuts.

B. Campus color codes for communication, fire, security, and CCMS, junction box covers shall be as set forth below.

SYSTEM NAME	COLOR
CCMS	Green
Communications	Blue
Fire Alarm	Red
Security	Yellow

See Division 1, Section 1.08; Division 2, Section 2.09; Division 12, Section 12.02

A. Energy

The University regards the reduction of energy consumption as an important objective in all University facilities.

To comply with the requirements of this manual, the design shall meet the Energy Performance Index, using the procedures detailed in the University Manual in order to demonstrate that the design meets the energy performance criteria.

To be fully cost effective, energy conservation measures must be given early and careful consideration during the design phase of a new construction project. To ensure that energy conservation is given priority status, an independent Energy Analyst shall be utilized. The role of this Energy Analyst shall be to:

1. Review and coordinate all disciplines within the design team to achieve the most optimal energy efficient design;

2. Review architectural, mechanical, and lighting submissions for compliance with energy guidelines developed by the University, prior to submission to the University;

3. Perform energy and life cycle analysis, to influence the building design to minimize future energy expenditures, and to achieve the University's desired energy budget;

4. Attend early design meetings to address building site, orientation, and shape as factors in energy consumption;

5. Calculate the projected energy cost of various design alternatives, as requested by the University;

6. Prepare required energy reports;

In designing for energy conservation, the entire facility shall be considered, its site and prevailing climatic conditions. Interactions among these elements as well as the facility's energy using systems must be taken into account. Design elements and sub-systems must be analyzed to arrive at the most appropriate mix of energy conservation measures.

B. Energy Analysis

Any building includes a diverse collection of spaces and functions with varying environmental requirements. Therefore, a system that is both efficient and functionally responsive shall be developed. This includes conducting a comprehensive Energy Study of the building and a cost/benefit analysis of available energy saving alternatives. The following considerations have been specifically designated for evaluation. Other such considerations shall be investigated which affect the quality of the building environment and the cost of operating its system.

1. Design variations in the fenestration, thermal resistance for the exterior surfaces, and building geometries which take advantage of passive energy conservation systems.

2. Systems selection contingent on life cycle cost and compatibility with building needs. A minimum of three different systems are to be analyzed.

3. Instrumentation of the building so that the building automatic central control systems will monitor and control the various components.

4. Functional zoning of the building by use and exposure.

At the Design Development submittal stage, provide a formal written analysis to include, but not limited to:

1. Single line, conceptualized schematic system drawings on floor plans. All HVAC duct work shall be drawn double line in plan view regardless of scale.

2. Heating, ventilating, and air conditioning block and zone load calculations.

3. Economic cost/benefit study of the system chosen and compared to alternatives chosen.

4. A computer energy analysis of the building system's energy consumption, operation, and maintainability over a period of not less than five years to compare life cycle costs for the various HVAC systems. It is desired to obtain from this analysis the projected cost of operation by varying hours of use and occupancy in the computer program. One of the following shall be used:

   DOE - 2 Computer Program
   Order: National Technical Information
   5285 Port Royal Road
   Springfield, VA 22161

   Info: 1. Lawrence Berkley Lab
   University of Calif.
   Berkley, CA 94720
   (415) 486-5711

   2. TRACE Computer Program
   12320 Parklawn Drive
   Rockville, MD 20852
   (301) 984-2400

   3. E20-II Computer Program
   Box 4808
   Carrier Parkway
   Syracuse, N.Y. 13221
   (315) 432-6000

This analysis is to show the cost benefit of the systems selected by having compared selected alternative mechanical systems pre-approved by the design project manager.
Analysis will be used in systems selections. ASHRAE approved or based programs such as Trane Tracer, York Yes III, Carrier OP Cost, DOE II, Trakload, or approved equal shall be used.

PART 1 – GENERAL

1.01 SUMMARY

A. This section outlines the requirements for Outdoor Power Transmission and Distribution, including but not limited to the following:
   1. High Voltage cable
   2. High Voltage Splices and Terminations
   3. High Voltage Loop Switches
   4. High Voltage Transformers
   5. Underground Ductbank
   6. Electrical Manholes

B. The high voltage (13,800 volts) distribution system on campus is operated and maintained by MEDCO through their contractor Trigen Cynergy Solutions (TCS). Any modifications, removal or new installations involving the following components shall be forwarded to MEDCO and TCS for review and approval (in addition to the normal university review process);
   1. High voltage cables or ductbank
   2. High voltage loop switches
   3. High voltage transformer
   4. Low voltage cables or ductbank from service transformer to service disconnect
   5. Main service entrance switchgear

1.02 REGULATORY REQUIREMENTS

A. All materials and installation methods shall comply with current NFPA Regulations.
B. All work in or around high voltage systems shall comply with current OSHA Safety Regulations.

1.03 QUALIFICATIONS

A. All work on the high voltage system shall be completed by technicians certified to work on high voltage systems. This includes all workers entering high voltage manholes or working in loop switches or transformers.
B. All testing of high voltage loop switches, transformers and cables shall be performed by independent testing companies, certified by nationally recognized testing agency to perform such work.

PART 2 – PRODUCTS

2.01 BASIC MATERIALS

A. All products shall be UL (Underwriters Laboratories) listed.
B. Warning Signs: Provide warning signs for electrical equipment per OSHA and NFPA.

2.02 HIGH VOLTAGE CABLE

A. The High Voltage feeder cable shall be 3-1/c, each rated 15KV, 133% level, 220 mils insulation, EPR (ethylene-propylene rubber) cable. The cable shall have a full tape shield, and be rated for 105 degrees C continuous operating temperature (MV-105), and 100 hours per year of “emergency” overload at 130 degrees C for five years of cable life. The Outside Diameter (O.D.) of the 500 kcmil cable and jacket shall be less than 1.5 inches. The cable shall be rated for 500 amps in accordance with NEC for three single conductors in one underground raceway, three feet deep with a conductor temperature of 105 degrees C, 100% Load Factor, an ambient earth temperature of 20 degrees C, and thermal resistance (RHO) of 90. The cable shall be either 500 kcmil or 750 kcmil cable if installed as part of the campus "Loop" Feeder system. The cable may be 4/0 AWG between the Loop Switch and the transformer.

1. Manufacturer: Okonite, Prysmian, Rome, or approved equal.

B. The ground conductor shall be 2/0 AWG stranded soft drawn bare copper conductor.

2.03 HIGH VOLTAGE SPLICE AND TERMINATION MATERIALS

A. SPLICE KITS

1. The splice kits shall match the make and type of high voltage cable provided. They shall be "cold shrink" splice kits and be rated for operation at 105 degrees C. If "cold shrink" splice kits are not manufactured for the particular cable application, then "resin filled" kits shall be provided. The kits shall include all components, including lugs and connectors, etc., needed to prepare the cables and completely install a splice. The kits shall provide water, weather, and mechanical protection, and be suitable for underground and cable tray applications.
2. All splices shall be grounded type (outdoor type).
3. Splice kits shall be manufactured by Prysmian, "3M" or approved equal.

B. TERMINATION KITS

1. The termination kits shall match the make and type of high voltage cable provided. They shall be "cold shrink" termination kits. The kits shall include all components, including lugs and connectors, etc., needed to prepare the cables and completely install a termination. The kits shall provide water, weather, and mechanical protection.
2. Termination kits shall be manufactured by "3M", Prysmian or approved equal.

2.04 HIGH VOLTAGE LOOP SWITCHES

A. The High Voltage Loop Switches shall be S&C Electric Company "PMU-19" style low profile, pad-mounted switchgear. No substitutions will be permitted.

B. The S&C switch shall be a four compartment, three phase switch rated 14.4 Kv Nominal, 17.0 Kv max, and 95 Kv BIL. The switch shall be rated 600 amps RMS Continuous, as well as 600 amps RMS for Load interruption (Dropping and Load Splitting) (Parallel or Loop Switching)

C. The switch shall have the following Duty-Cycle Fault-Closing, Two Time ratings;
Asymmetrical—40,000 Amps RMS
Symmetrical—25,000 Amps RMS
Peak—62,500 Amps RMS

D. The switch shall have a Momentary rating of 40,000 Amps RMS, and a One-Second rating of 25,000 Amps RMS.

E. The switch shall utilize SM-5S fuses and fuse holders. Three spare fuses shall be provided with switch. The fuse ratings shall match the transformer Primary protection rating.

F. Compartments #2 and #3 shall disconnect the incoming cables from the internal bus. Compartment #4 shall disconnect the internal bus from load side fuses. Compartment #1 shall contain fuses and connect to load side cables.

G. The switch shall have physical dimensions of 72" wide x 74" deep by 63" high. The switch shall be dark green.

2.05 HIGH VOLTAGE TRANSFORMER

A. Transformers shall be outdoor, pad-mounted, oil-filled units with primary fusing via the S&C switchgear.
B. The transformer shall be three phase(unless UM approved otherwise), 65 degree C rise, 60 hertz, copper windings, rated 30 degree C average ambient.
C. The transformer shall be rated 13,800 volts delta on the primary side, with 480/277 volts (or 208/120 volts) on the secondary side. It shall be rated 95 KV BIL, and have 2-2.5% FCAN and 2-2.5% FCBN taps. Total voltage compensation shall be 5%.
D. Impedance values—2.3% min and 5.75% max up through 500kva. 750 kva and larger shall have a design impedance of 5.75%.
E. Transformers shall equipped with externally replaceable, 8.3/14.4kV rated loadbreak bushing wells and inserts suitable for use with loadbreak elbow connectors. Bushings shall be arranged for loop feed in accordance with ANSI C5.12.26 Fig 6A.
F. Transformers shall be equipped with metal oxide, distribution class under oil lightning arresters. Arresters shall be rated 10kV.
G. Transformer shall be equipped with ground attachment points, one in the primary compartment, and one in the secondary compartment. The secondary ground point shall be a bar capable of supporting up to 12 ground cables. Grounding attachments shall be made using a “taplug” connector with ½” – 13UNC threads.
H. Transformer shall be filled with ANSI Type II mineral oil and shall have less than 1 PPM of PCB content at the time of manufacture.
I. Transformers shall be equipped with 6-hole spade type connectors. Transformers over 1500 kva shall be equipped with 10 hole spades. Spades shall be capable of accepting copper conductors up to 750 kcmil in size.
J. Transformers shall be equipped with a pressure relief device, that utilizes a pull-ring to operate the device.
K. The transformer shall have the following accessories:
    1. 5 position tap changer
    2. Dial type thermometer (measuring current and max temperature achieved)
    3. Liquid level gauge
    4. Pressure vacuum gauge
    5. Gas sample valve
    6. 1” drain valve and sampler
    7. Pressure relief valve
    8. Ground bar in the secondary compartment
    9. Standard industrial enamel paint (dark green)

2.06 UTILITY ACCESS HOLES

A. Utility access holes shall be pre-cast reinforced concrete with minimum inside dimension as indicated for each utility access hole (minimum size 6’ wide x 8’ long x 6’ high) and a centered entrance opening of 36 inches diameter (minimum).
B. The utility access hole, cover, and collar shall be capable of supporting truck loads on the cover and all other loads imposed by dry or wet earth. Provide engineering computation "sealed" by a registered professional engineer as part of the shop drawing submittals for each size of utility access hole to substantiate that the utility access hole design accommodates the criteria set forth in C. below.
C. Design Loads:
    Dead Load:
    1. Concrete at 150 PCF
    2. Earth Cover at 120 PCF
    Lateral Earth Pressure on Walls:

1. Equivalent Fluid pressure above the water table at 32 PSF per foot of depth.
2. Equivalent Fluid pressure below the water table at 81.4 PSF per foot of depth.
3. Surcharge on walls equal two feet of dry earth.

Time Load:

H20-AASHO truck loading rear wheel load of 16,000 lbs + 30% impact (20,800 lbs total)

D. Utility access holes shall be as manufactured by: Penn Cast, Easi Set, A.C. Miller Products, Inc., Smith-Midland or approved equivalent.
E. The utility access hole cover shall be cast iron to accommodate a clear opening into the utility access hole of 36 inches diameter (minimum).
F. Covers for "Electric" utility access holes shall have the word "Electric" cast as part of the cover.
G. The rim supporting the cover shall be cast iron.
H. Cover and rim shall be structurally adequate to accommodate a 20 ton truck loading (H20-ASSH) as required for each utility access hole.
I. Covers shall be solid except for openings to enable placing and removing the cover, and shall be designed to meet standard U.S. Government designs for underground electric or telephone construction.
J. A Ground rod shall be installed, and shall be copper clad steel at least 10 feet long and 3/4 inches diameter (minimum).
K. Cable support racks shall be installed on all four interior walls of the utility access hole and shall be non-metallic, adjustable arm, cable racks as manufactured by Underground Devices, Inc. Each stanchion (upright) shall be at least 36” long. Install six stanchions in the utility access holes—two on each of the long walls, and one on each of the short walls. Utilize stainless steel bolts and washers to attach the stanchions. Install a total of twelve 14” support arms on the stanchions. Each arm shall be rated to support 350 lbs. The racks shall be Underground Devices, Inc. or approved equal.
L. Each utility access hole shall have a hot dip galvanized steel ladder that reaches from the rim supporting the cover to the floor of the utility access hole. Attachments to secure the removable ladder to the steel rim shall be stainless steel.
M. Each utility access hole shall have "hot dip galvanized steel pulling eyes" for each wall. Each "pulling eye" shall be located near the floor and shall be centered in the respective wall.
N. Provide end bells for all duct penetrations.

2.07 Low Voltage Cables

A. All low voltage cables for feeders, branch circuits, and control circuits shall be copper conductor, THHN/THWN, 600 volt insulation, rated at 90 degrees C. Use of wire smaller than #12 AWG for feeder and branch circuits, and #14 AWG for control circuits shall not be acceptable. Feeder and branch circuit conductors larger than #10 AWG and all control circuit conductors shall be stranded.

2.08 Main Service Entrance Switchgear

A. Service Entrance disconnecting means for services of 400 amps or more shall be a single main breaker--fused disconnects are not acceptable.

PART 3 – EXECUTION

3.01 DESIGN

A. The high voltage (13,800 volts) distribution system on campus is operated and maintained by MEDCO through their contractor Trigen Cinergy Solutions (TCS), and will require their approval.

Any modifications, removal or new installations involving the following components shall be forwarded to MEDCO and TCS for review and approval;

1. High Voltage cables or ductbank
2. High voltage Loop Switches
3. High voltage transformer
4. Low voltage cables or ductbank from service transformer to main building switchgear
5. Main building service switchgear

B. The design concept shall first be coordinated through the University Engineer Office, to ensure the concept agrees with the campus high voltage distribution philosophy.

C. The design including the connection to the existing high voltage distribution system, through the loop switch and transformer to the first disconnecting device in the main electrical switchgear in the building shall be submitted to MEDCO for review and approval at each stage of the design.

3.02 HIGH VOLTAGE CABLES

A. All feeders in manholes shall be labeled. The labels shall be permanent and be readable with auxiliary lighting in the manhole. The labels shall indicate origination and destination locations, as well as the feeder number.

B. Install fireproof taping on all phase cables in manholes.

3.03 HIGH VOLTAGE DUCTBANKS

A. High voltage ductbanks constructed for high voltage loop feeders shall be concrete-encased, 5" diameter (minimum) PVC tubes, with a minimum of four tubes.

B. Ductbanks for feeders between the loop switch and the transformer may utilize concrete-encased, 4" diameter PVC tubes.

C. Ductbanks shall utilize "long sweep" elbows.

D. Ductbanks terminating in buildings or manholes shall have "bell ends", where the tubes penetrate the wall, or bushings if terminating in equipment.

E. Ductbanks shall have a minimum of 30" cover from the top of the ductbank to the top of grade.

F. Ductbanks shall include a minimum of 100% spare tubes.

G. Ductbanks should be graded gently sloping down toward each manhole (3" per 100' minimum).

H. If multiple loop switches are installed on a common pad, the high voltage loop ductbanks shall not go from switch to switch, but shall go back to the manhole—one 4-tube ductbank for each switch on the pad.

I. Utilize rigid PVC spacers to provide minimum duct spacing and concrete cover depths while supporting tubes during concrete pours.

J. Install reinforcement in ductbanks passing through disturbed earth and when running perpendicular across roadways.

K. Waterproof floor and wall penetrations of the duct tubes, prior to pouring concrete around the tubes

L. Provide 6" of separation in combined ductbanks between high voltage tubes and communication or low voltage tubes.

M. Provide a minimum of 18" separation when crossing steam or hot water lines. Ductbanks shall cross under steam and hot water lines, unless depth of ductbank exceeds 8'.

N. Ductbanks shall not run parallel to steam lines, unless there is at least a 5' separation between ductbank and steam line.

O. Empty tubes shall have pull strings installed, and tied off at both ends.

3.04 HIGH VOLTAGE MANHOLES

A. Manholes shall not be greater than 400’ apart.
B. Upon completion of the feeder installation, provide “fold-down” drawings of the interior of the manhole, with the duct tubes clearly labeled, and with cables annotated.
C. Low voltage cables (less than 600 volts) shall not pass through high voltage manholes (more than 4160 volts).

3.05 LOW VOLTAGE DUCTBANKS

A. Low voltage ductbanks constructed for service entrance feeders or emergency power feeders shall be concrete-encased, 4” diameter (minimum) PVC tubes.
B. Ductbanks shall utilize “long sweep” elbows.
C. Ductbanks terminating in buildings or manholes shall have “bell ends”, where the tubes penetrate the wall.
D. Ductbanks shall have a minimum of 30” cover from the top of the ductbank to the top of grade.
E. Ductbanks shall include a minimum of 50% spare tubes.

3.06 TESTING

A. All high voltage components (loop switches and transformers, etc.) shall be tested after they are placed in their final position. The applicable tests include; Megger, Contact Resistance, and Hi-Pot test.
B. All high voltage cables, terminations, and splices shall be tested prior to energizing.
C. All test results shall be submitted to MEDCO (and TCS) prior to de-energizing the campus high voltage system in preparation for splicing in the new or modified system.

PART 1 – GENERAL

1.1 SUMMARY

A. This section outlines the requirements for Basic Electrical Materials and Methods, including but not limited to the following:

1. Basic Materials
2. Connection of Utilization equipment
3. Supports
4. Identification
5. Conduit and fittings
6. Wireway
7. Surface raceway system
8. Electrical boxes, cabinets and enclosures
9. Wire and Cable
10. Wiring Devices
11. Service Fittings

1.2 REGULATORY REQUIREMENTS

A. All materials and installation methods shall comply with NFPA.

PART 2 – PRODUCTS

2.1 BASIC MATERIALS

A. All products shall be UL (Underwriters Laboratories) listed.
B. Nameplates: Engraved, Phenolic laminated plastic, 0.125 inch thick, black background with white core, with beveled edges. ALL LETTERING SHALL BE UPPERCASE. Shall be attached using self tapping screws.

1. Nameplate shall be installed on all equipment items. Use ¼" high engravings.
2. Nameplates shall be installed on all feeder circuits and all outdoor circuits.

a. Attach nameplates to each cable or wire located in pullboxes and at each splice and termination. Use ¼" letters. Cable nameplates shall be secured in place with ¼" cable ties. Nameplates shall indicate which panel and circuit breaker the feeder or circuits is fed from.

3. Phases of all 600V wire shall be identified at all splice and termination points using colored tape. Colors shall be black, red, and blue for 208 volt phase conductors, white for neutrals, and green for ground conductors. Utilize orange, brown, and yellow for 480 volt phase conductors, gray for neutrals, and green for ground conductors.

C. Warning Signs: Provide warning signs for electrical equipment per OSHA and NFPA.
D. Label junction boxes with panel #, and circuit breaker # of where circuits originate – use permanent marker.
E. Steel – all steel products shall be galvanized or treated for corrosion.
F. Conduit and fittings.

1. Use only specified raceway in the following indoor and outdoor locations:
   a. Installation in or under concrete slab shall be; galvanized steel (EMT) or schedule 40 PVC. Stub-ups out of concrete shall be galvanized steel (EMT). Applicable for branch circuits and service entrance feeder only.
   b. Exposed outdoor locations: Only rigid galvanized steel conduit shall be used.
   c. Concealed dry interior locations: Electrical metallic tubing or MC cable as allowed below.
   d. Exposed dry interior locations: EMT or rigid steel in areas with motorized vehicles.
   e. Connections to vibration producing equipment or motors shall be liquid tight flexible metallic conduit.
   f. New Construction: raceway/conduit in finished areas shall be concealed by architectural surfaces.
   g. Electrical Feeder Distribution conduits within a building shall not be in the concrete slab or underground.

2. Use of the following types of conduits and fittings shall not be permitted in any application for this project:

   a. "Die-cast metal" conduit fittings.
   b. Aluminum Conduit, Cable Tray and fittings.
   c. PVC Type 'EB'.

G. Electrical Boxes

1. Interior – metal only, approved for the specific location and application.
2. Exterior – metal, NEMA approved for outdoor locations.

2.2 WIRE AND CABLE

A. Building Wire:

1. Feeders and Branch Circuits Larger Than 10 AWG: Copper, stranded conductor, 600 volt insulation, THHN/THWN, rated at 75 degree C.
2. Feeders and Branch Circuits 10 AWG and Smaller: Copper, 600 volt insulation, THHN/THWN solid conductor, rated at 75 degree C. No conductor smaller than #12 AWG is acceptable.

B. Forbidden Cables:

1. Use of BX (Armored) Cable, UF, and Romex Cable is not permitted.

C. Color coding shall be a permanent part of and uniform throughout the entire length of the jacket material of the cable and shall be used throughout the building for feeder circuits. Color applied to the outer surface only is not acceptable. Taping (6" minimum) at termination points is acceptable. Color coding shall be:

	480/277 Volts	208/120 Volts
Phase	Color	Color
A	Orange	Black

B	Brown	Red
C	Yellow	Blue
Neutral	Gray	White
Ground	Green	Green

2.3 WIRING DEVICES AND WALL PLATES

A. Receptacle:

1. Use specification grade receptacles and switches.
2. GFCI Receptacle: Duplex convenience receptacle with integral ground fault current interrupter, test and reset push buttons.
3. Device plates for interior use on flush-mounted devices shall be satin finish type 302 stainless steel.
4. Device plates for interior use on surface-mounted devices shall be galvanized sheet metal with rounded corners.

B. Weatherproof Cover Plate: Match receptacle configuration provided for equipment connection. Gasketed cast metal with gasketed device covers.

1. A receptacle installed in a wet location where the product intended to be plugged into is not attended while in use (e.g. sprinkler system controller, landscape lighting, holiday lights, etc.) shall have an enclosure that is weatherproof with the attachment plug cap inserted or removed.
2. A receptacle installed in a wet location where the product intended to be plugged into is attended while in use (e.g. portable tools, etc.) shall have an enclosure that is weatherproof when the attachment is removed.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Do not drill structural steel members.
B. Install free-standing electrical equipment on 4” concrete pads.
C. Arrange conduit to maintain headroom and to present neat appearance.

   1. Route exposed raceway parallel and perpendicular to walls and adjacent piping.
   2. Maintain minimum 6 inch clearance to heat surfaces such as flues, steam pipes, and heating appliances.
   3. Maintain required fire, acoustic, and vapor barrier rating when penetrating walls, floors, and ceilings.
   4. Use conduit hangers and clamps; do not fasten with wire or perforated pipe straps.

D. Install surface metal raceway and multi-outlet assemblies in accordance with manufacturer's instructions.

   1. Use flat-head screws or clips and straps suitable for the purpose, to fasten channel to surfaces. Mount plumb and level.

2. Use suitable insulated bushings and inserts at connections to outlets and corner fittings in metal raceway.
3. Use fittings and accessories designed for use with raceway system.

E. Use recessed outlet boxes in finished areas or as required.

1. Secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness.
2. Do not install boxes back-to-back in walls; provide 6 inch separation, minimum. In acoustic-rated walls provide 24 inch separation, minimum.

F. Install floor boxes in accordance with manufacturer's instructions.
G. Minimum conduit size shall be ¾ inches.
H. Install pull strings in all spare raceways. Pull strings shall be multi-strand polypropylene monofilament, with minimum size of 3 strand 3/16 inch diameter and 800 pound breaking strength.

3.2 EXAMINATION AND PREPARATION

A. No wiring shall be installed until the building is under roof. Do not install wire in raceways until after concrete work fireproofing or plastering is completed.

3.3 WIRING DEVICES

A. Install wiring devices in accordance with manufacturer's instructions.
B. Install convenience receptacles 18" inches above finished floor with grounding pole on top.
C. Install duplex convenience receptacles in corridors at 30 foot maximum intervals.

3.4 WIRING FOR LIGHTING FIXTURES, RECEPTACLES:

A. MC cable shall be allowed for connections within a room from a junction box to the lighting fixtures.
B. Conduit home runs shall be in EMT.
C. MC cable shall be allowed from a junction box within a room to the receptacles in the same room.
D. MC cable shall not be allowed to cross one room to another room whether the wall between two rooms goes up to slab or not. If the rooms are identified as two separate rooms, MC cable shall not be used between the two rooms.
E. MC cable shall not be used, between two receptacles when they are in two separate rooms, on the same wall.

3.5 LABELING FOR LIGHTING AND POWER EQUIPMENT

A. All electrical equipment shall be labeled as set forth in this section, including but not limited to the following types;

1. Switchgear/Switchboards
2. Power Distribution Panels/Load Centers
3. Lighting/Power Panels

4. Disconnect/Safety Switches
5. Automatic Transfer Switches (ATS)
6. Power Distribution Units (PDU)
7. Motor Control Centers (MCC)
8. Transformer
9. Uninterruptible Power Supply (UPS)

B. The labeling shall be in the following format;

```
Type   Volt/Sys   Location    Item
X X  – X X X X – X X X X X  – X X
```

1. <u>TYPE</u>—First group of two characters describes the type of power equipment;

   a. “SE”—Service Entrance Equipment (Switchgear or Switchboard)
   b. “DP”—Power Distribution Panel. Panel with a significant majority of “feeder” breakers
   c. “PP”—Power Panel. Panel with a significant majority of power “branch” breakers
   d. “LP”—Lighting Panel. Panel with a significant majority of lighting “branch” breakers
   e. “DS”—Disconnect Switch. Fused or non-fused disconnect switch or circuit breaker
   f. “AT”—Automatic Transfer Switch
   g. “MC”—Motor Control Center
   h. “TX”—Transformer
   i. “PD”—Power Distribution Unit
   j. “UP”—Uninterruptible Power Supply

2. Volt/Sys—Second group of two to four characters describe the voltage level and the system providing power.

   a. 1st character is the “Voltage designation
      (1). “1”---120/240 volt 1 phase
      (2). “2”---120/208 volt 3 phase
      (3). “4”---277/480 volt 3 phase

   b. 2nd and possibly the 3rd and 4th character are the system power

      (1). “N”---Normal Power
      (2). “E”---Emergency (not segregated into Life Safety, Legally Required, etc.)
      (3). “ELS”---Emergency, Life Safety Power
      (4). “ELR”---Emergency, Legally Required Power
      (5). “EOP”---Emergency, Optional Standby Power
      (6). “UPS”---Uninterruptible Power Supply
      (7). “SL”---Site Lighting (controlled by contactor)

3. Location—Third group of four (or five) characters describes the location (room number or nearest room number) within the building.

a. 1st characters will indicate the floor of the building
b. 2nd character will indicate the wing
c. 3rd and 4th character will indicate the room number in that wing
d. 5th character may be an alpha prefix indicating a sub-basement (SB0123), basement (B0123) or mezzanine (M1123), or an alpha suffix indicating a part of a room or space (1123A)

4. ITEM—Fourth group of two characters

a. 1st character is the sequence number for the same type equipment (same label designation) within the SAME room.
b. 2nd character is the section number for multiple section equipment items.

C. When replacing “existing” equipment, provide two labels;

1. The new label as defined above
2. A second label below the first, that provides the “old” designation of the panel/equipment, with the words “old label” in front of the old designation. For instance, “old label PP-01N”

D. Label Samples

1. “SE-4N-1201-1” is Service Entrance equipment, operating on 277/480 volt “normal” power, situated in Room 1201.
2. “DP-4N-2301-2” is a Power Distribution Panel, operating at 77/480 volts “normal” power, situated in Room 2310. This panel is the second or two panels of this type within Room 2310.
3. “DP-2ELS-2310-1” is a Power Distribution Panel, operating at 120/208 volt “Emergency, Life Safety” power, situated in Room 2310.
4. “PP-2N-3224-1” is a “Branch” Power Panel, operating at 120/208 volt “normal” power, situated in Room 3224.
5. “MC-4N-0210-1” is a motor Control Center, operating at 277/480 volt “normal power, situated in Room 0210.

A. Emergency power for the following systems is required:

1. Fire Alarm
2. Security
3. Emergency Lighting
4. Telephone Service
5. CCMS
6. Other systems as may be needed/identified by the University.

Lighting equipment pertaining to code required illumination shall be also supported by an emergency generator.
All mechanical and electrical rooms having disconnecting or air handling equipment shall have 50% of connected lighting served by an emergency circuit. All lighting shall be switchable at entry to room.
Where applicable, new loads shall be connected to existing generators to maximize the use of existing equipment.

B. The size of the generator set shell be calculated by A/E base upon the connected load include any Alternate plus 20 percent spare capacity for future expansion.

C. Provide for and show a generator set with automatic transfer switch, manual by-pass, start/stop control system, remote alarm annunciator, battery charger, and other accesories for a complete working system.

D. Fuel to power the generator shall be selected on the basis of cost and availability with a preference for natural gas followed by fuel oil and propane gas.

E. Acceptable locations for Emergency Generators:

1. SCUB
2. Basement or ground floor of building,
3. A weather protected enclosure meeting noise abatement standards adjacent to building.

No other locations are acceptable.

F. Generator exhaust shall not be discharged in a fashion to cause it to enter any building's air handling system or into pedestrian walkways.

G. Generator rooms must be large enough to enable repairs. Access doors must be large enough to permit removal and replacement of the generator without having to dismantle the generator in any way.

H. The generator shall be run for several hours while the building is in use and occupied; therefore, the generator must be properly exhausted and sound-proofed so as not to interfere with the building's usage.

I. Overhead lighting, on an emergency circuit, is required in the generator room or within the weather protected enclosure while the generator is operational.

16.06 FIRE PROTECTION SYSTEM

The following equipment shall be included as part of a comprehensive system for fire protection in accordance with NFPA 101, Life Safety Code and approved by DAEC.

A. A complete multiplex fire alarm system with a control panel located in a designated fire protection services room, or as specified.

B. A textually graphic annunciator in the main lobby areas and other locations as designated.

C. Standard fire alarm signals, claxon horns and flashing lights located throughout the building.

D. The connection of the system with the Central Control and Monitoring System.

E. The use of smoke detectors, magnetic door releases, manual pull stations, and HVAC controls where appropriate, and as required.

F. A complete automatic sprinkler system throughout the building with main controls in a designated fire protection services room.

G. A complete standpipe system (combined with the sprinkler system) for fire department use in areas of the building with three or more stories and as directed.

H. Fire extinguisher cabinets.

The entire system and all equipment is to be designed and/or specified in accordance with the latest addition of all applicable codes and standards.

In cases in which sensitive electronic equipment is to be located within the facility, it will be necessary to design a fire detection system capable of interrupting the power supply to the equipment. Halon or carbon dioxide type suppression systems shall not be specified.

Coordination with Facilities Management through DAEC to insure conformity of all new fire protection equipment is required.

16.07 LIGHTNING PROTECTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials, equipment and services necessary for the furnishing and installing of a complete Lightning Protection System.

1.02 QUALITY ASSURANCE

A. Underwriter's Laboratories, Inc. Standards for Lightning Protection Systems, UL 96A.

B. National Fire Protection Association Code for Lightning Protection Systems, #78.

C. The Lightning Protection System shall be designed and installed by a firm regularly engaged and experienced in installing Master Labeled Lightning Protection Systems and shall be listed with the Underwriter's Laboratories, Inc.

D. The Lightning Protection System shall conform to the requirements of the Underwriter's Laboratories Inc., Standards for Master Labeled Lightning Protection Systems, UL 96A, latest edition and the Master Label covering the existing buildings, shall be delivered to the Owner on completion of all work.

E. The Lightning Protection Installer shall issue a UL compliance certification suitable to present and satisfy any and all requirements.

1.03 SHOP DRAWINGS

A. The Contractor shall submit, for approval, shop drawings showing complete details with description of all air terminals, air terminal bases, conductors, conductor fasteners, splicers, bonding clasps, ground rods, etc. Only shop drawings bearing the stamp of approval of the Architect shall be used by the Contractor.

1.04 WORKMANSHIP

A. The Contractor shall guarantee all materials and workmanship furnished and installed under this section of the specifications two years from date of final acceptance of the work. The Contractor also agrees that he will, at his own expense, repair and/or replace all such defective materials or effective workmanship which become defective during the term of this guarantee.

PART 2 - PRODUCTS

2.01 GENERAL

A. The system to be furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of Lightning Protection Systems and shall be the manufacturer's latest approved design. All material specified for this work shall be Underwriter's Laboratories, Inc. approved and shall be manufactured by Bonded Lightning Protection, Inc., Rockville, Maryland; Thompson Lightning Protection, Inc., St. Paul, Minnesota; Independent Protection Co., Goshen, Indiana; or Robbins Lightning Protection Co., Maryville, Missouri.

2.02 MATERIALS

A. Materials used in connection with the installation of the lightning protection system shall be approved for this system by the Underwriter's Laboratories, Inc.

2.03 CONDUCTORS

A. All conductors shall be bare stranded cable, 28 strands of 14 gauge.

2.04 AIR TERMINALS

A. Air terminals shall be aluminum, 1/2 inch in diameter with tapered points; they shall extend not less than 10" above the object they are to protect.

2.05 FASTENERS, CLAMPS, ETC

A. All fasteners, clamps, and connectors shall be bolted pressure type and shall be substantial in construction, not subject to breakage, shall be of the same material as the conductor or of such nature that there will be no serious tendency toward electrolytic corrosion in the presence of moisture.

2.06 GROUND RODS

A. Ground rods shall be 3/4 inches in diameter by 10 feet in length, made of copper-clad steel. The portion of copper on copper-clad rods shall be approximately 27% of the weight of the rod. All ground rods shall be equipped with Bonded Lightning Protection #107 ground reservoirs and shall be driven to a depth of 36 inches below finished grade and/or finished floor, minimum.

2.07 TEST WELL

A. Provide a 6 inches diameter by 24 inches terra cotta test well with steel covers for each ground rod. Test wells shall be installed flush with the finished first floor and/or finished grade. Tests wells shall be Bonded Lightning #200. Ground resistance test shall be performed on the finished system and the results submitted to the University of Maryland. Grounds resistance shall not exceed 10 ohms on completion.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The installation of the Lightning Protection System shall avoid penetrations of existing building roofs.

PART 1 – GENERAL

1.1 APPLICATION

A. This section applies to all interior and exterior lighting in "new building" designs.

B. This section applies to "renovation work" within existing buildings--if the installation of new light fixtures, or the relocation of existing light fixtures is a part of the renovation, and the lighting work involves at least 50% of the lighting within the renovated space.

C. Any deviation or exception to the requirements of this section requires the prior written approval of the Director of the Operations and Maintenance (O&M) Department in Facilities Management Electrical Systems Section, as well as notification to the Electrical Systems Section within O&M.

PART 2 - PRODUCTS

2.1 LIGHT FIXTURE COMPONENTS NOT ALLOWED

A. Lamps

1. *Fluorescent T-12 lamps*
2. *Linear fluorescent "U-Tubes"*
3. *Linear fluorescent lamps in any length other than nominal 24" or 48"*
4. *Incandescent lamps*
5. *Mercury vapor lamps*
6. *High or low pressure sodium lamps*
7. *Interior horizontal mounted lamps (except linear fluorescent) in any fixture mounted higher than 10' above the floor level*

B. Ballasts

1. *Magnetic*
2. *Ballasts containing PCB's, DEHP, oil or hazardous substances*
3. *Any ballast not rated for multiple voltages (120/277 volt)*

C. Occupancy Sensors

1. *In hallways*
2. *In main mechanical or electrical rooms.*

2.2 LAMP COLOR

A. Color temperature shall be 5000K or higher
B. Color Rendition Index (CRI) of 80 or higher

2.3 LAMP LIFE

A. Lamps (non-fluorescent) shall have an "average" lamp life of 5000 hours or more.

B. Lamps installed in fixtures over 12' high, shall have a lamp life of 10,000 hours or more.

C. Lamps installed within "BSL Labs", "Clean Rooms" or hazardous areas, shall have a *lamp life of 10,000 hours or more.*

2.4 BALLASTS

A. Hallways utilizing linear fluorescent fixtures shall utilize “Step-Dimming” ballasts, which have two “hot” leads, and provide lighting levels of 0%, 50%, and 100%.

B. Be rated for multiple voltage operation, at 120 volts or 277 volts.

C. Ballasts utilized in linear fluorescent fixtures with a Ballast Factor within one of the following ranges, shall be designed to meet “light level” and “power density” requirements utilizing a ballast at the lowest level within the range given. For instance, if a designer selects a fixture with a Ballast Factor of 1.2 for a particular space, then the designer shall ensure the light level and power density requirements are still met if the ballast is replaced with a 1.0 Ballast Factor ballast.

1. *High--1.15 to 1.30*
2. *Normal—0.95 to 1.14*
3. *Low-- 0.70 to 0.94*

2.5 LIGHT FIXTURES

A. Hallways

1. *Overhead fixtures*
   a. *Cooper 2’ x 2’ fixture, 2AC-214T5-UNV-L5850-TUB228PU95S50D-UM*
   b. *Lithonia 2RT5 14T5 MVOLT GEB10PS LP850*
   c. *H.E. Williams HETG-S22-214T5S-A-EBSD2-UNV*
   d. *Or approved equal fixture, with “step-dimming” (0%, 50% & 100%) ballast.*
2. *Ballast disconnect plugs. Hallway light fixtures shall have a three wire disconnect plug.*

B. Special Rooms

1. *Fixtures installed in “Clean Rooms“, “BSL Labs” or hazardous areas shall have the ballasts and light switches mounted remotely--outside of the clean area.*

C. Exit Signs

1. *Shall be 2 watts or less LED fixtures. Exit fixtures with special features, such as “vandal resistant” fixtures, shall be 5 watts or less.*
2. *Shall be red exit signs, unless in an existing building, where new exit signs should match the color in the remainder of the building.*

D. Outdoor

1. *Outside street, walkway and parking lot lighting fixtures shall be the “Gardco” shoebox fixture utilizing metal halide lamps in 175 watt, 400 watt, and 1000 watt sizes.*
2. *Fixtures shall be mounted on square tapered poles.*

PART 3 – EXECUTION

3.1 ENERGY CONSUMPTION

A. The power consumption level of lighting fixtures shall be determined on a "Space-by-Space" method.

B. The power consumed by lighting fixtures within a "space type", shall not exceed a value determined by multiplying 65% times the value listed in ASHRAE 90.1-2007 "Lighting Power Densities (LPD) Using the Space-by-Space Method".

C. All light fixtures within a space type shall be included in this calculation, including wall washer, decorative, bulletin board, cove, task, special lighting and overhead light fixtures.

D. The "input Power" rating of the light fixture shall be used in this calculation.

E. For "screw-in" type lamps, the wattage used for the above calculation shall be the highest "UL rated" lamp wattage allowed in the fixture.

3.2 LIGHT LEVELS

A. Light levels shall be as specified by the Illuminating Engineering Society of North America (IESNA) handbook (latest edition), unless modified below.

B. Light levels shall be measured by "full spectrum" light meters, or at a level of 90% of IESNA Standards using "photopic" light meters.

C. Classrooms, Offices and Labs
1. *Light levels in classrooms shall be as indicated in IESNA on at least 90% of the desks in the classrooms.*
2. *Light levels in offices shall be as indicated in IESNA, with the recommended level measured on the portion of the desk used for detailed reading or paper work. The IESNA recommendation is not an average for the entire room, but is the level on the work surface.*
3. *"Average Light Level" range: 30 – 50 foot-candles, calculated on the desk and table tops.*

D. Hallways
1. *"Average Light Level" range: 5 to 8 foot-candles, calculated at floor level.*
2. *"Max to Min" Ratio Maximum: 5*

E. Restrooms
1. *Shall be designed for 5 to 8 foot-candles.*

F. Stairwells
1. *Shall be designed for 10 fc on the walking surfaces.*

G. Electrical and Mechanical Rooms
1. *Electrical switchgear, distribution panels, motor control centers and branch panels shall have 50 fc measured at a height of 5'-0" above the finished floor along the front of the equipment and the rear of the equipment (if there is maintenance access).*
2. *Provide an average level of 30 fc throughout the remainder of the room (measured at 5'-0" level).*

3.3 POWER SOURCE

A. The hallway, lobby, stairwell, exit and emergency egress lighting fixtures required for emergency egress shall be powered from a 277 volt “emergency power” source originating from either an emergency generator or a central battery system such as a “Central Inverter System” (UPS System).

B. Hallway and lobby lighting that is over and above that needed for “emergency egress lighting” shall be connected to the “switched” leg of the emergency power source (see detailed description of hallway wiring below), or connected to a “non-emergency” power source utilizing occupancy sensors.

C. The “Central Inverter System”, if utilized, shall have an automatic “self-test” and “record” function, a bypass switch, the ability to communicate status via phone dialer, or similar feature. The inverter shall also include local status alarms.

D. In main Electrical and Mechanical rooms, 50% of the light fixtures throughout the room shall be on an emergency power source.

E. All overhead lighting within the building shall operate at 277 volts, if available within the building.

3.4 CONTROLS

A. In main mechanical and electrical rooms, “timer switches” with the ability to warn occupants by flashing the lights as “off-time” gets close, may be used on no more than 50% of the lighting in the room.

B. The outdoor lighting for sidewalks, parking lots and street shall be controlled via central photocell to turn the lights on, and a 7 day/24 hour time clock to turn the lights off, and a “Hand-Off-Auto” (HOA) switch to operate the lights manually. The HOA switch shall be mounted in an area not accessible to the general public.

C. Hallway, stairwell, lobby, exit, or emergency egress lighting needed to support emergency egress requirements, shall not be connected to local wall switches.

D. Locate light switch at the main entrance to the room.

3.5 WIRING CONFIGURATION

A. Hallway Wiring
   1. An “Emergency Power” conduit system shall be installed to support the hallway lighting (see Figure 1). The conduit system shall consist of an EMT conduit (appropriately sized), from the main electrical room, to the top floor of the building. The conduit shall rise from the lowest floor to the top floor near the center of the building.
   2. At each floor of the building, above the suspended ceiling or in an accessible location, a junction box shall be installed in the conduit run. The junction box shall be at least 8” x 8” x 4”.
   3. Inside the conduit system, a series of #10 AWG wires (minimum size) shall be installed from the main electrical room to the junction box on each floor as indicated below;

a. Two circuits (7 wires) shall be installed to each floor of the building for connection to exit, hallway, stairwell, emergency egress and lobby lighting. A three story building, would have 6 circuits (19 wires) in the Emergency Power conduit system as the conduit leaves the main electrical room.

1. The first circuit to each floor shall leave the Emergency Power Panel (generator or inverter source) and enter a "relay" or "lighting controller" box (minimum size 20" x 16" x 6"). The "hot" shall be spliced within the "relay" box, to two wires—one a "switched" wire and the other an "un-switched" wire. The "switched" wire shall be Orange. The "un-switched" wire shall be Brown. The neutral wire shall be Gray and the ground wire shall be green, and shall accompany the two "hot" wires.

2. The second circuit to each floor shall leave the Emergency Power Panel (generator or inverter source) and enter the "relay" box. The "hot" shall be spliced to two wires—one a "switched" wire and the other an "un-switched" wire. The "switched" wire shall be Yellow. The "un-switched" wire shall be Brown. The neutral wire shall be Gray and the ground wire shall be green, and shall accompany the two "hot" wires.

b. The two "hot" wires, neutral and ground wire shall continue to the junction box, be capped with wire nuts, and identified (via tags) with the "Power Panel #" and "Circuit Breaker #" where the two "hot" wires originated.

4. The "Emergency Power" conduit system from the main electric room to every floor of the building shall be installed along with the first project that installs or relocates any hallway lighting.

5. From the junction box on each floor, install two 12/3 MC cables down one direction in the hallway, and two other 12/3 MC cables down the other hallway direction. Runs greater than 750' need to have the MC cable size re-evaluated. Down each hallway, the outer casing of one of the MC cables shall be "striped" to indicate the "Orange" interior wire, and the other MC cable may be "striped" to indicate the "Yellow" interior wire, or may have a plain exterior jacket, but it must be different than the other (striped) MC jacket.

a. Exterior "striped" MC cable shall AFC Cable Systems, Kaf-Tech or approved equal

6. Connect the two phase wires in one 12/3 MC cable which goes down one direction in the hallway, to the two "hot" wires in one of the two circuits for that floor (from the main electric room). Splice in another two phase wires from the 12/3 MC cable going down the hallway in the other direction. This provides for a single circuit from the main electric room, feeding two 12/3 MC cables leaving the junction box, going down the hall in two different directions.

7. Repeat the step above for the other two 12/3 MC cables leaving the junction box. This provides a second circuit from the main electric room, feeding two 12/3 MC cables leaving the junction box, going down the hall in two different directions.

8. The two steps above provide two different circuits to be going down each direction of the hallway. This allows a 12/3 MC cable to be connected to "every other" light fixture in the hallway--so that every other fixture is fed by a different circuit. This would permit one breaker or circuit to trip, and still have every other fixture still operating in the hallway.

9. For each light fixture in the hallway, connect a 12/3 MC cable. Connect the two phase wires in the MC cable to the two "hot" wires on the light fixture "step-dimming" ballast. One of the wires will be a "switched" leg, and the other will be an "un-switched" leg.

B. For lighting within a room, the "home run" circuits shall be terminated in a ceiling (or above ceiling) mounted junction box, before going to the light switch.

C. Light switches in new buildings shall have EMT conduit installed from the switch to a junction box above the ceiling. This allows future wiring changes for various switch opportunities.

D. Support MC Cables from building structure as required by the NEC.

3.6 FIXTURE MOUNTING

A. Fixtures mounted in stairwells shall be mounted at no more than 12'-0" above the flat landing surface in the stairwell, or utilize an integral "fixture lift" system.

B. Fixtures mounted over 15'-0" above the finished floor level shall utilize one of the following;
1. *Be accessible from a standard stepladder (12'-0" max ladder height)*
2. *Utilize an integral "fixture lift" system*
3. *Be accessible from a "man lift" system, owned and stored in the building*
4. *Utilize remote accessible ballasts*
5. *Have an FM approved maintenance plan*

C. Locate fixtures at telecommunications closets to the front and rear of data racks. Coordinate locations with UM OIT.

3.7 ABOVE CEILING LIGHTING COMPONENTS

A. Lighting system components that are mounted above a suspended ceiling, such as power supplies, controls, relays, etc., shall be located within 6'-0" of the main entrance door to the space, but to the side, out of the path of travel.

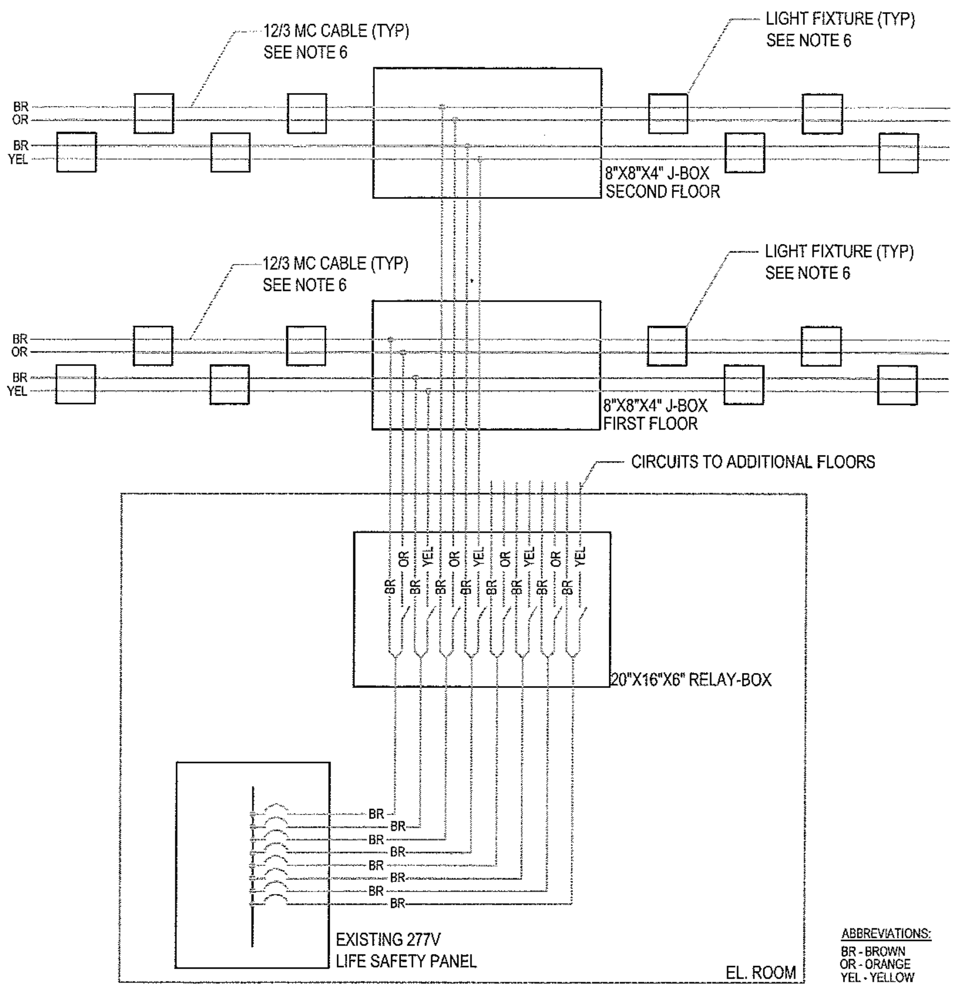
3.8 SUPPORTS

A. Lighting fixtures shall be supported in accordance with code.

B. Sprinkler piping or hangers shall not be used to support non-sprinkler system components, per NFPA 13.

3.9 LABELS

A. Junction boxes utilized for power distribution, shall be labeled on the cover plate with the following information.
1. *Circuit Number (feeding the light fixture)*
2. *Power Panel Number*
3. *Room Number for Panel location*



ABBREVIATIONS:
BR - BROWN
OR - ORANGE
YEL - YELLOW

NOTES:

1. PROVIDE TWO CIRCUITS ON EACH FLOOR AND IDENTIFY EACH CIRCUIT WITHIN THE JUNCTION BOX.
2. PROVIDE DEDICATED NEUTRAL (GRAY) FOR EACH CIRCUIT AND COMMON EQUIPMENT GROUND.
3. ALL RISER WIRING TO BE #10 AWG THHN COPPER.
4. PROVIDE CIRCUIT NUMBERS ON EACH JUNCTION BOX COVER.
5. SIZE JUNCTION BOXES AND CONDUITS AS REQUIRED.
6. MC CABLE OF AT LEAST ONE OF THE CIRCUITS SHALL BE STRIPED TO DIFFERENTIATE. CONNECT ALTERNATE LIGHT FIXTURE TO EACH CIRCUIT.

UNIVERSITY OF MARYLAND 1856
FACILITIES MANAGEMENT
1600 Service Building
College Park, Maryland 20742-6033

BUILDING NAME
N/A

BUILDING NUMBER
N/A

PROJECT NAME
TYPICAL
EMERGENCY LIGHTING
WIRING

FIGURE #1

16.08.01 HALLWAY LIGHTING (11-21-11)

Section deleted. Refer to section 16.08 LIGHTING

16.08.02 GENERAL LIGHTING (11-21-11)

Section deleted. Refer to section 16.08 LIGHTING

16.09 SECURITY EGRESS SYSTEM FOR INDIVIDUALS WITH DISABILITIES(12-2-02)

All facilities that have handicap door openers have the electronic panic bar. The handicap door opener is activated by the handicap door switch.

A. Install an electric panic bar on each door equipped with a handicap door opener.

B. Interface the door opener with the electric panic bar. See DIVISION 8, Section 8.03.

A. All security measures and systems shall be coordinated through the Office of Public Safety, Building Security Systems and incorporate the following:

1. Doors

a. All entrances shall have an alarm/access control system connected to Building Security Systems (BSS's) main computer. Each door shall be equipped with either an alarm, a card reader, electric locking devices, and any other necessary equipment to operate the system. Access shall be controlled by a computer coded card. Designated doors can be locked or unlocked from the main computer at BSS. (Also Reference Section 16. Security Egress System for Individuals with Disabilities.)

b. All exterior doors to be provided with conduit and wiring for future installation of automatic door operators and a card access system.

c. Pairs of exterior doors shall have keyed removable mullions for improved security.

d. Any required second means of egress shall accommodate wheelchair users.

e. All exterior doors which are designated as "EXIT ONLY" shall be installed without hardware on the exterior.

f. Service and rear entry doors shall be as entry-proof as possible. All doors shall have non-removable hinge pins (NRP) which are not exposed to public areas/exterior.

g. Garage, service, and rear entry doors are to be as entry-proof as possible. They should be constructed of heavy-duty construction with locking systems which provide an appropriate degree of security and wiring for future installation of a card access system.

h. ALL MECHANICAL AND ELECTRICAL ROOMS MUST HAVE CARD READERS.(9-25-03)

2. Security Alarm System

   a. Alarm system controls shall be by DSC Products; access control equipment shall be by LENEL, no substitutions Other devices to be by approved vendors per BSS.

   b. All security alarm equipment and access control system equipment shall be installed in an independent Security Closet. BSS shall provide exact requirements for location and required electrical service.

3. Long corridors should be avoided.

4. Rest rooms and stairwells should not be separated from areas of high usage.

5. Different units within the facility shall be separately securable without interfering with required egress routes from the building.

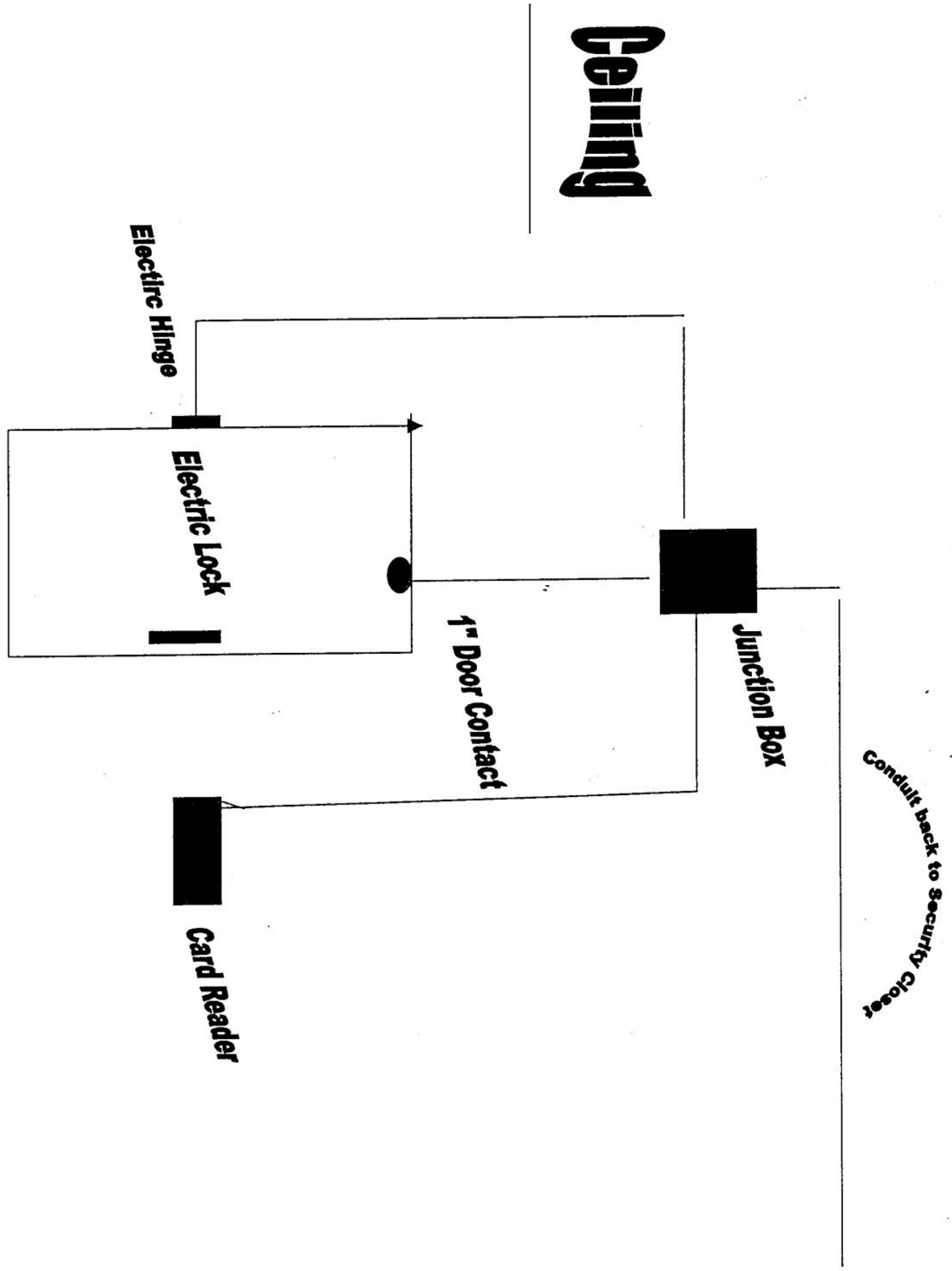
6. Ground floor windows are discouraged. If installed, ground windows shall be constructed to prevent easy entry into the building.

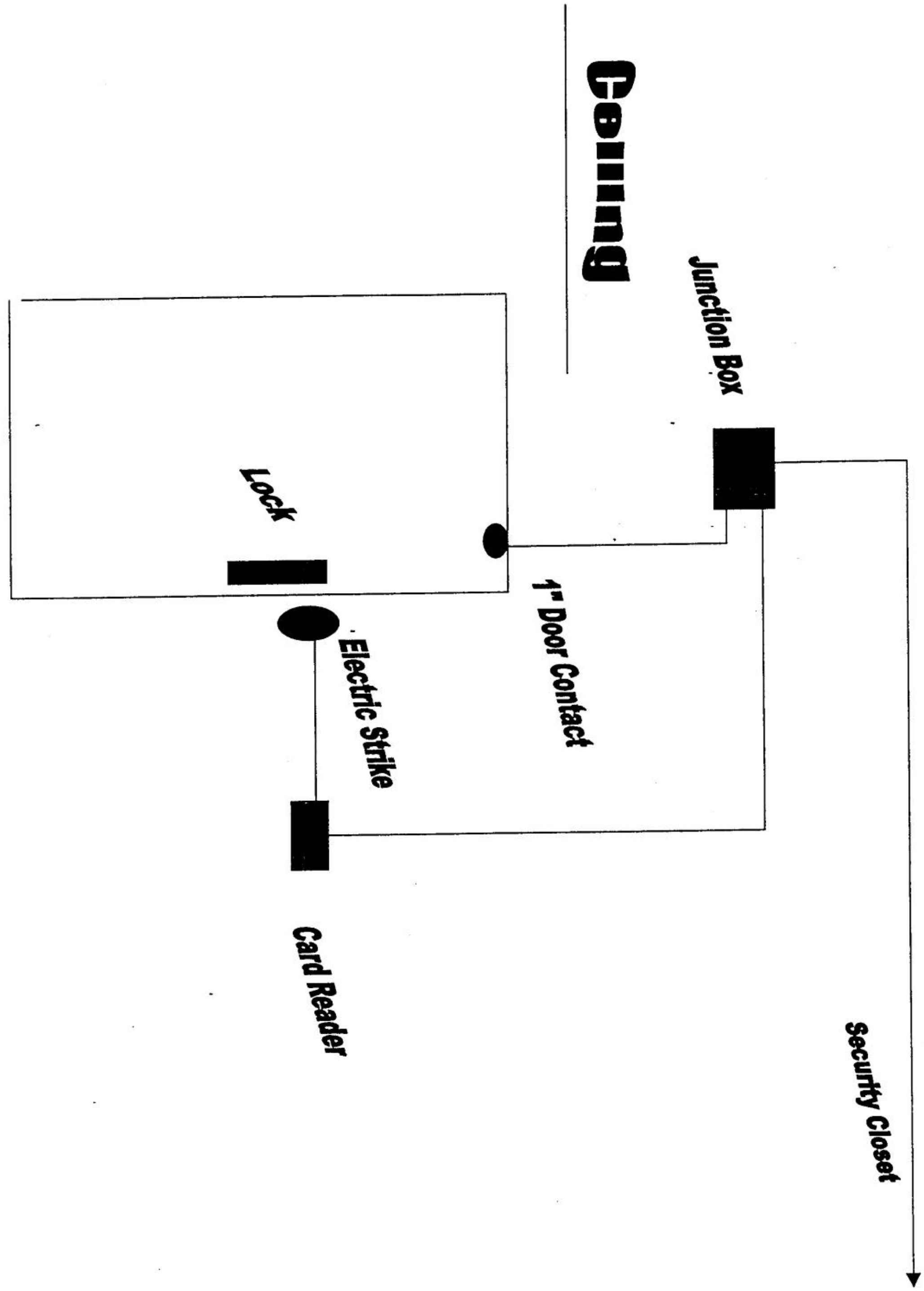
   Surface materials or windows which can be easily vandalized should be avoided. In the event other criteria dictates the requirement for operable windows, methods for securing these windows are to be provided. Methodology for securing operable windows is to be coordinated with BSS.

7. New or expanded stairwells and elevators must utilize public spaces for access and egress. Elevators or stairwells should not allow access directly into private office areas which would jeopardize security to the area. Wiring for future installation of a card access system must be provided.

B. All departmental and administrative offices should be equipped with heavy duty locksets with anti-friction latch bolts approved by BSS.

C. For security camera and security camera equipment specifications see the Table of Contents.


Ceiling
Electirc Hinge
Electric Lock
1" Door Contact
Junction Box
Conduit back to Security Closet
Card Reader


Ceiling
Junction Box
Lock
1" Door Contact
Electric Strike
Card Reader
Security Closet

PART 1 – GENERAL

1.01 REFERENCE REQUIREMENTS

The provisions of the General Conditions, Special Conditions, Program Requirements and Division 1, General Requirements, apply to the work of this Section.

1.02 SECTION INCLUDES

A. Telecommunications service entrance.

B. Premises wiring system.

C. Broadband type cable video system.

1.03 RELATED SECTIONS

A. Shop Drawings, Product Data and Samples

B. Product Record Documents

C. Cast-In-Place Concrete

D. Painting

E. Wiring Materials and Methods

F. Outside Power Transmission and Distribution

1.04 REFERENCES

A. Building Industry Consulting Services International (BICSI), "Telecommunications Distributions Methods Manual," Tenth Edition.

B. ANSI/TIA/EIA 568-B.1 - Commercial Building Telecommunications Cabling Standard – Part 1: General requirements, April 1, 2001

C. ANSI/TIA/EIA 568-B.1-1 - Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements - Addendum 1 - Minimum 4-Pair UTP and 4-Pair ScTP Patch Cable Bend Radius, July 1, 2001

D. ANSI/TIA/EIA 568-B.2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Cabling Components, April 1, 2001

E. ANSI/TIA/EIA 568-B.2-1 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted Pair Components - Addendum 1 - Transmission Performance Specifications for 4-Pair 100 Ohm Category 6 Cabling, June 1, 2002

F. ANSI/TIA/EIA 568-B.2-2 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components - Addendum 2, December 1, 2001

G. ANSI/TIA/EIA 568-B.2-3 - Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling - Addendum 3 - Additional Considerations for Insertion Loss and Return Loss Pass/Fail Determination, March 1, 2001

H. ANSI/TIA/EIA 568-B.3 - Optical Fiber Cabling Components Standard, March l, 2000

I. ANSI/TIA/EIA-568-B.3-1 - Optical Fiber Cabling Components Standard - Addendum 1 - Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables, April 1, 2002

J. ANSI/TIA/EIA 862 Building Automation Systems Cabling for Commercial Buildings, April 11, 2002

K. ANSI/TIA/EIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.

L. ANSI/TIA/EIA 606-A – Administration Standard for Commercial Telecommunications Infrastructures, June 21, 2002

M. International Standards Organization/International Electrotechnical Commission (ISO/IEC) DIS 11801, January 6, 1994.

N. Underwriters Laboratories (UL®) Cable Certification and Follow Up Program.

O. National Electrical Manufacturers Association (NEMA).

P. American Society for Testing Materials (ASTM).

Q. National Electric Code (NEC®), Latest Issue

R. Institute of Electrical and Electronic Engineers (IEEE).

S. UL Testing Bulletin.

T. American National Standards Institute (ANSI) X3T9.5 Requirements for UTP at 100 Mbps.

U. SYSTIMAX® Structured Connectivity Solutions (SCS), Performance Specifications, (Addendum) Latest Issue.

V. SYSTIMAX® SCS, Components Guide, Latest Issue.

W. SYSTIMAX® SCS Generic Specifications: Fiber Optic Outside Plant Cable, Latest Issue.

X. SYSTIMAX® SCS Solutions Design & Installation Guidelines, Latest Issue.

1.05 QUALITY ASSURANCE

A. Contractor shall install work in accordance with the BISCI Telecommunications Distributions Methods Manual.

B. Contractor shall install work in accordance with the SYSTIMAX® SCS Guidelines.

1.06 SUBMITTALS

A. Before the installation of any wire or equipment, Contractor shall submit shop drawings and product data under provisions of, "Shop Drawings, Product Data and Samples" for University approval.

B. Contractor shall indicate installation details, cable routing, system configuration, and outlet numbering on all shop drawings.

C. Contractor shall submit all appropriate product data for each component.

D. Contractor shall submit manufacturer's installation instructions.

1.07 PROJECT RECORD DOCUMENTS

A. Contractor shall submit record documents.

B. Contractor shall accurately record location of service entrance conduit, termination backboards, outlet boxes, messenger cable raceways and cable trays, pull boxes, and equipment boxes on CD or 3.5-inch floppy diskettes using AutoCAD 14 or latest version.

C. Contractor shall document the cable plant and associated equipment installation in accordance with Parts 3.19, 3.20, and 3.21 in this Section.

1.08 QUALIFICATIONS

A. Installation of all wire, equipment, terminations and associated services shall be performed by a company that is currently a Authorized SYSTIMAX® SCS Value Added Reseller (VAR) in good standing with SYSTIMAX Solutions™; and has a minimum of (5) years of experience on similar SYSTIMAX® SCS systems. Prior to the final selection of the telecommunications sub-contractor, the main contractor shall submit its choice for telecommunications sub-contractor for the University's approval.

B. The company specializing in supplying the products specified in this Section shall have a minimum of three (3) years experience distributing such supplies, and shall be duly authorized by the product manufacturer.

1.09 MAINTENANCE SERVICE

Contractor shall furnish warranty of SYSTIMAX® SCS products, applications, and workmanship for no less than 20 years from the date of acceptance by the University. All other non-SYSTIMAX products and workmanship shall carry warranties equal to or greater than the SYSTIMAX warranty from date of acceptance by the University

1.10 DEFINITION—STRUCTURED CABLING SYSTEM

Structured Cabling Systems, Henceforth referred to as “SCS,” wiring is defined as all required equipment and cabling including hardware, termination blocks, cross connect wiring, patch panels, telecommunications outlets, UTP and fiber lightguide cable installed and configured to provide computer data and voice connectivity from each data or voice device to the network file server or voice network/ switch designated as the service point of the local area network.

PART 2 - PRODUCTS

2.01 TELEPHONE TERMINATION BACKBOARDS

A. The Contractor shall install 3/4-inch fire resistant plywood with Class A surface in all communications rooms (BDF and ER/TR). Equipment Room (ER) and Telecommunications Room (TR)

B. Termination backboards shall cover entirely, to a height of 8 feet, all walls within a communications room

C. Minimum backboard size shall be 4' X 8' unless otherwise approved by the University

2.02 STATION COPPER CABLE

A. All UTP station copper cable supporting voice and data communications requirements shall be SYSTIMAX® XX91E (where XX is either 10 or 20 depending on insulation type), and shall meet the following technical specifications:

Specifications:
The SYSTIMAX® GigaSPEED® X10D Guaranteed Performance Specifications for 4 - Connection GigaSPEED X10D Channels:

Electrical Parameters	Guaranteed Channel Margins to ISO/IEC 11801 : 2002 "Class E" (1 – 250 MHz)	Guaranteed Channel Margins to Draft ISO/IEC 11801 Edition 2.1 "New Class E" (1 – 500[1] MHz)
Insertion Loss	5%	2%
NEXT	6 dB	1 dB
PSNEXT	7.5 dB	2.5 dB
ELFEXT	6 dB	6 dB
PSELFEXT	8 dB	8 dB
Return Loss	3 dB	0 dB
PSANEXT	N/A	0 dB
PSAFLEXT	N/A	0 dB

Guaranteed Channel Performance Specifications for 4-Connection GigaSPEED X10D Solution[2]

Freq (MHz)	Insert-ion Loss (dB)	ANEXT (dB)	NEXT (dB)	ACR (dB)	NEXT (dB)	ACR (dB)	ELFEXT (dB)	ELFEXT (dB)	Loss (dB)	Delay (ns)	Skew (ns)
1.0	2.1	75.0	71.0	68.9	69.5	67.4	69.3	68.3	22.0	580	40
4.0	4.0	74.0	69.0	65.0	68.0	64.0	57.2	56.2	22.0	562	40
8.0	5.6	71.0	64.2	58.5	63.1	57.5	51.2	50.2	22.0	557	40
10.0	6.3	70.0	62.6	56.3	61.5	55.2	49.3	48.3	22.0	555	40
16.0	7.9	68.0	59.2	51.3	58.1	50.2	45.2	44.2	21.0	553	40
20.0	8.9	67.0	57.6	48.7	56.5	47.6	43.2	42.2	20.5	552	40
25.0	10.0	66.0	56.0	46.1	54.8	44.9	41.3	40.3	20.0	551	40
31.3	11.2	65.1	54.4	43.3	53.2	42.1	39.4	38.4	19.5	550	40
62.5	15.9	62.0	49.4	33.4	48.1	32.2	33.3	32.3	17.0	549	40
100.0	20.4	60.0	45.9	25.6	44.6	24.2	29.3	28.3	15.0	548	40
200.0	29.4	55.5	40.8	11.4	39.4	10.0	23.2	22.2	12.0	547	40
250.0	33.1	54.0	39.1	6.0	37.7	4.5	21.3	20.3	11.0	546	40
300.0	36.5	52.8	32.7	-3.8	31.3	-5.3	19.7	18.7	8.0	546	40
400.0	42.7	51.0	30.6	-12.2	29.1	-13.7	17.2	16.2	8.0	546	40
500.0	48.3	49.5	28.9	-19.4	27.3	-21.0	15.3	14.3	8.0	546	40

Note: The table provides reference values only. All parameters comply with the governing equations given above over the entire frequency range. All values and equations apply to worst-case channels utilizing four-pair 91A series cables with full cross-connects, consolidation points and work area outlets (4 connectors in a channel) for the length up to 100 meters.

B. All copper cable and jumpers shall conform to the REA color guide meet NEC article 125-38, 3 (B) 1, 2, and 3.

2.03 RISER COPPER CABLE

All UTP riser copper cable supporting voice communications requirements shall be standard 24 gauge, paired dual, semi-rigid PVC skin over foamed PE, Superior Essex Cable-XXX (where XXX is the number of pairs), and shall meet the following technical specifications:

COPPER VERTICAL RISER CABLES
(SPECIFIER NOTE, REMOVE FROM FINAL SPEC: SYSTIMAX WILL EXTEND ITS WARRANTY AND APPLICATION ASSURANCE TO COVER THE USE OF SUPERIOR ESSEX ARMM CABLE AS PART OF A TOTAL SYSTIMAX SCS.)

The 24 AWG multi-pair copper cables shall be used as the vertical riser cables. The cable shall support voice, data and building service applications. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation. The multi-pair copper cables shall be in nonplenum form and placed in conduit as required.

The Superior Essex ARMM cables are a nonplenum cable and shall consist of solid-copper conductors insulated with expanded polyethylene covered by a PVC skin, be conformance tested to meet EIA/TIA 568B for Category 3 cables, be UL®and c(UL®) Listed as CMR. The core shall be overlaid with a corrugated aluminum sheath, which is adhesively bonded to an outer jacket of PVC plastic to form an ALVYN sheat.

2.04 UNDERGROUND COPPER CABLE

The underground copper cable supporting voice communications requirements shall be 24 gauge, paired, dual-insulated with foam skin and plastic, flooded by FLEXGEL filling compound, Superior Essex ANMW, and shall meet the following technical specifications:

OUTSIDE PLANT COPPER CABLES

All voice grade wire and cable placed in the outside environment shall be solid, twisted pair, and multi-conductor. The copper twisted pairs shall have a mutual capacitance at 1kHz of 15.7 nF/1,000 ft. The cable shall be resistant to mechanical damage, lightning or damage from wildlife.

The buried or underground cable shall have an aluminum steel polyethylene (ASP) sheath and a core of solid-copper conductors, dual insulated with foam skin and plastic, surrounded by FLEXGEL III® filling compound.

2.05 CABLE PROTECTORS FOR COPPER CABLE

A. For all pairs, Contractor shall install three-element gas protector modules, SYSTIMAX® 4B1-EW, containing silicon avalanche on both ends.
B. Contractor shall supply and install SYSTIMAX® 195A1-type, multi-pair protector panels in BDF and MDF

2.06 FIBER OPTIC CABLE

A. For single mode fiber, SYSTIMAX® TeraSPEED™ 5201 (24 – 72 strands (HFC) 301)-0XXA-WPYL (indoor applications, plenum rated) where XXX is strand count, or SYSTIMAX ® TeraSPEED™ 5022-0XXA-ZXBK dielectric (outdoor applications) cable, and shall meet the following technical specifications:

Optical Specifications:

Mode Field Diameter	9.2 (±0.3) µm @1310 nm; 10.4 (nominal) @1550 nm
Group Index of Refraction	1.466 @1310 nm and 1383 (±3) nm, 1.467 @1550 nm
Attenuation	Tight Buffered: 0.70 dB/km @1310 nm 0.70 dB/km @1550 nm
	Loose: 0.35 dB/km @1310 nm 0.24 dB/km @1550 nm
Maximum Dispersion	2.8 ps/nm-km 1285 to 1330 nm
Zero-Dispersion Wavelength	1300-1322 nm
Zero-Dispersion Slope	0.092 ps/((nm)^2 km)
Polarization Mode Disp. LDV	0.08 ps/(km)$^{1/2}$

Physical Specifications:

Core Diameter	8.3 µm nominal
Cladding Diameter	125.0 (±0.7) µm
Core/Clad Offset	<=0.5 µm
Cladding Non-Circularity	<=1%
Coated Fiber Diameter	245 (±10) µm
Cladding/Coating Offset	<=12 µm
Colored Fiber Diameter	254 (±7) µm
Proof Test	0.7 Gpa
Fiber Curl	>4 m
Dynamic Fatigue Parameter	>=18
Macrobend 100turns, 50mm Mndrl	0.10 dB @1310 nm, 0.10dB @1550 nm
Macrobend 1 turn, 32mm Mandrel	0.50 dB @1310 nm and @1550 nm

SYSTIMAX® TeraSPEED™ Loose Tube Dielectric Enhanced Singlemode Cable 5024 xxxA WXBK, Black (4 – 288 fibers) approved.

B. All optical fiber cable used shall have the following physical characteristics:

Cable Core:
Building interior: Air core
Building exterior: Filled core stable from -40F to +140F

Cable Composition:
Building Interior:
station:
(plenum) OFNP Flouropolymer jacket
(non-plenum) OFNR PVC jacket
riser: OFNR PVC jacket

Building exterior:	Non-metallic dielectric
Cable Strength:	Maximum pulling tension-600 lb.
Minimum Bend Radii:	(<30% max. pull tension) 10 times cable diameter (>30% max. pull tension) 20 times cable diameter
Fiber Identification:	Color coding system adequate to unambiguously identify each fiber. See paragraph 3.16 in this Section. The words “Fiber Optic Cables” shall be imprinted on cable no more than one meter apart.

2.07 OPTICAL FIBER TERMINATIONS

A. All single mode optical fiber cable installed shall be terminated utilizing a split-ferrule alignment sleeve and a precision ceramic tip. All single mode connectors shall meet the following technical specifications:

Connector Type:	SC
Fiber Outside Diameter	125 Microns
Loss Repeat:	< 0.2 dB per 1000 reconnects
Axial Load, min.	30 pounds
Temperature Stability:	-40 C to 85 C

2.08 OPTICAL FIBER PATCH CORDS

The University will provide optical fiber patch cords as it relates to the University’s voice and data systems.

2.09 CONNECTING BLOCKS

A. All UTP riser copper cable shall be terminated on high-density, modular SYSTIMAX® 110AW2-XXX, where XXX indicates pair capacity, connecting blocks.

B. All UTP station copper cable shall be terminated on SYSTIMAX® GigaSPEED®X10D Universal Modular Patch (UMP) panel(s). The UMP panel accepts up to 24 GigaSPEED® X10D MGS500 information outlets that must be ordered separately. A SYSTIMAX® equivalent patch panel may be substituted with approval by the Office of Information Technology.

C. All optical fiber cable in Building Distribution Frame (BDF) rooms and Intermediate Distribution Frame (IDF) rooms shall be terminated in SYSTIMAX® 600G2-1U-MOD-SD (760028324) Fiber Optic Terminating Unit with MODG2-6SC-SM (760032201) adapters and associated equipment.

2.10 EQUIPMENT RACKS

All equipment racks will be Ortronics “Mighty Mo 6” racks with the following accessories:

Item	Ortronics Part #
10.5” channel X 7’ high rack	OR-MM6710
Vertical cable mgmt 10” x 13” x 7’	OR-MM6VMD710
Vertical cable mgmt 6” x 8” x 7’	OR-MM6VMD706
10.5 channel dust cover	OR-MM6BDC10

2.11 INTRABUILDING COAXIAL CABLE

All intrabuilding coaxial cable in the new facility supporting video communications requirements shall be RG-11/U Belden 89292, and shall meet the following technical specifications:

Gauge:	14 AWG solid bare copper covered, .064 in
Outside Diameter:	0.348 in (8.84 mm)
Shields:	Duofoil + 61% tinned copper braid
Insulation:	Black tint Teflon jacket
Nominal DC Resistance:	2.5 Ohms/1000 ft
Nominal Mutual Capacitance:	16.5 pF/ft @ 1 kHz
Attenuation:	.15 dB/100 ft @ 1 MHz
Characteristic Impedance:	75 Ohms @ 1 MHz

2.12 INTERBUILDING COAXIAL CABLE

All interbuilding coaxial cable in the new facility supporting video communications requirements shall be P-3-75-500JCASS, and shall meet the following technical specifications:

Gauge:	0.111 in. (2.82 mm) nom.
Outside Diameter:	0.560 in. (14.22 mm) nom. Outer jacket of medium density polyethylene, solid aluminum sheath and Migra-Heal compound between jacket and sheath
Nominal DC Resistance:	0.37 Ohms/1000 ft
Attenuation:	0.66 dB/100 ft @ 83 MHz
Characteristic Impedance:	75 Ohms @ 1 MHz

2.13 VIDEO SYSTEM PARTS AND ACCESSORIES

Coaxial cable equipment: The following equipment of University approved equivalent shall be used:

Fiber Optic Transmitter (BNI Solutions):	ENI TR2100-7715
Fiber Optic Receiver (BNI Solutions):	ENI TR2200-750(38)-N17
Line extender:	CCOR LAN-100-2rv

Pads (attenuators) for CCOR LAN-100-2rx:

PB-0	PB-12
PB-3	PB-15
PB-6	PB-18
PB-9	PB-21

Pads for Line Extender:

Forward	dbmv of cable @ 450 MHz
Eq-450-3	2.5
Eq-450-5	6.2
Eq-450-8	9.9
Eq-450-11	13.8
Eq-450-13	17.3
Eq-450-15	20.9

Splitters and Directional Couplers:

Type	Tap Value	Insertion Loss @ 450 MHz
Jerrold SSP-3	4.4	
Jerrold SSP-6367.9,	7.9	4.4
Jerrold SSP-7	7.8	2.5
Jerrold SSP-9	10.0	1.8
Jerrold SSP-12	12.8	1.5
Jerrold SSP-16	16.3	1.2

Full Feature Taps:

Type	Tap Value	Insertion Loss @ 450 MHz
Jerrold FFT8-14	14.2	4.3
Jerrold FFT8-17	17.8	1.8
Jerrold FFT8-20	20.0	1.2
Jerrold FFT8-23	22.5	1.0
Jerrold FFT8-26	26.1	0.8
Jerrold FFT8-29	29.2	0.6

Connectors and Other Accessories:

Gilbert Parts:	
Pin Connector:	GRS-500-CH-DU-03
Power Blocking Ks-F:	GF-625-CH-DCB
Chassis-Chassis Connector:	G-KS-KS-M
Right Angle Connector:	GP-90-S
Splice Connector:	GRS-500-SP-DU-03
Teflon RG-11 Connector:	GF-11-300p-388
F-type terminators:	GTR-59-s

D-Rings for Mounting Equipment:

Type	Inside Dimension	Outside Dimension
Graybar GB 13a	1-7/8"	4-7/8"
Graybar GB 13b	3-1/8"	6-1/8"

Crimping Tool:

Teflon RG-11 Crimper:	HCT-775

Testing Equipment:

RF Signal Strength Meter:	Wavetek SAM III or approved equal must be used for testing.

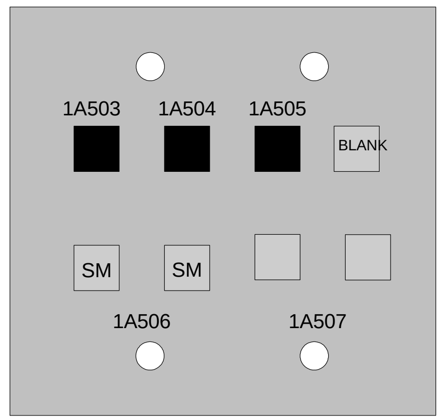
2.14 OUTLET BOXES

A. All outlet boxes supporting voice/data communications requirements shall be double-gang, four (4) inch square, by two and one half (2.5) inch deep minimum galvanized steel boxes.

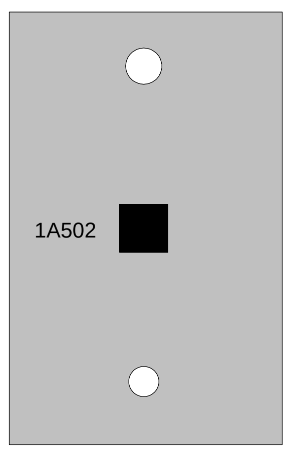
B. All outlet boxes supporting video communications requirements shall be single gang; two and one half (2.5) inch deep minimum galvanized steel boxes.

2.15 VOICE/DATA OUTLETS AND COVER PLATES

A. All outlet plates shall be SYSTIMAX® M13L-246 faceplates for voice/data applications and (SYSTIMAX M28A-246) faceplates for voice/data/fiber applications, with M20AP-246 modular covers filling unused portals.



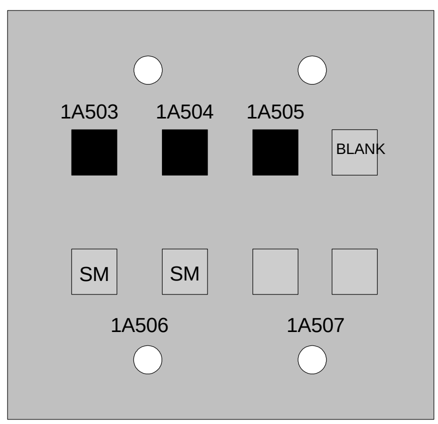
B. The outlet assembly to support voice only or data only communications requirements shall be one (1) eight (8) position, eight (8) wire SYSTIMAX® MGS500-003 (BLACK) modular RJ45 outlets, wired per the 568B wiring standard. The faceplate will be SYSTIMAX® M10L-246.



C. The outlet assembly supporting voice/data communications requirements herein referred to as a "standard" outlet shall be three (3) eight (8) position, eight (8) wire modular RJ45 outlets, wired per the 568B wiring standard. The RJ45 receptacle (SYSTIMAX® M13L-246) shall consist of three (3) RJ45 outlets. The standard outlet is to be mounted in a vertical position with three (3) SYSTIMAX® MGS500-003 (BLACK) modular RJ45 outlets.

D. Video outlets shall be one (1) M81C-B coupler kit, video F81 coaxial video module, mounted in a separate single-gang box.

E. All fiber outlets, herein referred to as a “standard with fiber, shall be one (1) *SYSTIMAX®* 108 009 408 M series coupling mounting, with appropriate SC coupling per strand. Fiber outlets will be mounted in conjunction with other voice or data applications, using the (SYSTIMAX® M28A-246) faceplate.



F. The “pin-out” wiring assignment for the 4-pair UTP copper cable for both voice and data shall be consistent with the TIA/EIA T568B Commercial Building Telecommunications Wiring Standard.

2.16 HORIZONTAL DISTRIBUTION CABLE MANAGEMENT SYSTEM

A. Cable Tray Pathways

1. Cable tray is required in all areas where horizontal cabling bundle quantity (copper, optical fiber and coax) exceeds 40 wires.

2. Cable tray for telecom applications shall be Cablofil Incorporated EZTray or an approved equivalent, and shall adhere to the following dimensional guidelines:

Dimension	EZTray Part#	Bundle Quantity
4"D X 12" W	CF 105/300EZ	Less than 300
4"D X 18" W	CF 105/450EZ	300- 450
4"D X 24" W	CF 105/600EZ	In excess of 450

3. Cable tray shall be installed to the specifications of the manufacturer.

B. J-Hook Pathways

1. J-hooks shall be utilized in all areas where bundle quantity is between 10 and 40 cables

2. All j-hook pathways shall be provided with a center hung, triple tiered, six-hook cable support system with a maximum spacing specified as not greater than four (4) feet. Contractor shall submit samples and cut sheets on proposed solutions.

2.17 DUCTBANK INNERLINERS

Innerliners are required. Contractor shall furnish Pi-Mar PVC conduit manufactured by Pyramid Industries Inc. Contractor will install four (4) one (1) inch innerliners in a duct. If OSP is to be installed, contractor will fill duct with OSP and inner liner as space allows.

2.18 CABLE LUBRICANT

Cable pulling lubricant, Ideal Yellow 77 or a University approved equal, shall be utilized when pulling all cable.

2.19 CASES AND SPLICES

A. All outside plant (OSP) Cable Splice Cases shall be Preformed Line Products Stainless Steel with Filling Flange and must be filled with a University Approved re-enterable encapsulant.

B. All entrance cases in the Patuxent Building; Building 010 shall be SYSTIMAX® Cable Rearrangement Facilities.

2.20 FIRESTOPPING

A. Contractor shall provide firestopping protection that shall meet NFPA Life Safety Code #101, 6-2.3.6, "Penetrations and Miscellaneous Openings and Fire Barriers" and the NEC 300.21 "Fire Stopping" regulations and standards.

B. All vertical penetrations consisting of conduit, sleeves, or chases shall be firestopped at the bottom of the penetration.

C. All horizontal penetrations consisting of conduit, sleeves of chases shall be firestopped on both sides of the penetration.

D. Individual cable penetrations in plenum air return areas not enclosed in conduit shall be firestopped.

E. Openings made in concrete floors shall be firestopped using a tested system. Thickness or depth of firestop materials shall be as recommended by the material manufacturer and backed by formal ASTM E-814 tests.

F. Plenum air return ceiling penetrations for conduit and cables shall be sealed with a system appropriate for the substrate and level of protection required.

G. All metal conduits designed for communications with or without wire/cable inside shall be firestopped to restrict transfer of smoke.

2.21 ELEVATOR PHONE

In the event of a new elevator installation that does not come equipped with a phone or during a retrofit, the following equipment will be installed:

Manufacturer	Description	Stock No.
Talk-A-Phone Co. 5013 North Kedzie Ave. Chicago, IL 60625 312-539-1100	Hands-free Phone programmed to use campus circuit assurance equipment	EPT-100E

2.22 OUTDOOR EMERGENCY PHONE

The Contractor shall coordinate with the General Contractor to install the following campus approved Emergency Phone:

Manufacturer	Description	Stock No.
Talk-A-Phone Company 5013 North Kedzie Ave. Chicago, Ill. 60625 539-1100	Vandal resistant security unit with speakerphone, with keypad, blue light, strobe, with phone and camera arm.	ETP MTR OPT4 UMCP ETP-400K Phone(773)
	**** Wall Mount for Garages and other locations as specified with by the University.	ETP-400K Phone ETPWM UMCP

All outdoor emergency phones will be wired with a 6 pair OSP cable terminated in the building on a protector in the nearest BDF/TR. The University will terminate the OSP at the phone unless contractor is otherwise instructed.

Additional cabling is required by the Department of Public Safety for camera placement. Please consult the DCFS of Department of Public Safety for that information.

PART 3 - EXECUTION

3.01 SYSTEM DESIGN

A. The cabling system to support voice, data, and video requirements has been designed in accordance with BICSI, EIA/TIA, NFPA, NEC, SYSTIMAX® SCS, IEEE, and FCC communications.

B. The proposed cabling system has been designed and shall be installed in a manner that provides mechanical integrity and symmetry for the cabling media and any associated frames and racks and which also furnishes ease of access and suitability for future rearrangements and changes.

C. The transmission media shall be installed through a network of cable trays, conduit, sleeves, and chases and interconnect the various rooms and floors of the building.

D. Provide one (1) 208v, 30 amp outlet with an L6-30R receptacle from normal power and one (1) 208v, 30 amp outlet with an L6-30R receptacle from emergency power in all telecom closets. Mount these outlets to the bottom of one of the racks. Wire should be in conduit or installed per NEC requirements.

E. Provide a minimum of two (2) 120v, 20 amp dedicated outlets, wall mounted at 18" on opposite walls in all telecom closets. Locate outlets in accordance with the NEC.

F. Telecommunications Closet Design Requirements (BDFs, MDFs, IDFs and TRs)

1. Building Distribution Frame/Main Distribution Frame (BDF/MDF)
    a. BDF/MDF shall be located on lowest level of building.
    b. BDF//MDF shall be at least 200 square feet.
    c. BDF/MDF shall have neither width nor depth less than 12 feet.
    d. BDF/MDF shall have card access through the Department of Public Safety Lenel System.
    e. BDF/MDF shall be cooled by way of the building HVAC system (to be determined by the AE during design), including dust filtering of all ventilation outlets and inlets.
    f. Wall and floor penetrations, and door assemblies shall be sealed to minimize the introduction of dust into room.

2. Intermediate Distribution Frame/Telecom Room (IDF/TRs)
    a. Each floor with telecommunications outlets must include at least one (1) TR.
    b. IDF/TR(s) must be placed such that the longest station run is less than 90 meters from outlet termination point to the cross connect.
    c. IDF/TR(s) shall be sized as follows:

# of Stations	Minimum Closet Size	Minimum Width/Depth
0 – 100	100 square feet	8 feet
Over 100	120 square feet	10 feet

    d. IDF/TR(s) shall be "stacked" one above the other.
    e. Telecom closets are for the exclusive use of telecommunications and network equipment and systems. No other equipment shall be located within the room.
    f. 4" conduits (or sleeves where appropriate) shall be installed to accommodate current needs plus 100% growth.
    g. IDF/TR(s) shall have card access through the Department of Public Safety Lenel System.
    h. Ventilation shall be provided with air drawn from the adjacent corridor through a ceiling grille. The intake grille shall be ducted to a constantly operating fan, which is ducted to the TR room ceiling where the air is supplied through a filtered grille. Relieve air through an open-ended duct which shall run from 1'-0" above the floor to the inside of the ceiling plenum.
    i. Provide a temperature sensor connected to the Campus Controls Monitoring System (CCMS), which shall send an automatic alarm to Work Control then the temperature rises above 95ºF(adjustable).
    j. Wall and floor penetrations, and door assemblies shall be sealed to minimize the introduction of dust into room.

G. Determination of station quantities—quantity and placement of outlets, as well as outlet labeling assignments, shall be shown on the floor plans.

H. Determination of minimum station quantities:

General Office:	(1) standard outlet every 70 sq/ft
Conference Rooms:	(2) standard outlets with CCTV coax connections at opposing ends of the room, and (1) standard outlet every 70 square feet
Computer Labs/ Server Rooms	(1) standard outlet with 4 strands of sm fiber (location to be determined during design), and one standard outlet every 70 sf. Internal wiring to seating to be determined during design.
Classrooms:	(2) standard outlets with CCTV coax connections both in the front of the room.
Wireless Coverage:	(1) single wire jack to be located every 2,000 sq. feet. Location to be determined by design.

Note: (sm = singlemode)

3.02 FORBIDDEN WORK

A. Other than the entrance splice, no cable splices shall be allowed within buildings.

B. Aerial cable construction shall not be permitted.

3.03 EXAMINATION

A. Contractor shall verify that surfaces are ready to receive work.

B. Contractor shall verify that field measurements are as shown on the CDT's Construction Drawings approved by the University.

3.04 INSTALLATION OF BACKBOARDS

A. All termination backboards in the BDF and TR's shall be finish painted with durable white enamel prior to installation of any communications equipment.

B. All backboards shall be supported as specified under provisions of "Wiring Materials and Methods."

C. All backboards shall be marked with the legend "COMM" under the provisions of Section 16915.

3.05 CABLE PULLING

Contractor shall utilize cable-pulling lubricant for all pulls in conduit ducts or innerliners. Not less than three (3) gallons per kilometer shall be used.

3.06 COORDINATE WITH OTHER TRADES

A. Cable routing shall be designed and installed so that cabling and associated equipment does not interfere with the operation or maintenance of any other equipment. No wiring shall be hung, tied to, or supported from anything other than telecommunications raceway or the building structure.

B. All cable in accessible spaces shall be designed and installed for easy access. Cable paths above suspended ceilings, mechanical rooms, closets, etc. shall not be blocked or covered in any way that would impede the addition of cable in the future.

3.07 CONDUIT INSTALLATION

A. To support voice and data communications requirements, Contractor shall install one (1) inch conduit from the outlet box stubbed into the accessible ceiling for a maximum of three Category 6A cables. If additional cables are required to an outlet, conduit must be sized accordingly to meet product specifications. All telecommunications wiring shall be concealed in conduit or in the ceiling.

B. Conduit sleeves shall be four (4) inch trade size minimum. Sleeves shall be Rigid Galvanized Steel for penetrations of concrete slabs, concrete walls, and CMU walls. Sleeves for penetrations of stud walls shall be EMT. All sleeves shall be rigidly installed using appropriate fittings and all masonry penetrations shall be grouted. Sleeves shall project a minimum of six (6) inches beyond wall or floor surface. All penetrations of fire rated construction shall be firestopped with fire-stopping as specified in Part 2.16 of this Section to equal or exceed fire rating of the penetrated material. Sleeves for penetration of walls and floors shall have one hundred percent (100%) spare capacity, and shall be firestopped as per code.

C. Any section of conduit containing two (2) 90-degree bends, a reverse bend, of having length greater than one hundred (100) feet shall have an accessible pullbox. All conduits with less than a 50% fill ratio shall have a 3/32-inch polyethylene pull cord approximately secured at each end.

D. No oval or square conduit fittings shall be permitted. No screw type fittings shall be permitted.

E. All metallic conduit and raceways shall be appropriately grounded as specified in the National Electric Code.

F. Supports and fasteners shall be used to hold all cables, conduits, and trays firmly in place. Supports and fasteners shall be used such that they provide an adequate safety factor. All conduit/cable trays shall be supported from the building structure and not from any other ductwork, pipes, ceiling tiles, or equipment.

G. Where cable trays or conduit are not provided (especially between the stubbed out conduit and the nearest cable tray). Kindorf lay-in pipe hangers, or a University approved equal shall be installed. The lay-in pipe hanger shall be attachable to a floor slab through the use of a pre-threaded lead insert, which is suitable for installation of a 3/8-inch "all-thread" rod in a predrilled 1/2-inch hole. The threads of the closure bolt on the pipe hanger shall be covered by 3/8-inch copper or aluminum tubing to protect the cabling sheaths.

H. Cables placed in hangers in the plenum ceiling area shall be routed high and away from all other electrical and mechanical systems so as to avoid contact with light fixtures, ventilation ducts, sprinkler systems or plumbing piping, motors, or any other electrical devices. The cable shall not be run in parallel with any high voltage electrical wiring. The maximum separation between support points for all cabling shall be eight (8) feet. Lay-in pipe hangers shall be installed so as to accommodate these maximum distance spacing. Hangers shall be installed at directional bend points so as to provide a maximum bend angle of 45 degrees for the supported cabling.

I. Contractor shall install 3/16-inch polyethylene pulling string in each empty conduit, and appropriately secured at each end.

3.08 COMMUNICATIONS EQUIPMENT ROOMS

A. The communications equipment rooms supporting voice, data, and video requirements are identified on the construction documents.

B. Prior to the installation of any equipment in any of the communications rooms, the Contractor shall provide room layouts, for University approval, for each of the rooms listed above showing the proposed locations of all backboards, termination blocks, distribution panels, security boxes, control boxes, power supplies, etc. required for all communications systems, which is part of this specification.

C. Cable must be installed such that station wire runs from the outlet to the cross connect do not exceed 90 meters.

D. Grounding shall be #6 AWG wire provided to each communications equipment room in accordance with ANSI/NFPA 780.

E. All walls, ceilings and floors must be made non-porous with paint or sealant to minimize dust.

F. Sleeves or conduits from outlets shall penetrate closet walls at a height above the plywood panels and extend only far enough to install bushings.

G. Hardware shall be installed plumb and level on the wall backboards. Appropriate wire management shall be installed so that jumper, cross connects, and patch cord wires can be installed in a neat and orderly fashion.

H. Equipment racks shall be installed level, to manufacturer specifications, and shall be so that jumpers and patch cords can be installed in a neat and orderly fashion. Contractor will install (1) one equipment rack installation of network infrastructure hardware. Contractor will install fiber termination shelves at the top of the rack, unless otherwise instructed. Contractor shall appropriately ground all equipment racks in accordance with the National Electric Code (NEC).

3.09 STATION CABLING AND INSTALLATION

A. All voice, data, fiber, and video outlets shall be installed in the locations that are conspicuously marked in the building floor plans. If there is a question as to the location of any outlet it shall be brought to the attention of the University prior to installation.

B. Prior to installing any cabling, drawings indicating all jack numbering shall be submitted by contractor for approval.

C. All outlets supporting voice and data communications requirements shall be wired with three (3) (SYSTIMAX® XX91) 4 pair UTP copper cables as specified in Part 2.02 of this section.

D. Data jack for wireless access: All wireless access points will be located above an accessible ceiling in areas designated by the University. (See 3.01F, Minimum Station Requirements) If areas designated for wireless access do not have accessible ceilings, jack location is at the discretion of the University.

E. Fiber jack: The station fiber pairs (single mode) will be terminated at the outlet and in fiber termination shelves mounted at the top of the equipment racks.

F. The terminations in the BDF and all TR's of all UTP riser copper cable shall be on 110 termination fields.

G. The terminations for all UTP station copper cable in the BDF and TR rooms shall be on patch panels.

H. All wiring supporting voice and data communications shall conform to IEEE 802.3 100BASE-T, and 100 Base-t and 1000 Base-t wiring standards.

I. All wiring shall meet Category ***6A*** standards.

3.10 RISER CABLING AND INSTALLATION

A. In the BDF and all TR's, connecting blocks shall be modular, high-density, SYSTIMAX® 110-type or a University approved equal, with clear protective covers. All telecommunication rooms shall be grounded by means of a #6 AWG insulated copper ground wire connected to the building ground system. The BDF shall also have gas element surge protection with sneak fuses adequate for protecting all circuits entering the building.

NOTE: All closet layouts shall be approved by the University before installation of any equipment or termination of any wiring.

B. Contractor shall install UTP vertical copper cabling between the BDF and each TR to support voice communications requirements. Each riser cable shall be homerun from the BDF to each TR in the conduit and sleeves provided. In both the BDF and TR, the cable pairs shall be terminated on SYSTIMAX® 110 connecting blocks and appropriately cross-connected to the UTP horizontal copper cabling (in the TR) and the UTP backbone copper cabling (in the BDF). The size of the riser cables for voice communications from the BDF to each TR can be found in the Table below.

Number of outlets X 4 + 20% Example: 50 stations X 4 = 200 + 40(20%) = 240

Contractor will increase riser to the next highest available cable after utilizing the above formula.

C. Riser Optical Fiber Cabling: All optical fiber riser will be terminated on shelves mounted at the top of the equipment rack. Each TR will have twelve (12) tested single-mode optical fibers installed and terminated from the BDF fiber shelves to each of those TR's (see additional riser requirements below). All optical fiber, terminations, and connections shall conform to the IEEE 802.3 100BASE-F specifications.

Additional Riser Requirements:
In addition to the existing fiber riser, contractor will install two (2) single mode fibers to each of the TR riser counts, for each two strands installed to an outlet being serviced by that TR.

D. Riser Coaxial Cabling: A single RG-11 coaxial cable extending from the BDF to the top floor TR's shall be installed and used as the riser for each TR stack.

E. "Kellums"- type basket hangers, or a University approved equal, shall be installed on all riser cables to provide independent support of cables passing through conduit sleeves installed in floor slabs. Hangers shall have a maximum separation of twelve (12) inches.

3.11 UNDERGROUND CABLING AND INSTALLATION

A. Contractor shall install UTP underground copper cabling between the BDF and the ER (Main Distribution Frame located in Patuxent Building, Building 010) to support voice and data communications requirements (as specified in Part 2.04 of this Section). The underground cable shall run in the appropriate ductbank and manholes. The contractor shall terminate the underground cable in the cable vault of Building 010 in a SYSTIMAX® Cable Rearrangement Facility (vertical splice case). The pairs shall then be run into the frame room of building 010 and terminated on Contractor provided 195A type protector panels, and extend tails to 110 fields, as directed by the University. The Contractor shall make terminations in the BDF, utilizing SYSTIMAX® 195A type, multi-pair protector panels and extend tails to 110 fields. The Contractor shall also provide new frame racks to support the protector units. The size of the copper underground cable shall be XXXX pairs. The Contractor shall use the largest size of cable applicable.

B. Contractor shall install single mode optical fiber backbone cabling between the BDF and the ER to support data communication requirements (as specified in Part 2.06 of this Section). The underground single mode optical fiber shall run in innerliner (as specified in Part 2.17 of this Section) in the appropriate ductbank and manholes. The single mode optical fiber shall be terminated on both ends utilizing Contractor provided SYSTIMAX® 600G2-1U-MOD-SD (760028324) Fiber Optic Terminating Unit, with MODG2-6SC-SM (760032201) adapters. The size of the backbone single mode optical fiber cable shall be XX strands.

C. Contractor shall install coaxial backbone cabling between the BDF and the nearest available tap, as designated by the University, to support video communications requirements (as specified in Part 2.12 of this Section). The underground coaxial cable shall run in innerliner (as specified in Part 2.16 of this Section) in the appropriate ductbank and manholes. Cable in the manhole shall be secured to the manhole at least two (2) feet from the connection point and every four (4) feet thereafter. The connector shall be covered with a one (1) foot section of shrink tube except where the connector is located inside the building. Upon completion, the cable now shows no sign of stretches, kinks, or compressions. If damage is apparent, the contractor will pull new coaxial cable.

D. Whenever termination points for single and multi mode fiber are the same, a hybrid cable shall be utilized, when available.

E. Contractor shall install coaxial backbone cabling between the BDF and the nearest available tap, as designated by the University, to support video communications requirements (as specified in Part 2.12 of this Section). The underground coaxial cable shall run in innerliner (as specified in Part 2.16 of this Section) in the appropriate ductbank and manholes. Cable in the manhole shall be secured to the manhole at least two (2) feet from the connection point and every four (4) feet thereafter. The connector shall be covered with a one (1) foot section of shrink tube except where the connector is located inside the building. Upon completion, the cable now shows no sign of stretches, kinks, or compressions. If damage is apparent, the contractor will pull new coaxial cable.

3.12 OUTLET BOX INSTALLATION

Unless otherwise noted on the drawings, outlets shall be securely and neatly installed at the height specified in the following table:

Standard Telephone Outlets:	1ft 6 inches above Finished Floor (AFF)
Wall Mounted Telephone Outlets:	4ft 6 inches AFF
Wall Mounted for Head On Wheelchair Access:	4ft 0 inches AFF
Service Counter Areas:	0ft 8 inches above counter work surface

3.13 DUCTBANK DESIGN, CONSTRUCTION, AND UTILIZATION

A. Contractor shall install XXXX pairs (specified and approved by the University) of multipair, UTP copper cable between the BDF and the Patuxent Building (Building 010). Prior to the termination of this cable in the Patuxent Building, Contractor shall verify its termination location with the University.

B. Contractor shall install a XX strand (specified and approved by the University) single mode optical fiber cable (as specified in Part 2.06 of this Section), between the BDF and the ER located in the Patuxent Building. Prior to termination of this cable in the Patuxent Building, Contractor shall verify its termination location with the University.

C. Contractor shall install one (1) coaxial cable (as specified in Part 2.12 of this Section) between the BDF and the nearest available tap. Prior to termination of this cable Contractor shall verify its termination location with the University.

D. Contractor shall install new concrete encased ductbank and manholes and/or install new concrete encased ductbank between existing manholes to accommodate the outside plant needs of the facility as directed by the University. The contractor shall submit proposed pathway for University approval.

E. Any duct supporting optical fiber, copper or coax will require installation of four (4) one-inch innerducts. In the event of a larger cable being installed, the remaining duct space shall be filled with innerduct. Optical fiber, copper and coaxial cable in the specified amounts above shall be run in separate innerducts. Ductbank shall be engineered to accommodate the required twisted pair, fiber optic, and coaxial cable needs plus one hundred percent (100%) spare capacity.

F. All ductbank shall conform to the provisions of “Outside Power Transmission and Distribution”, and shall be arranged in a rectangular fashion. Only four (4) inch PVC "type B" conduit shall be used for communication ducts. No section of ductbank shall have more than a sum of 180 degrees of bends without the installation of a manhole.

G. Ductbanks shall have a minimum of (30) thirty inches cover over encasement. There shall be twenty-four (24) inch minimum clearance between communications ductbank encasement and any other utilities.

NOTE: No exceptions will be made without prior approval of the University.

H. Concrete encased, galvanized intermediate weight rigid steel conduit shall be used instead of PVC or polypropylene wherever ductbanks cross roads, parking lots, or buried steam lines. Steel ducts shall extend ten (10) feet on either side of the crossing. At steam line crossings, encasement shall be covered with an aluminum reflector.

I. All spare ducts or those with less than twenty-five percent (25%) fill shall have a one-quarter (1/4) inch polypropylene pull wire appropriately secured at each end. All vacant innerducts or those with less than twenty-five percent (25%) fill shall have a 3/16- inch polypropylene pull wire appropriately secured at each end.

J. All ducts shall be pneumatically rodded using a University approved slug of one-quarter (1/4) inch diameter less than the duct inner diameter.

K. All ducts, including spares, shall be sealed watertight with expandable urethane foam at both ends.

3.14 MANHOLES

A. Manholes shall have inside dimensions 6 feet Wide x 12 feet 1 inch deep x 7 feet High (6'-0"W x 12'-1"D x 7'0"H) minimum.

B. Manholes shall conform to the provisions of “Outside Power Transmission and Distribution”. All steel equipment shall be hot dipped galvanized. All manholes shall have at least one (l) 7/8-inch diameter steel-pulling eye in the wall opposite each duct entrance. Pulling eyes shall be welded to the reinforcing rods at the time of manhole fabrication. Each manhole shall be equipped with at minimum four (4) cable racks, two (2) per long side, that have adjustable hooks adequately sized to support the hardware. Manhole covers shall have the designation ""COMM"" cast on the cover.

C. New ductbank shall be appropriately doweled to existing manholes.

3.15 CONNECTION TO EXISTING SYSTEM

A. Splicing shall only be allowed in manholes or at building entrance locations. No splices shall be allowed in any other location in the new facility or in any ducts or innerliner. Splice cases in manholes shall be securely supported by support hooks on the cable racks not more than two (2) feet away from the splice case. Before closure, all splices shall be offered for inspection by the University and certification of workmanship by SYSTIMAX Solution™.

B. Contractor shall make all cross-connections in each TR to connect the first pair of each voice UTP horizontal copper cable to the facility copper riser system.

C. Contractor shall connect to University video network at the University's direction.

3.16 RE-ROUTING OF EXISTING UNDERGROUND CABLES

A. Contractor shall re-route any voice, data, and video cables that are currently located in the space where the new facility is to be constructed to new or existing manholes. The re-routing and manhole locations are conspicuously identified on the site plan of the drawings.

B. Contractor shall notify the University at least two (2) weeks in advance prior to any outage, re-routing any existing voice, data, and video cables; and the outage shall be scheduled at the convenience of the University.

C. Any cable that is re-routed must be re-terminated and tested according to the termination and testing requirements as described in Part 3.19 of this Section.

3.17 VIDEO SYSTEM INSTALLATION - BUILDING INTERIOR

A. Install a BNI TR2100-7715 (Multichannel RF Fiber Optic AM Transmitter in the BDF of building 147, location to be determined by OIT/NTS. The University will make the final fiber connection to the transmitter.

B. Install a BNI TR2200-750(38)-N17 (Multichannel RF Fiber Optic AM Receiver) in the BDF of the new building. The University will make the final fiber connection to the receiver.

C. The contractor shall provide video system design with loss calculation for University approval before the beginning of installation of any video system cable or equipment.

D. Line extenders shall be mounted horizontally five (5) feet above finished floor using two (2) GB13b D-rings secured with eight (8) 1-3/16” screws. At least one (1) line extender must be provided for each TR stack. Appropriate pads and equalizers shall be installed in the forward line extender section. Return line extenders pads and equalizers may be omitted.

E. The first line extender in each TR stack shall be located in the first floor TR’s Depending on sign level requirements and the size of the building, additional line extenders in the higher floor TR’s may be required.

F. All active and/ or passive devices in an individual BDF or TR shall be attached together using chassis to chassis or right angle connectors.

G. Multiport taps shall be mounted vertically to one (1) GB13a D-ring, with a hex bolt (1/4" wide x 3/4" long) and secured to plywood with four (4) 1-3/16" screws. This does not apply to multiports attached to line extenders.

H. The multiport tap, excluding those attached to line extenders shall face either left or right, but not outward into the BDF/TR. All unused ports shall be terminated.

I. An FFT8-29 multiport shall be the first device attached to the output side of the line extender and is to be used to read the signal levels and measure forward tilt. F-Type right angle connectors may be used for multiport wiring.

J. Directional couplers and splitters shall only be used to connect the first amplifiers in the BDF/TR stacks.

K. All BDF/TR’s shall have at least one (l) multiport tap connected to the riser regardless if that IDF/BDF, services any outlets. At every TR/BDF, a minimum of three (3) spare ports is required.

L. In each TR, the RG-11 coaxial station cable shall be secured to the existing plywood every two (2) feet with screw-type cable tie connectors. Station cable ends in the TR/BDF shall clearly indicate the outlet and room number of the station end in indelible ink written on plastic cable tags.

M. Connectors shall be chosen and installed so they can withstand (30) thirty pounds of pulling force without separating from the cable.

3.18 VIDEO SYSTEM ADJUSTING

Contractor shall adjust amplifier gain and make other system adjustments to achieve specified output levels at each outlet.

3.19 CABLE PLANT LABELING

A. All labeling shall be clear, securely affixed, and consistent on both ends of each installed cable. The University shall approve all labeling in advance.

B. The labeling of outlets and TR hardware shall be permanently engraved in the field by the Contractor according to the following numbering system:

1. Each outlet identification code shall consist of five (5) characters.

2. The first character shall indicate the floor of the building where the communications room serving the outlet is located. The number 0 (zero) shall be used for the ground floor, 1 (one) for the first floor, etc. The--letter B shall be used for basements, S for sub-basements, and M, N, and P for mezzanines.

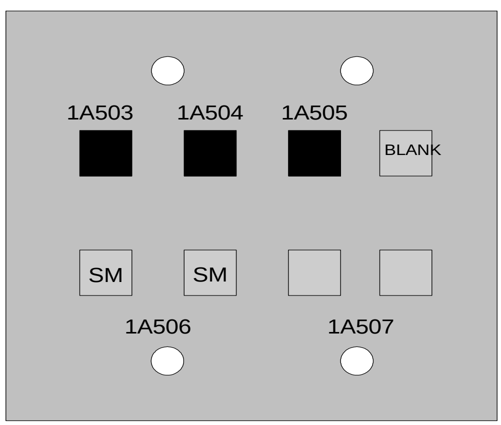
3. The second character shall be used for the communications room identifier. The letters A through Z (except I and O) shall be used and the University will specify the character to be used for each communications room.

4. The last three (3, characters shall denote the number of the outlet. <u>All outlet numbering will begin at 001.</u>

   Example: An outlet labeled 1A006 means first floor, TR "A", outlet number 006.

5. Outlets containing fiber shall be labeled with a separate 5-digit number. These numbers do not have to correspond to the UTP numbers that share the faceplate. <u>All outlet numbering for fiber will begin at 001.</u>

   Following is an example of a three UTP cable outlet with sm fiber:



C. The (5)-five character code for each outlet shall be permanently marked on the outlet, as well as on the corresponding IDF blocks. In addition, each outlet shall be labeled in advance on all telecommunications drawings.

D. All coaxial cable shall be labeled with an outlet number consistent with the closest communications outlet.

E. All UTP copper riser and underground cable termination blocks shall be labeled with white 110 label strips and shall indicate pair count and destination closet. Voice riser shall be labeled separately.

F. Underground cable protector units shall be labeled with green 110 label strips reflecting cable pair count and cable number. Underground cable in manholes shall be labeled with engraved brass tag showing cable number where entering and exiting manhole.

G. All optical fiber riser and underground cable termination panels shall be labeled with fiber strand count, destination closet, and “SMOF,” to indicate cable type. The underground frame shall be labeled with the fiber strand count, fiber number, and fiber optic hub building number. Underground cable in manholes shall be labeled with engraved brass tag showing cable number where entering and exiting manhole.

H. All underground coaxial cable shall be labeled on each end with brass tag marked with the building number and designated as a coaxial feed cable.

3.20 TESTING AND ACCEPTANCE

A. Prior to acceptance, all "As-Built" and technical documentation shall be received and approved by the University. As-built documentation shall include the completed and notarized original copy of the Avaya SYSTIMAX® Structured Cabling System Registration Document. All intrabuilding and interbuilding wiring and equipment, and all site restoration shall be installed and completed in accordance with University and industry standards. All wiring and equipment provided and/or installed under this Contract shall be tested as described under the terms of this Contract and shall be fully operational. After all work is complete, the Contractor shall also provide the University with SYSTIMAX® SCS Certification for all communications work completed on the project and Avaya Distribution Technologies certification for all outside plant splices.

B. All copper cable plant testing shall diagnose, at a minimum, the presence of all open-loop conductors, noisy lines and distortion, low-loop current, high-loop current, ringer failures, grounded, shorted or crossed conductors, dB loss, and split connections. Contractor shall perform a continuity test on all pairs installed in the cable plant, both inside and outside the new facility. The testing shall cover end-to-end, from the outlet to the TR and the BDF to the Patuxent Building (Building 010). In addition, all tests described above shall be performed on a randomly selected pair per twenty-five (25) pair binder group of the copper riser cable. If this random selection is bad, additional testing shall be done to ensure that ninety-nine percent (99%) good pairs exist. The Contractor shall supply complete testing and correction reports to the university for review prior to acceptance of the system. For copper pairs used for any voice/data outlets, the Contractor shall perform such additional testing as required to verify that pairs meet the transmission parameters required for 100BASE-T and Category 6A wiring specifications. The University shall have final approval on the format used for recording and reporting of test results prior to the start of testing activities.

C. Optical fiber cable testing shall, at a minimum, quantify the attenuation range, optical loss, bandwidth, and misalignment. The cable completion tests shall be performed after all optical fiber cable has been placed and all splicing completed. All optical fibers shall be tested at both 850nm and 1300nm. For outside plant fiber, testing shall include two-way testing using an Optical Time Domain Reflector (OTDR), and one-way testing using a Multimode Optical Loss Test Set (MOLTS). For optical fiber installation between the BDF and an TR, the contractor shall provide two-way loss testing through the use of MOLTS. Two-way MOLTS testing shall also be performed on station fiber terminated for testing purposes. All traces and results shall be provided to the University for approval. Protective covers shall be in place on all connectors when they are not in use to protest against contamination by dirt or dust. Any fiber found to be defective a result of installation, physical inspection, or operational test shall be replaced at the Contractor's expense.

D. Coaxial cable and video signal testing shall be performed in the following manner to verify correct installation of coaxial cable and video system electronics:

Input Signal @ 450 MHz (after pad & equalizer)	Output @450 MHz	Output@ch. 7 (175.2 MHz)
9 dbmv (± 1 dbmv)	43 dbmv	40 dbmv

FFT8s Located in TR's:
15 dbmv at 450 MHz at the output of all eight (8) ports of all FFT8s located in the building.

3.21 AS-BUILT DOCUMENTATION

A. The contractor shall provide the following outside plant wiring information, prior to acceptance of the building by the University, for each of the specified media:

1. Cable identification number (Copper, Fiber, Coax).
2. Cable design makeup (Copper, Fiber, Coax).
3. Cable lengths between splice points, terminations amplifiers, or line extenders (Copper, Fiber, Coax)
4. Exact routing of cable (Copper, Fiber Coax).
5. Splice location and identification (Copper, Fiber, Coax).
6. Strand count, mode of installed fiber, loss per splice in dB, and total amount of optical fibers installed (Fiber).
7. Frequency rating, location and identification of amplifiers and splitters (Coax).
8. Bonding and grounding (Copper, Fiber, Coax).
9. Location and description of all associated equipment (Copper, Fiber, Coax).
10. Location and description of all associated structures and obstructions. (Copper, Fiber, and Coax).
11. Signal level readings at all line extenders, FFT8s, and all video jacks using frequencies 175.2 MHz (CH. 7) and 450 MHz.

B. The Contractor shall provide the following intrabuilding wiring information for each specified media prior to acceptance of the building by the University:

1. Cable entrance locations and penetration details (Copper, Fiber, Coax)
2. Location and identification of all distribution closets and of all equipment located inside distribution closets (Copper, Fiber, Coax).
3. Terminal information, outlet numbering, and pair count information at each distribution frame (Copper).
4. Schematic drawings of riser (Copper, Fiber, Coax).
5. Routing of cable and termination information (Copper, Fiber, Coax).

C. The Contractor shall provide the following MDF wiring information prior to acceptance of the building by the University:

1. Cable pair assignments per connector block.
2. Identification of cable routing to MDF.

D. The Contractor shall provide a complete listing of pair assignment records for copper wiring, optical fiber cabling, and coaxial cabling. Copper cable records shall include the status of each copper pair. Optical fiber cable records shall include strand allocation, test results, and identification of media and protocol used.

E. The Contractor shall provide the University with the operational and maintenance documentation of all telecommunications equipment installed under this contract.

F. As-Built drawings shall include actual locations of installed ductbank and manholes, including elevations, and shall indicate location, elevation and type of service for all utilities crossed by the new ductbank.

G. Contractor shall submit all drawings on compact disc in AutoCAD, latest edition.

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Uninterruptible power system (UPS).

1.02 SYSTEM DESCRIPTION

A. Components: The UPS shall consist of the following major equipment.

1. Rectifier/Charger, Invertor, input and output transformers, static bypass switch, input and output circuit breakers located in a single cabinet or group of cabinets.

2. External maintenance bypass circuit breakers.

3. Battery and battery cabinet.

B. Modes of Operation: The UPS shall be designed to operate as an on-line, fully automatic reverse transfer system in the following modes.

1. Normal: The rectifier/battery charger shall derive power from the commercial AC source and supply DC power to the invertor while simultaneously float charging the battery. The critical load shall be continuously supplied by the invertor.

2. Emergency: Upon failure of the commercial AC power, the critical load shall continue to be supplied by the invertor which without any switching, obtains its power from the storage battery. There shall be no interruption of power to the critical load upon failure or restoration of the commercial AC source.

3. Recharge: Upon restoration of the commercial AC source, the rectifier/charger shall power the invertor and simultaneously recharge the battery. This shall be an automatic function and shall cause no interruption of power to the load.

4. Bypass Mode: If the UPS must be taken out of service for overload or internal failures, the static bypass switch shall automatically transfer the load without interruption, to the commercial AC power. Retransfer of the load to the normal mode shall be automatic after the overload or failure has been cleared and reset. Transfer to bypass shall also be initiated manually for maintenance or repair.

5. Downgrade: If the battery needs to be taken out of service for maintenance, the battery shall be disconnected from the UPS module by means of an internal battery circuit breaker. The UPS shall continue to function and meet all performance criteria specified herein, except for the reserve time capability.

C. Design Requirements: The UPS system shall be field-upgradable to 50 KVA.

1.03 APPLICABLE STANDARDS

A. The UPS shall meet the requirements of the following standards (latest edition):

1. ANSI C84.1 - Voltage ratings for Electric Power Systems and equipment.

2. ANSI/NEMA 250 - Enclosures for Electrical Equipment (1000 volts maximum).

3. NEMA PE1 - Uninterruptible power systems.

4. ANSI C 62.41/IEEE 587 - standards for surge with standability.

5. FCC Part 15, Subpart J, Class A.

6. NFPA 70 - National Electrical Code.

B. The UPS shall be UL listed under UL 1012.

1.04 SUBMITTALS

A. Shop Drawings: Submit system configurations with single line diagrams, detailed layouts of power and control connections, ladder diagrams for the maintenance bypass scheme, and detailed installation drawings including all terminal locations.

B. Product Data: Provide product data for UPS and battery including catalog sheets and technical data sheets to indicate electrical performance, UPS type, battery type, detailed equipment outlines, weight, dimensions, control and external wiring requirements, heat rejection and air flow requirements.

C. Submit manufacturer's installation instructions under provisions of Division 1.

D. Submit manufacturer's certificate showing that the system meets or exceeds the specified requirements.

E. Submit a copy of factory test reports to the University, before shipment of the equipment.

1.05 ENVIRONMENT CONDITIONS

The UPS shall be able to withstand the following environmental conditions without damage, derating or degradation of operating characteristics:

A. Operating Ambient Temperature

UPS: +10°C to +40°C
Battery: +10°C to +40°C

B. Storage/Transport Ambient Temperatures

UPS: -20°C to +60°C
Battery: -20°C to +60°C

C. Relative Humidity (operating and storage) 0 to 95%, non-condensing.

D. Elevation: 5,000 feet

E. Acoustical noise: 65 dBA to one meter from any operator surface, measured at full load on invertor, at 25°C.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in UPS equipment with a minimum of three years experience in the design, manufacture, and testing of solid-state UPS systems.

B. Factory Testing: The manufacturer shall fully and completely test the system to assure compliance with the specifications, before shipment.

1.07 WARRANTY

The manufacturer shall warrant the complete Uninterruptible Power System against defective material and workmanship for a period of five (5) years and shall provide a minimum of two (2) preventative maintenance service calls per year by qualified factory service technicians during this period. This warranty period shall commence with the date that the University takes over the building.

PART 2 - PRODUCTS

2.01 SYSTEM REQUIREMENTS

A. System Efficiency: The overall system AC to AC efficiency shall be determined by dividing the output power by the input power. The battery shall be fully charged and connected. The rectifier/battery charger shall be in the normal float mode. The invertor shall be operating in the normal mode.

The minimum acceptable efficiency values are 83% at 50% rated load, 84% at 75% rated load, 86% at 100% rated load.

B. Components: All active electronic devices shall be solid-state and shall not exceed manufacturer recommended tolerances for maximum reliability. All semiconductor devices shall be sealed. Vacuum tubes shall not be used. All relays shall be provided with dust covers.

C. Grounding: The UPS output AC neutral shall be electrically isolated from the UPS chassis, battery, and main ac input.

D. Conductors: All wiring, including transformers and inductors, and all other conductive components shall be copper for maximum safety and reliability. All exposed copper surfaces shall be treated with a suitable permanent protective coating electrically equivalent to tin. Aluminum wiring, foil or bus work shall not be used. Aluminum shall not be used as a current carrying media. Aluminum heat sinks may be used provided that no electrical current passes through the part.

E. Power Transformers: Input and output power transformers shall be designed and manufactured for maximum safety, reliability, and efficiency. All input and output transformers shall be of the isolated winding type. All windings shall be copper. Input transformer(s) shall have an electrostatic shield between primary and secondary windings for noise isolation and suppression. Insulation type shall have a temperature rating that is greater than the highest winding temperature during worst case UPS operation. All transformer connections shall be accessible from the front of the enclosure to facilitate periodic inspection and maintenance.

F. Materials: All materials and parts comprising the UPS shall be new, of current manufacture, and shall not have been in prior service, except as required during factory testing. All metal surfaces shall be treated with a corrosion inhibiting permanent protective coating.

G. Sag/Surge/Impulse Protection: The UPS shall have built-in protection against sag/surge/impulse disturbances on both the main and bypass ac input sources. These disturbances shall include, but not limited to, the effects of load transfer between the invertor and bypass ac source as well as low energy induced transients resulting from the proper operation of correctly applied lightning protection systems.

H. Reliability: The UPS Module shall have an internal Mean Time Between Failure (MTBF) of not less than 50,000 hours. This requirement shall be based upon actual field experience using representative data from all installed UPS models of the specified series and/or rating. For the purpose of determining specified reliability, the bypass AC input source shall not be used as an enhancement method.

I. Overtemperature Protection: The rectifier/charger heat sink and the invertor heat sinks shall be protected by temperature sensors so that the UPS will shut down before any semiconductor devices are damaged by over temperature. When a sensor is activated, the UPS shall transfer the critical load to bypass.

2.02 MANUFACTURER

The UPS system shall be as manufactured by Exide Electronics, Powerware System 50, Model 20 or approved equal.

2.03 ELECTRICAL CHARACTERISTICS

The UPS shall have the following electrical characteristics:

A. Input

1. Input voltage: 480 volts, 3 phase, 4 wire.

2. Voltage range: +10%, -20% without battery discharge.

3. Frequency: 60 Hertz, ± 5%.

4. Input power factors: 0.95 lag minimum.

5. Input current total harmonic distortion (THD): 10% maximum.

B. Output

1. Nominal output voltage 208/120 volts, 3 phase, 4 wire plus ground.

2. Frequency: 60 hertz ± 0.1%

3. Rating: 20 KVA, 16 KW at 0.8 p.f lagging.

2.04 COMPONENTS

A. Rectifier/Charger: Incoming AC power shall be converted to regulated DC by the rectifier/charger. The rectifier/charger shall be a phase controlled, solid-state type with constant voltage and constant current control circuitry. The rectifier shall be provided with a timed walk-in circuit, with loading over a period of 15 seconds.

B. Invertor: The invertor shall be transistorized, pulse-width-modulation design.

C. Static Transfer Switch and Bypass: The static transfer switch and bypass shall be provided as an integral part of the UPS. The control unit shall include transfer circuitry that senses the status of the invertor logic signals and alarm conditions to provide an uninterrupted transfer of the load to bypass. Return to normal mode of operation shall be automatic, upon restoration of normal operating conditions, except for invertor failure or overload.

D. Input and Bypass Protection: Thermal-magnetic molded case breakers and transient suppression circuitry shall be provided for input and bypass protection.

E. Battery and Battery Cabinet: The stationary storage battery system shall be sized to meet or exceed the 100% UPS output requirement for a minimum of ten (10) minutes. The individual battery shall be sealed, maintenance free, non-gassing absorbed electrolyte type with automatic/self sealing safety vents, heavy duty integral copper terminals, heavy duty lead plated copper connectors, and stainless steel bolts and lockwashers. The battery shall be housed in a separate cabinet(s) to match UPS cabinets, with casters and leveling feet. Battery shall have minimum 10 years expected life covered by warranty through the manufacturer. Battery short circuit protection shall be provided by a molded case circuit breaker located in the battery cabinet.

F. Control and Monitoring Panel: The UPS shall be equipped with control and monitoring panel that provides metering, monitoring, and control functions. An Emergency Power Off (EPO) pushbutton shall be located on the control and monitoring panel.

G. Remote Monitor Panel: A remote monitor panel shall be provided and shall be connected to the UPS via the RMP interface. A panel shall have a local audible alarm horn and three user selectable alarm indicators.

H. Input Filter: An input filter with power factor correction shall be provided in a matching cabinet.

I. External Maintenance Bypass Circuit Breakers and Enclosure:
A separate maintenance bypass shall be provided to allow complete isolation of the load from the UPS. The bypass scheme shall consist of two non-automatic, molded case circuit breakers provided in a separate NEMA 1 enclosure. The operation of the external bypass breakers shall be enabled only when the UPS is in bypass mode. The closing of the invertor output contractor or breaker shall be inhibited during the transfer or retransfer operation. Kirk Key interlocks with two sets of keys shall be provided such that only one breaker can be in the open position at all times and power supply to the load is never interrupted.

J. Remote Alarm Panel: A remote alarm panel shall be provided, and shall be connected to the UPS. A summary alarm dry contact shall be provided on the UPS for indicating any alarm condition at the new alarm panel to be located in the telecommunication switch room in the existing building. The sequence of operations in the alarm panel shall be as follows: One green indicating light shall display the systems normal; the alarm condition shall flash the red indicating light and sound the local alarm horn; the acknowledge pushbutton shall stop the horn and the light shall be steady on until the panel is reset; the reset button shall return the panel to normal only after the alarm condition on the UPS has been cleared.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The UPS system shall be installed in the UPS room. The remote monitor panel and the remote alarm panel shall be provided as per University requirement.

3.02 TESTING

A. Before application of primary power, all connections shall be verified for correct phase rotation.

B. The Contractor shall provide all equipment necessary for load testing including a load bank equivalent to the full capacity of the UPS. Any additional ventilation required shall be provided by the contractor.

1. Pre-Start-Up Tests: All manufacturer required or suggested "Prestart-up Tests" shall be performed.

2. Primary Power Application: Primary power shall be applied only after the successful completion of the "Pre-start-up Tests". Primary power shall be applied for a minimum of seventy-two (72) hours with the dummy load operating, prior to the initiation of additional required tests. During this period of operation, all functions of the UPS shall be continuously monitored. The load testing of the system with load bank shall be conducted only once. Run down time and battery back-up shall be monitored and verified as well as the recharge time of the batteries as specified or as listed by manufacturer as minimum.

3. Operational Tests: After the initial seventy-two (72) hours of operation, the Contractor, under the direction of a skilled and qualified technical

representative of the manufacturer, shall non-harmfully induce conditions necessary to successfully test and assure the proper operation of all alarms, overrides, transfers and/or bypasses.

4. Final Acceptance Test: The UPS shall have been in service for at least thirty (30) days prior to the final inspection. The Contractor shall notify the Construction Manager in writing within five (5) working days prior to the date of the final acceptance tests. The UPS shall be considered ready for such testing only after all necessary preliminary tests have been made and all defects and deficiencies found have been corrected to the satisfaction of the equipment manufacturer's technical representative. The UPS shall be acceptance tested in the presence of representatives of the manufacturer, the Construction Manager, the University of Maryland, College Park. The Contractor shall furnish all instruments, labor and materials required for the tests; and the technician who supervised the installation shall conduct the tests. Any deficiencies found shall be corrected and the UPS retested at no cost to the University. All tests shall be repeated as directed by the Construction Manager during final acceptance testing period to his satisfaction at no additional cost.

5. Additional Tests: When deficiencies, defects normal functions develop during required testing, all further testing of the UPS shall be suspended until proper adjustments, repairs, corrections or revisions have been made to assure proper performance of the system. If these adjustments, repairs, corrections or revisions require more than a nominal delay, the observers as herein before indicated shall be notified when the additional work has been completed to arrange a time for a new final inspection and test of the equipment involved. All tests required shall be repeated prior to final acceptance, unless directed

otherwise.

6. Maintenance Instructions: Submit to the Construction Manager with the initial notification of final acceptance testing, a complete set of reproducible as-built, approved wiring and interconnection wiring diagrams with four (4) sets of copies, and four (4) complete sets of maintenance manuals. This is in addition to the requirements of Division 1.

7. Instruction of Owner's Personnel: Upon completion of the work and at a time designated by the Construction Manager, designated personnel at the activity shall receive a complete training session of 20 hours, comparable to the equipment manufacturer's factory training procedure. The training shall include an explanation and review of the theory of operation, the function, description, analysis, and the trouble-shooting of all equipment provided. Training shall include a review of manuals, drawings, and lists supplied, together with any clarifications required. At least one period of eight hours shall be spent demonstrating routine maintenance procedures and trouble-shooting equipment with actual faults being introduced for training purposes. The instruction personnel shall be factory certified by the related equipment manufacturer to provide instruction services. The training shall take placed at the site.

A. All utilities serving a building shall be metered.

B. Temporary utility meters are required during construction and shall be included in the specifications.

C. Water, electric, and steam utilities shall be remotely metered.

D. Water meters shall incorporate flange meters at all locations. For 2" meters or smaller, rotating disk type shall be used. For 2 ½" or greater, turbine type shall be used. Pulse weighing shall be not less than 1 closure/100 gallon on 2" or smaller and 1 closure/1000 gallons on 2 ½" or greater. A Trican "S" head shall provide dry contact operation for DPP use.

E. All sub-metering opportunities will be identified. When sub-metering is appropriate, the specified meter and installation shall be inspected and certified by the appropriate governing agency.

F. Steam utility shall be metered via turbine type condensate meters. Pulse output shall be made available via dry contacts for CCMS use.

G. Condensate shall exit to a condensate return system. Condensate shall not be discharged to sanitary sewer.

H. All service conductors entering a building shall be metered. All electrical metering at service entry shall utilize campus standard Time of Use electronic registration with remote communication via Sangamo's ST-MT100 register (or its current replacement), T3000 meter interface unit (or current production model), induction disk meter body, and polycarbonate cover with Optocom port.

I. Where building service provides power to computer systems requiring three phase, uninterruptable power supply, the electrical load shall have electrical monitoring for on-line alarming and documentation. The hardware used shall conform to existing campus locations and the software used to interrogate these installations.

J. Service entry locations and critical load distribution locations shall be served by a standard telephone service. This service shall be a hard wire bridge to an analog service existing in the building. If an analog courtesy phone is applied anywhere in the building a bridge shall be provided via a jack at the BDF. One analog bridge will be required per meter interface unit, MIU, (T3000). If no line exists a separate line should be provided to serve the MIU.

16.14 VARIABLE FREQUENCY DRIVE (VFD) REQUIREMENTS

A. Control Frequency Drives shall be manufactured by a single contractor utilizing a sine coded pulse width modulated invertor control. The variable speed drive units applied to various HVAC systems shall be provided with designs utilizing the following basic criteria/specifications:

1. Converter shall consist of a modular assembly consisting of a diode rectifier and capacitor assembly which will first convert, then filter and maintain a fixed DC voltage source from the fixed voltage and frequency input.

2. Invertor shall be Insulated Gate Bipolar Transistor (IGBT) with a minimum rating of 1000 VDC on 460 VAC controls to invert the converter fixed DC voltage into a sine-coded pulse with modulated output.

3. Control Logic to consist of a single printed circuit board for all horsepower sizes and incorporates an 8 bit, or larger, microcomputer central processing unit to control all invertor, converter, base drive, and external interface functions.

B. The VFD unit shall allow application onto systems whichemploy any NEMA-B induction squirrel cage motor.

C. The selected VFDs shall provide user friendly diagnostics clearly displayed at a front display.

D. The following identifies the minimum features to be noted in a design:

1. Standard line input voltage 460 VAC.

2. Shall not induce voltage line notching into the utility line.

3. The VFD units shall be controlled automatically a 4-20 mA control signal.

4. The VFD shall be UL approved.

5. The VFD shall be designed to meet power line transient conditions defined within IEEE-587.

6. The VFD shall comply with 1990 NEC.

7. The VFD shall contain the following general features:

   a. Automatic restart after power outage and fault occurrences of over current or over voltage.

   b. Control follower circuit board to utilize 4-20 mA control signal.

   c. Electronic overload protection.

   d. Hand/Off/Auto operator switch.

   e. Instantaneous electronic trip when 180% FLA sensed, phase to phase output short or phase to ground output short circuit occurs.

   f. Interface for time clock control.

   g. Line circuit breaker.

   h. Manual bypass (door interlocked) for fixed 60 Hz operation in emergency.

   i. Manual speed potentiometer.

   j. Minimum/Maximum adjustable speeds.

   k. Over-temperature protection.

   l. Panel mounted display of status, frequency, service diagnostics.

   m. Run/Stop command switch.

   n. Shall provide for 100% current limit.

   o. Thermal overload relay.

   p. Timed acceleration and deceleration for soft starting and stopping.

PART 1 - GENERAL

A. The inspection and testing of medium voltage components shall be performed by an independent testing agency. The inspection and testing shall be applied for, coordinated and paid by the construction contractor.

1.01 SCOPE OF WORK

A. The testing agency shall furnish all labor, materials, equipment, supervision, and insurance necessary to provide electrical acceptance testing including load surveys, power line disturbance studies, calibration and adjustment of relays, PCB sampling, ground resistance tests, transformer tap adjustments and testing on high voltage apparatus such as cables, switchgear, and transformers at the University of Maryland installations on demand.

1.02 SUBMITTALS

The construction contractor shall submit the following to the Department of Architecture, Engineering & Construction and get approval in writing prior to entering into a contract with the testing agency or initiating any testing.

A. Documentation supporting the testing agency qualifications (per article 4 of this specification).

B. The name(s) and certifications of the members of the testing teams.

C. The name and State of Maryland registration number of the registered electrical engineer responsible for testing and evaluation of the test data.

D. Certificate of the testing firm's insurance containing evidence of the "Hold Harmless" clause protecting the University of Maryland from all, suits, actions or claims.

1.03 QUALIFICATIONS OF TESTING AGENCY

A. Requirements

1. Testing Agency shall be limited to any firm, company, or corporation in the electrical testing industry providing the following qualifications are met:

a. They shall be regularly engaged in the technical testing, maintenance, and repair of electrical materials, devices, appliance, electrical installation, and systems for the purpose of preventing injury to persons or damage to property and other equipment. This type of business shall constitute the firm's principal source of revenue. Equipment installation and/or services normally performed by manufacturers, contractors, consulting firms, producers, suppliers, vendors or installer shall constitute less than twenty-five percent (25%) of total revenue.

b. The testing firm shall meet federal OSHA criteria for Accreditation of testing laboratories, Title 29, PARTS 1907, 1910, and 1936.

c. They shall be engaged in such practice for a minimum of two (2) years and must have a minimum of one (1) registered professional electrical engineer, licensed in the State of Maryland who has been regularly engaged in over 600 volt acceptance testing for a periods of not less than five (5) years and shall be responsible for all phases of testing and maintaining electrical power systems including short circuit analysis, protection coordination studies, and the evaluation of test and maintenance data. The engineer shall review and evaluate all results and issue a certified test report.

   1. Any company with fewer than twelve (12) test technicians may meet the professional Engineer requirement by contracting with a State of Maryland registered Professional Engineer for review of all short circuit studies, overcurrent coordination studies, and other engineering reports, who meets the above 4.A.1. criteria.

2. Any company which employs twelve (12) or more test technicians for twelve (12) consecutive months must employ a full time State of Maryland registered Professional Engineer who meets the above 4.A.1 criteria.

d. The testing firm must have in their employee a minimum of two (2) two-person test teams who are employed full time by the firm for testing services.

1. The members of the testing teams shall be currently certified by the International Electrical Testing Association (NETA) in Electrical Power Distribution System Testing, or certified as an Engineering Technician in Electrical Testing Engineering Technology by the National Institute for Certification in Engineering Technologies (NICET).

e. They must agree to perform all work according to the guidelines of the approved testing standards for equipment of their class and type. However, job specifications shall take precedence over approved testing standards for equipment of their class and type guidelines.

f. They shall be corporately and financially independent testing organizations which can function as unbiased testing authorities, professionally independent of the manufacturers, contractors, counseling firms, producers, suppliers, vendors or installer of equipment or systems of a type evaluated by the design organization. such a testing organization or laboratory is defined as follows:

The testing organization or laboratory is legally constituted to perform testing and is independent of manufacturers, contractors, consulting firms, producers, suppliers, vendors and installers. "Independent" as used herein shall be defined as an organization or laboratory which meets all of the following criteria:

1. Such individual group, organization or laboratory shall be free of common ownership or control of manufacturers, contractors, consulting firms, producers, suppliers, vendors, or installers of equipment. As used herein, the following terms shall have the following means:

   a. To own means to own, control or influence a majority of the voting rights in the testing organization or laboratory.

   b. To control means to be able to formulate, determine, or veto basic business policy decisions of the testing organization or laboratory. It is not necessary for another company to own the testing organization or laboratory to control it; it may exercise control through use of dominant minority voting rights, proxy voting, contractual arrangements or otherwise.

   c. A manufacturer means an individual, group or organization whose primary business is to design or assemble, or cause to be assembled, products which would customarily be tested and evaluated for conforming tot he manufacturer's specified performance criteria by a member of the International Electrical Testing Association or distribution of electrical power.

   d. A contractor means an individual, group or organization whose primary business is the construction and/or installation of electrical power distribution equipment, systems or facilities.

   e. A consulting firm means an individual, group or organization whose primary business is the concept, design, supervision, and/or management of projects that include electrical power distribution equipment, systems or facilities.

2. It has no managerial affiliation with manufacturers, contractors, consulting firms, producers, suppliers, vendors or installers.

3. It has sufficient breadth of interest or activity so that the loss or award of a specific contract to determine the compliance of a product with the applicable test standard would not be a substantial factor in the financial well-being of the organization or laboratory.

4. The employment security status of the personnel of the organization or laboratory is free of influence or control of manufacturers, suppliers, vendors, and installers.

5. The organization of laboratory is not engaged in the promotion of the product.

g. The testing organization or laboratory shall have a minimum of four (4) or twenty-five percent (25%) of their field testing personnel (whichever is greater) approved as NETA Certified Test Technicians or NICET Certified.

1.04 SAFETY AND PRECAUTIONS

A. All work shall be performed in accordance with applicable regulations of the Occupational Safety and Health Administration (OSHA), the Maryland Occupational Safety and Health Administration, the National Fire Protection Association - NFPA 70E, ANSI-C2 National Electrical Safety Code and the American National Standards for Personnel Protection.

B. No work involving reaching into or dismantling of equipment, work in the immediate vicinity of exposed electrical connections, or work involving the handling of hazardous materials shall be performed by any employee of the test agency except int he immediate presence of another employee of the test agency who is capable of rendering assistance in case of an emergency.

C. It is the intent of this contract that all test procedures shall be provided by a two-person team of the testing agency.

1.05 LOCAL CONDITIONS COVERING WORK

A. The testing firm shall cooperate with those in authority on the premises in bringing, storing, or removal of all materials and equipment, to observe all rules and regulations in force on the premises, avoid unnecessary dust or accumulated debris, or the undue interference with the convenience, sanitation or routine of the University of Maryland, and to prevent the loss of, or damage to the property of the University of Maryland and/or its employees.

The testing firm shall repair any and all damage he/she may cause to the building or property, to the full satisfaction of the staff of the Department of Architecture, Engineering & Construction.

B. Special precautions shall be exercised in accordance with the regulations of the particular institution when testing at some hospital centers.

1.06 RESPONSE TIME

A. The testing agency shall respond to routine test requests by the Contractor or the University of Maryland within 72 hours of request.

B. Response time for location/identification of equipment failures shall be within three (3) hours of receipt of request.

1.07 TECHNICAL STANDARDS AND LIBRARY

A. The testing procedures to be performed under this contract shall be in accordance with the latest applicable requirements of ANSI, ASTM, IEEE, ICEA, NFPA, OSHA, EPA, NETA, and the Doble Engineering Company. The testing agency shall maintain in-house the latest copies of these standards, codes, and recommended practices.

1. In particular, copies of standards and codes pertaining to the following electrical equipment and testing practices must be available in-house for ready reference upon demand:

a. Power cables of all types and of all distribution voltage ratings.

b. Medium voltage switchgear of all types.

c. Medium voltage circuit breakers and switches of all types.

d. Dry-type and liquid-filled power and distribution transformers.

e. Protective relaying and protection system requirements.

f. Current transformer and potential transformers.

g. Voltage regulators.

h. Surge arresters and capacitors.

i. Metering apparatus.

j. Motors.

k. Generators and Motor Generator sets.

l. Grounding systems.

B. The testing company must have in its in-house technical library the following reference electrical manuals of the latest edition:

* OSHA CFR 29
* IEEE Color Book Series
* Electrical Engineering Handbook
* applies Protective Relaying Handbook
* NETA Acceptance Testing Specifications
* Electrician's and Technician's Handbooks
* NFPA-70E
* ANSI-C2
* ANSI-C39

1. Furthermore, reference library of various electrical equipment manufacturer's technical pamphlets or manuals for the variety of electrical equipment commonly in use must be maintained in-house. The manuals and

reference technical data must be published by the manufacturers of switchgear, circuit breakers, transformers, protective relays, cables, bus ducts, motors, metering and other power and control equipment being tested regularly.

1.08 UNIVERSITY OF MARYLAND RIGHTS OF INSPECTION AND TEST

A. The University of Maryland reserves the right to make or cause to be made such inspections and tests as deemed advisable to ascertain that the requirements of these specifications are being fulfilled. Should it be found that the standards herein specified are not being satisfactorily maintained, the University of Maryland may, by written notice to the Contractor, terminate this testing agency services. In such event, the University of Maryland may take over the work and prosecute it to completion, by contract or otherwise, and the contractor and his sureties shall be liable to the University of Maryland for any additional costs occasioned by the University of Maryland.

1.09 TESTING AND INSPECTION PROCEDURES

A. Prior to the energization of any new and/or relocated high voltage apparatus (above 600 volts) such as cables, transformers, and switchgear, the following field inspections and tests shall be performed. It shall be the responsibility of the electrical contractor doing the construction to advise and coordinate the test procedures including cable preparation with the testing agency.

B. In Power Company service entrance applications, unless otherwise required by the Power Company, it shall be the responsibility of other than the testing agency to deliver draw-out elements of overcurrent relays to the Power Company's Laboratory for inspecting, testing, and setting prior to the equipment being placed in service.

C. The scope of inspection and testing services for medium voltage electrical equipment includes but is not limited to the following:

1. Switchgear and switchboard assemblies

2. Transformers
    a. Dry-Type
    b. Liquid Filled

c. Small Dry-Type

3. Cables - Medium Voltage

4. Metal Enclosed Bus

5. Air Switches
   a. Medium Voltage - Metal Enclosed
   b. Medium voltage - Open

6. Circuit Breakers - Medium Voltage
   a. Air Filled
   b. Oil Filled
   c. Vacuum

7. Protective Relays

8. Instrument Transformer

9. Metering and Instrumentation

10. Grounding System

11. Motor Control - Medium Voltage

12. Surge **Arresters** - Medium Voltage

13. Capacitors

14. Automatic Circuit Reclosers - Medium Voltage - Oil and Vacuum

15. Automatic Line Sectionalizers - Medium Voltage - Oil

D. The testing scope and procedures for those items noted in paragraph 10C above shall be in accordance with Section 7 of the latest edition of NETA Acceptance Testing Specifications for electrical Power Distribution Equipment and Systems. Optional test procedures noted in Section 7 are not required to be accomplished except as follows:

1. Section 7.3.2.2. - Cable insulation resistance testing utilizing a megohm-meter shall be provided.

2. Section 7 of the latest NETA Acceptance Testing specifications for Electrical Power Distribution Equipment and Systems is made inclusive of this

contract by reference.

1.10 TEST EQUIPMENT AND TEST EQUIPMENT CALIBRATION

A. All test equipment required to price the services outlined in this specification shall be in the testing agency's inventory or shall be procured by the testing agency, if required, at no additional cost to the University of Maryland.

B. The testing firm shall have a calibration program which assure that all applicable test instruments are maintained within rated accuracy.

   1. The accuracy shall be directly traceable to the National Institute of Standards and Technology.

1.11 PCB ANALYSIS UNIT PRICES

A. Upon request by staff engineers of the Department of Architecture, Engineering & Construction, the testing firm shall obtain the following suspected PCB contaminates, analyze same for degree of contamination, and report the results. these services shall be billed at the contractual hourly rate for labor plus the contractual unit price for the PCB laboratory analysis noted in the Bid Form. All testing shall be in accordance with EPA prescribed methods.

   1. Provide unit price for laboratory analysis for PCB contamination of a suspected oil sample.

   2. Provide a unit price for a wipe sample of suspected contaminated surfaces.

   3. Provide a unit price for concrete core samples. Core samples shall be one (1) inch diameter by three (3) inches deep.

      a. The samples shall be obtained with a diamond bit and water coolant system. The core samples shall be pulverized and dried for a 24 hour period. The PCB shall then be extracted from each sample for a period of two (2) hours using EPA recommended techniques. The analysis is completed by injection into a gas chromatographic system with subsequent computation and report in PPM.

b. Though there are no present EPA specifications or standards for this criteria, laboratory analysis shows a 1:2 extraction ratio for this process.

c. The holes shall be patched with Super Por-Rok, or approved equal, non- shrink grout.

1.12 DEMAND VISITS

A. In addition to the acceptance testing of medium voltage electrical equipment the testing agency shall also provide fault identification services for cable, transformer, switchgear, etc., failures on demand. Additional services such as load surveys and device testing for over and under 600 volt applications may be required.

1.13 TEST RESULTS

A. All test data shall be recorded on standard National electrical Testing Association (NETA) forms or forms developed by a manufacturer for use with specific test equipment and approved by the University of Maryland.

B. All test results shall be typewritten when submitted in their final forms and shall include the assigned University of Maryland project number, job name and location.

C. Under "Remarks" Column, an analysis of the test data shall be given indicating whether data recorded is or is not within accepted limits.

D. Normally five (5) copies of final report shall be submitted with copies going to each of the following:

1. Department of Architecture, Engineering & Construction Project Manager (2 copies).

2. Consulting Engineer responsible for the particular project (1 copy).

3. In Power Company service entrance application, all test results and applicable field inspection reports shall be forwarded to the applicable Power Company (1 copy).

Test result reports shall be submitted with copies as noted within five (5) working days of the date of the test.

Immediately upon the completion of the testing of each high voltage system component (cables, transformers, switches, etc.), the testing agency technician shall provide written certification to the contractor and University of Maryland that the tested component is or is not suitable to be energized. This document shall be the Contractor's authorization to/or not to energize the equipment.

The above noted document shall be on a standard NETA form or approved substitution.

E. All test results shall be certified by an electrical engineer registered in the State of Maryland. Each test report shall bear the signature and seal of the professional engineer who shall certify the data and conclusions presented therein. The stamp and seal shall be affixed to the first page of the body of the Report, not a cover or title sheet.

1.14 EST FIRM'S LIABILITY INSURANCE

A. Responsibility for Damage Claims

The testing firm shall indemnify and hold harmless and defend the University of Maryland and all its representatives form all suites, actions, or claims of any character brought on account of any injuries or damages sustained by any person or property including State property and State employees, agents or representatives in consequence of any work performed under this testing contract, either by the testing firm or any Sub-Contractor, or their employees, agents, or representatives.

B. Liability Insurance

1. The testing firm and/or any Sub-Contractor shall maintain such insurance as will protect him/her from claim under Workmen's Compensation Acts, by coverage with Insurance Companies acceptable to the State Insurance Commissioner for damages which may arise, from operations under this testing contract, whether such operations be by himself/herself or by any sub-contractor or anyone directly or indirectly employed by the testing firm.

2. He/she shall protect himself/herself and the state from any other claims.

3. The limits for Bodily Injury Liability shall not be less than $500,000/$1,000,000; that is, $500,000 is the limit for injury per occurrence and $1,000,000 in the aggregate. The minimum limit for Property Damage Liability shall be $500,000 per occurrence and $1,000,000 aggregate.

4. The above policies for Bodily Injury and Property Damage Liability Insurance shall be so written as to include Contingent Bodily Injury against claims from the operations of the Sub-Contractors.

5. Certificates of the testing firm's insurance containing evidence of the Hold Harmless Clause protecting the University of Maryland shall be filed with the Department of Architecture, Engineering & construction and shall be subject to their approval for adequacy of protection.

1.15 CHARGES

A. The charges for this testing contract shall be submitted on a monthly basis and shall be payable by the construction contractor on a monthly basis. Invoices shall be separate, by project identification.

B. The hourly rate quoted for a two-person testing crew per hour shall include charge for administrative expenses, overhead expenses, vehicle mileage and profits.

   1. The maximum allowable round trip travel time for any testing procedure anywhere in the state, shall be five (5) hours.

C. Site visits by the testing company shall be certified by either the on-job electrical contractor's foreman or by a responsible staff member of the using agency. This certification on an approved form, shall be submitted with each job invoice and shall state the number of hours at the job site, travel time, and the names of the individuals doing the work.

PART 1 - GENERAL

1.01 SECTIONS INCLUDES

A. Control switches and stations.

B. Photocells.

C. Relays.

D. Time switches.

E. Control device enclosures.

1.02 SUBMITTALS

A. Shop Drawings: Indicate control device enclosure wiring diagrams and panel layout drawings.

B. Product Data: Provide data on each control device specified.

C. Operating and Maintenance Instructions: Include instructions on adjusting, repairing, cleaning, and lubricating each control device specified.

PART 2 - PRODUCTS

2.01 CONTROL SWITCHES AND STATIONS

A. Description: Heavy duty, oil-tight control switches and stations manufactured to NEMA ICS 2.

B. Contact Ratings: Class A150.

2.02 PHOTOCELL SWITCH

A. Description: Photocell switch manufactured to NEMA ICS 2.

B. Ratings: Contact Ratings: Class A150.

C. Enclosure: Gasketed, cast feralloy box with conduit hub.

2.03 RELAYS

A. Description: Relays manufactured to NEMA ICS 2.

1. Magnetic Control Relay: Class A300.

2. Time-Delay Relay: Class A600.

B. Ratings:

1. Contact Ratings: Class A150.

2. Coil Voltage: 120 volts, 60 Hz., Single Phase.

C. Enclosure: NEMA Type 1 for interior and NEMA type 4 for exterior use.

2.04 TIME SWITCH

A. Description: Clock timer manufactured to NEMA ICS 2, with astronomical dial.

B. Ratings:

1. Contact Ratings: Class A150; SPST.

2. Coil Voltage: 120 volts, 60 Hz., Single Phase.

3. Dial Time: 24 hours, 7 days.

C. Enclosure: NEMA Type 1 for indoor applications, and NEMA Type 4 for outdoor applications.

2.05 CONTROL DEVICE ENCLOSURES

A. Description: Shop fabricate and wire control device enclosures to NEMA ICS 1, for groupings of more than one device.

B. Use hinged cover enclosures under provisions of Section 16110.

C. Terminal Blocks: ANSI/NEMA ICS 4.

D. Fabrication: Shop assemble to NEMA ICS 6. Use plastic wiring through to route internal wiring.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Install control devices in accordance with manufactures instructions.

B. Install individual components in enclosures.

C. Connect control devices to systems controlled, to achieve proper system operation.

3.02 ADJUSTING

A. Adjust time delay relays and clock timers to achieve specified system operation.

16.17 SECURITY CAMERA SYSTEMS (12-2-02)

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes furnishing of equipment and installation of a CCTV System for the University of Maryland. The new camera system shall interface with the existing Pelco CCTV system and all cameras shall connect to the existing Pelco Video CM9760 Matrix Switcher. Contractor shall be responsible for installation and programming of any cameras to this system. Contractor is responsible for the supply and installation of any video input/output cards, switching bay boxes, or any other head end equipment required to expand the existing system and provide the university with a fully operational CCTV system. The contractor shall provide all wiring, fiber and electrical power, to provide control of pan/tilt/zoom cameras and all CCTV equipment.

1.03 SUBMITTALS

A. Product Data: Include detailed manufacturer's specifications for each component specified. Include data sheets reflecting the model numbers, features, ratings, performance, power requirements, and dimensions.

B. Shop Drawings: For CCTV equipment to include plans, elevations, sections, details, and attachments to other Work.

1. Include dimensioned plan and elevation views of components and enclosures. Show access and workspace requirements. Shop drawings shall include mounting details for all wall and pole mounted equipment. Such details shall include all mounting brackets, hardware, and connections to the building and pole structures.
2. Wiring Diagrams: Power, signal, and control wiring point-to-point diagrams. Differentiate between manufacturer-installed and field-installed wiring.
3. It is the Contractors responsibility to submit for approval the complete designed system configuration and layout showing all devices, wiring, conduit, and locations along with other required information as specified herein for the completely integrated system proposed for installation.

C. Coordination Drawings: Plans drawn to scale and coordinating locations of CCTV equipment. Show the following:

1. Method of attaching hangers to building structure.
2. Location of items requiring installation coordination including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and other architectural features.

D. Samples: Provide full size samples of each outlet; finish plate, for colors and textures required.

E. Product Certificates: Signed by manufacturer of CCTV equipment and components certifying that products furnished to the Contractor comply with requirements.

F. Installer Certificates: Signed by manufacturer certifying that installers comply with manufacturers requirements.

G. Field Test Reports: Indicate and interpret test results for compliance with performance requirements of installed systems.

H. Maintenance Data: Maintenance Data for CCTV equipment and components shall be a part of the maintenance manuals specified in Division 1. In addition to requirements specified, to be provided include the following:

1. Detailed operating instructions covering operation under both normal and abnormal conditions.
2. Routine maintenance requirements for system components.
3. Lists of spare parts and replacement components recommended are to be stored at the site for ready access.

I. Warranties: Special warranties specified in this Section.

J. Calculations and Parameters; Contractor shall submit for approval by University of Maryland, Building Security Systems, the calculations used and plans and diagrams for the Field of View calculations for the CCTV system. Submission as a minimum shall include and address Low Level Lighting. Backlight compensation, and Lens conformance with this Specification.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: This project requires an experienced installer with a minimum of five (5) years experience installing CCTV equipment and possess manufacturers certification, for both installation and maintenance of equipment required for this Project.

B. Product Options: Drawings shall indicate size, profiles, and dimensional requirements of surveillance equipment and are based on the specific system indicated. Other manufacturers' products complying with requirements may be considered. Refer to Division I Section "Substitutions."

C. Electrical Components: Devices, and Accessories; Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with NFPA 70.

E. Comply with 47 CFR 15, 17, and 76.

F. UL Compliance. Comply with applicable requirements of UL safety standards pertaining to television equipment and accessories. Provide TV equipment and accessories, which are UL-listed and labeled.

1.05 PROJECT COND1TIONS

A. Environmental Limitations: System components shall be equipped and rated for the environments where installed

1. Service Conditions for Outdoor Equipment: Rate equipment for continuous operation under the following environmental conditions, unless otherwise indicated:

a. Temperature: Minus 15 deg F to plus 122 deg F.
b. Relative Humidity: 5 to 100 percent.
c. Weather: Enclosure housings to prevent entry of moisture due to melting ice build-up or driven rain or snow.

2. Service Conditions for Indoor Equipment: Rate equipment for continuous operation under the following environmental conditions, unless otherwise indicated:

a. Temperature: 32 deg F to 140 deg F.
b. Relative Humidity: 0 to 95 percent.

1.06 COORDINATION

A. Coordinate layout and installation of CCTV surveillance equipment and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.07 WARRANTY

A. Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1. Special Warranty for Surveillance System and Components: Written warranty, signed by manufacturer and Installer agreeing to correct system deficiencies and replace components that fail in materials or

workmanship within specified warranty period when installed and used according to manufacturer's written instructions. This warranty shall be in addition to, and not limiting, other rights Owner may have under other provisions of the Contract Documents.

2. Special Warranty Period: Two years from date of Substantial Completion.
3. Technical Assistance: CCTV equipment manufacturer shall provide a 24-hour technical telephone assistance program, allowing for the communications directly with manufacture employees to answer any questions and resolve problems over the telephone on a 24-hour basis.
4. Repairs: Manufacturer shall provide 24-hour repair and turn around service on all CCTV equipment.

This section applies to security cameras accessories and equipment.

1.08 GENERAL REQUIREMENTS

A. Design, furnish and install the camera system equipment and layout in conformance with IES recommended procedures. All CCTV system components are to be new, unused products provided with complete Manufacturer's and Contractor's warranty of no less than two years Parts and Labor service. All of the equipment to be furnished is to interface and directly connect to the existing Pelco CCTV equipment in place. Code converter boxes or translator equipment will not be acceptable.

B. Wiring

The wiring system shall consist of tying into owner supplied multimode fiber, running from the new construction site to University of Maryland, Building Security Systems in Building 10. The fiber transceivers shall be supplied by the contractor and will need to be coordinated for the type based on the cameras in the new building site and shall be American Fiber Tech products to integrate with the existing fiber backbone.

C. Lighting

Contractor will assure that adequate area lighting exists to allow for the proper viewing of the video images in the viewing area. This may be accomplished by use of the appropriate combination of cameras, lenses, environmental enclosures, and mounts, as well as, the possible addition of exterior lights. Metal Halide is the preferred exterior lighting source.

D. Parking Garage

Cameras installed within parking garages will conform to the general requirements listed above for cameras, lenses, environmental enclosures, mounts and lighting. Locations where the pendant mount camera suspends below the concrete beam structure a breakaway mount shall be used to keep from destruction to the camera unit or a vehicle.

1.09 PROJECT RECORD DOCUMENTS

Accurately record actual locations of each camera with the switching arrangements and provide the University with accurate As-built plans within 30 days of contract closeout.

1.10 REFERENCES

A. Poles - Shall conform to University of Maryland standard poles or PERT Telephone (Police Emergency Reporting Telephone) Installation Criteria 4.15.97 for Free Standing Talk-a-Phones with Camera Extensions.

B. Building exterior shall be a mountable surface capable of bearing a shear weight of 100 lbs.

1.11 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience.

PART 2 PRODUCTS

2.01 EXTERIOR EQUIPMENT AND ACCESSORIES

Equipment supplied shall be compatible with existing Pelco CCTV equipment, code converter boxes or translator equipment will not be acceptable.

A. Environmental enclosures, complete with gaskets to form weatherproof assembly.

B. Low temperature operation to zero degrees Fahrenheit.

C. Camera enclosure shall be vandal-proof.

E. Transceivers supplied shall be compatible with existing equipment.

F. Camera’s mounted on parapets must not be mounted on false parapets.

2.02 CAMERA EQUIPMENT AND ACCESSORIES

A. Internal Wiring: Component wiring within enclosures shall be UL Listed.

B. Digital Video Multiplexer:

1. The video multiplexers shall be a 16-camera input, color, full duplex system. The multiplexer will allow for simultaneous time base corrected digital recording of all cameras to VCR’s in a full screen format. Recording shall be accomplished in a field recording sampling method.

2. The multiplexer shall offer live selectable multi-screen displays while recording. The video multiplexer shall allow any input to be programmed into any display location: PIP (programmable for size and location on screen), quad (2x2), nine cameras (3x3), and sixteen cameras (4x4). The video multiplexer shall allow sequencing of at least four different Quad (4x4) displays and at least two different nine (3x3) camera displays.

3. The video multiplexer shall have three monitor outputs, one for full and/or multi-camera viewing in live or playback modes, one for full screen viewing of live cameras, and one for automatic sequencing of full screen live cameras. All three monitors shall be capable of automatically displaying cameras in alarm and/or cameras that have detected activity. The multiplexer shall provide a digital zoom display in full screen, in live and playback modes. The video multiplexer shall have an automatic speed-tracking mode that allows the VCR's recording speed to automatically adjust and control the multiplexer’s record speed via the VCR's head switching pulse.

4. The unit shall feature programmable, digital activity detection on all video channels. Digital activity detection shall provide programmable detection mask and sensitivity levels for each camera.

5. The multiplexer shall be capable of control of up to sixteen (16) pan-tilt-zoom cameras when wired in a daisy-chain configuration.

6. All video communications between the CPU's, the VCR's, and the monitors will be transmitted via RS485 connector to a CM9760-CDU or approved equal.

7. Color Duplex Multiplexers shall be Pelco Model MX4016CD or approved equal.

C. VCR's

Each VCR will be a time lapse VCR capable of recording in standard 6 and 8 hour recording modes and time-lapse recording modes for 18, 24, 30, 40, 54, 72, 78, 102, 104, 126, 136, 160, 174, or 232 hours dependent on type of tape. The VCR shall have a resolution of 400 lines in super resolution mode and more than 240 lines in VHS mode. The VCR shall have four rotary heads and utilize one rotary head for audio recording. The VCR shall have three direct drive motors. Search functions shall be made by time and date, alarm index, Skip, and counter memory stop. The unit shall have a jog/shuttle for easy forward or reverse field playback. The VCR shall be Pelco Model TLR3168 or approved equal. The VCR's shall be rack mounted in a 19" console with a Pelco RM-2001 Rack Mount Kit.

D. Monitors

Each multiplexer will be equipped with both a main and a spot monitor. These color monitors are to have 18" diagonal viewing areas. Resolution shall be a minimum 900 TV lines. Audio inputs, speakers, and looping BNC video inputs are to be available. Separate S-VHS inputs will be available for future requirements. The monitors shall be Pelco Model PMC21A Monitors or approved equal. Monitors are to be mounted as requested by the University.

E. Interior Pan/Tilt/Zoom Color Dome Cameras

Each interior ptz color camera shall be recessed and secured to the beam structure of the building or the University may opt for corner mounted or wall mounted units. All cameras that are recessed will be required to have the domes at ceiling level. It is the contractor's responsibility to coordinate the camera type and lens requirements with the University before the purchase of the cameras as stated in submittals above. The contractor shall refer to the camera schedule and drawings for installation location and type. The cameras shall be Pelco Model Spectra III SE or approved equal.

F. Exterior Pan/Tilt/Zoom Color Camera systems

The exterior ptz color cameras shall be mounted as required by the manufacturer and conform to University standards. The pan/tilt/zoom system shall have the receiver driver unit as an integral part of the unit. Separate receiver drivers are unacceptable. The camera shall be an integral part of the housing and be installed by the manufacturer and posses low light technology and utilize a 1/3" CCD imaging device with picture elements of a minimum 768 (H) x 494 (V) and a total of 480 TVL minimum. The camera shall have a minimum 0.023-lux at 35 IRE, f1.2 minimum illumination. Contractor shall coordinate the lens requirements with the University of Maryland, Building Security Systems before purchasing any unit. The Pan/tilt/zoom camera shall be a Pelco Model Esprit ES30CBW18-5W or approved equal.

G. Interior Color Fixed Cameras

The interior fixed color cameras shall be an integrated camera system consisting of surface and in ceiling mounted units. The fixed camera systems shall be color hi-resolution cameras with variable focus lenses, utilizing 1/4 inch CCD imaging devices with a horizontal resolution of 480 TV Lines and have a Signal-to-Noise ratio of at least 48dB and have a minimum illumination sensitivity of 1.2 lux. The fixed color cameras shall be Pelco Model ICS Series Cameras 100, 150, 200, or 300 or approved equal.

H. Console and Playback Stations

1. When necessary a complete security console with provisions to rack mount all recording, control, and display equipment will be provided for.

2. A complete playback station will be provided. This workstation will consist of Pelco MX4016CD Multiplexer, TLR3168 VCR and PM21A Monitor or approved equals. The playback/review station shall include a Toshiba 6A Printer Model EC 1200A or approved equal. The printer must also use print paper Model ECA-AGN or approved equal. This system shall allow for the offline review of any archived recorded video from the System with selectable, individual playback of multiplexed cameras.

I. Labels: All fixtures shall bear UL Wet Location and I.B.E.W. labels.

J. Lens

Lens-l (Exterior Domed Sites), the complete camera/lens/connector package must be compact enough to fit internally into the Environmental Dome. The exterior domed site shall have 64 presets built into the dome unit. The zoom lens shall be a minimum l6x auto-iris with a minimum focal length of 4.0-64mm. Mechanical dimensions shall be such that the lens and camera combination will fit in the enclosure with a 5.9” acrylic bubble. The domed system shall have 360-degree pan rotation and 180-degree auto flip dome rotation.
Lens-2 (Free Standing Code Blue Sites), the complete camera/lens/connector package must be compact enough to fit internally to the Free Standing Code Blue Telephone enclosures, which are approximately 11” in diameter. The zoom lens shall be an auto-iris with a minimum focal length of 4.0-64 mm.

Lens-3 (ESPRIT), the complete camera/lens/connector package must be compact enough to fit internally into the Environmental Enclosure. The zoom lens shall be a l6x auto-iris with a minimum focal length of 3.9-63mm.

K. Environmental Enclosures

All exterior camera sites are to be configured in an environmental enclosure, which incorporates a 360-degree rotation pan and tilt devise to allow for camera viewing in all directions from the camera site location. Two types of environmental enclosures shall be utilized.

Enclosure-l (The Exterior Domed Sites enclosure) The enclosure shall incorporate a 5.9” lower hemisphere with a black opaque lower dome with a clear viewing slot. The environmental dome shall include factory installed heater and blower. The dome is to be powered by 24 VAC. The integral pan-tilt will be pre-wired for all system functions. The environmental dome shall be the Pelco Spectra III Series or approved equal.

Enclosure-2 (The ESPRIT Series Enclosure) The enclosure is to be powered by 110 VAC. The enclosure will be prewired for all system functions. The environmental enclosure shall include factory-installed heater. This heated enclosure system shall be a Pelco Model ESPRIT Series Positioning System with Integrated optics package or approved equal with wall mount and pole mount adapter where needed.

L. Mounts

An appropriate mounting device will be provided at all camera locations to provide a stable and accessible means of access to the camera site. The specifics of each site location will be determined by local considerations at the indicated mounting location during the site walk-through. When domes are mounted to on the roof of buildings, parapet mounts, which incorporate swinging arms for serviceability, shall be provided. Whenever possible, domes are preferred to be roof mounted as opposed to wall mounted, for maximum serviceability. Typical building mounts shall be Pelco PP351 rooftop parapet mounts for Spectra series camera units or approved equal. Where pole mounted, the mounts, shall be Pelco IWM24 with a built in transformer for wall mounting the Spectra series cameras to a wall and pole adaptors with Pelco SWM-PA-GY or approved equal. Where corner mounts are to be used, the mount shall be Pelco SWM-CA or approved equal. Other mounts are to be applied where required.

2.03 SPLICES, TAPS

A. All splices underground; in hand holes or other wet locations shall be waterproof and made with Scotch-cast 85 Multi-Mold Splicing Kits, or approved equal.

B. All taps shall use suitable connectors such as Burndy Type Ks and taped with two layers of 3M Scotch Brand or approved equal rubber tape and six layers of vinyl plastic electrical tape.

C. Splices in hand holes shall be supported on bricks 8 inches above the bottom of the hand hole. Splices shall be kept to a minimum and are prohibited in locations other then hand holes, pull-boxes or lighting unit bases, except for the purposes of retaining circuitry of any existing underground wiring where existing poles or wiring are distributed.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Examine adjacent surfaces to determine that surfaces are ready to receive work.

B. Examine each piece of equipment to determine suitability for location specified.

3.02 INSTALLATION

A. Install camera equipment and accessories in accordance with manufacturers instructions.

1. Install equipment in consoles and EIA Standard 19” Equipment Racks.

2. Connect equipment to the branch circuits and cables provided by Contractor.

3. Bond products and metal accessories to the branch circuit equipment-grounding conductor.

B. Equipment shall be located clear of equipment that will affect the field of view of the cameras. The University reserves the right to relocate any camera within 15 feet from locations shown on drawings at no cost to the University.

C. Open trenches shall not exceed 30 linear feet before backfilling. All trenching shall conform to National Safety Standards. Contractor shall be responsible for traffic control, backfilling, asphalt or concrete repairs to the roadway, driveways, or sidewalks. No trench shall be left open overnight. It is the contractor’s responsibility to provide any steel plates to maintain traffic and vehicle access each day at job shutdowns. Contractor is also responsible for locating any utilities before trenching or digging begins.

3.03 ADJUSTING AND CLEANING

A. Adjust equipment as directed by the University Building Security Systems.

B. Clean paint splatters, dirt, and debris from installed equipment.

C. Touch up enclosures, buildings, and interior finish at completion of work.

D. Replace equipment and mounts, which have failed at completion of work.

3.04 COORDINATION

A. Confirm compatibility and interface of other materials with CCTV system. Report discrepancies to the University Building Security Systems.

B. Supply trim rings, back boxes, etc. to other trades as necessary.

C. Coordinate with the Mechanical, and Structural Contractors to avoid conflicts between cameras, supports, fittings, and mechanical equipment.

D. Before ordering, confirm construction details and architectural finish for each area with the University Building Security Systems.

3.05 ACCEPTANCE

A. Contractor shall demonstrate to the satisfaction of the University Building Security Systems that all equipment is operating properly. Any faulty equipment shall be replaced at the Contractor’s expense. The Contractor shall demonstrate operation of all installed equipment.

17.01 CENTRAL CONTROL AND MONITORING SYSTEM (CCMS)

The Department of Operations and Maintenance at the University of Maryland College Park operates a Campus-wide Central Control & Monitoring System (CCMS). Installation of a system that interfaces with the central equipment on the College Park campus of the University of Maryland are required. The CCMS system must be an extension of the campus system and not an independent system. This system is used to override local building control systems, but does not replace them. Therefore, a complete local (stand alone) system must be provided and integrated with the CCMS. Connection to the College Park CCMS can be achieved via modem and phone lines.

The scope of the CCMS design shall incorporate the operating characteristics for the proposed facility with regard to the capabilities of the existing CCMS, resulting in an optimally designed CCMS in terms of effectiveness and cost. The guiding principles for this design are to provide metering (and submetering by campus department as feasible) for all utilities; to provide remote start/stop and reset for all HVAC systems and other major equipment; to monitor energy-using systems for actual loads and conditions and all systems for alarm status and critical malfunctions. The desired CCMS shall provide surveillance and optimal operation of the HVAC and other systems and provide metering information as to actual utility usage.

CCMS is a microprocessor based, Environmental Management and Control System (EMCS) which uses a distributed processing architecture to achieve a high degree of system efficiency and reliability. It is an extension of the owner-provided Staefa Control System (SCS) Phoenix/System II model CCMS system.

Systems' requirements include:

A. The system design and architecture shall be compatible with the existing CCMS campus system. The system shall be designed and the equipment shall be selected to achieve the highest possible system wide reliability, serviceability, maintainability, and provide flexibility to meet both current sequences of operation and any anticipated future needs. Specific directions of approach are presently being developed.

B. A digital communication line connection shall be made between the existing owner-provided CCMS and the CCMS extension within a facility.

C. Supervisory remote control and monitoring of the system is accomplished through the CCMS unit which has an intelligent, stand-alone capability. The EMS/CCMS system will digitally communicate with stand-alone microprocessor-based DDC controllers installed in controlpanels associated with each mechanical system including the air handling units and the chilled and heating hot water systems. The CCMS will also communicate with stand-alone microprocessor-based controllers installed at each peripheral or terminal mounted equipment affecting a building's environment.

D. Control of equipment will be direct digital control DDC with electric and electronic actuation. Power actuation for isolation valves, two position in design, shall use pneumatic pressure (30 psig).

Director of Operations & Maintenance shall be contacted in order to obtain the present capabilities of the CCMS and to provide the University with a plan for the energy efficient operation of the HVAC systems. This plan shall be coordinated with the life cycle costing and HVAC load analysis in the Energy and Energy Analysis section to produce the most energy efficient facility design. It shall also delineate the scope of control between local controls, CCMS override control and fail-safe arrangements by HVAC systems.

Provisions shall be made for the complete system installation, including:

A. All sensors, contacts, equipment, and system interfaces and metering points.

B. All electrical and mechanical interface to the building systems and equipment.

C. All electrical and mechanical system components required by the CCMS.

D. Interfacing the new building CCMS to the existing CCMS central equipment. This includes all necessary alterations to the central processing units and their software routines located in the Service Building (003) on the UMCP Campus.

E. Extension of underground duct bank and communication cables from the existing CCMS to the proposed facility.

A. At the University of Maryland, Building Commissioning is an organized protocol through which the Prime Contractor demonstrates that all building systems are functional and operating in accordance with the A/E's design intent.

B. The University is the "Commissioning Authority". The intent is to improve communication between UM and the A/E and to minimize additional A/E involvement resulting from the University's Building Commissioning activity. The A/E prepares generic building commissioning documentation during the design phase, the "Test Engineer", a professional firm under contract to the Prime, prepares the site-specific commissioning plan, conducts the tests, and documents the results, and UM staff witness the acceptance tests.

C. A/E activity related to UM's Building Commissioning protocol includes:

1. During the design phase, respond to the Commissioning Authority as indicated below. Note that the design phase of the UM Building Commissioning process takes place on a parallel track with the routine UM document review. No additional meetings are foreseen as a result of the Building Commissioning protocol.

2. The development of the "Narrative of Design Intent." This document seeks to identify the design intent underlying the building systems which are to be tested. The University will review and approve the "Narrative of Design Intent". Observed performance, in accordance with the design intent, then becomes the "pass / fail" criteria for the related acceptance test.

3. Incorporate the "Narrative of Design Intent" into the contract documents. The "Narrative of Design Intent" is a part of a separate commissioning specification section.

4. Incorporate the University prepared, project specific listing of items to be tested into the contract documents.

5. Coordinate the building commission specification with the project specifications. The building commissioning specification incorporates the following key provisions:

   a. The Prime Contractor is required to retain a Test Engineer, from a list of professionals prepared by the University. The Test Engineer produces the site-specific Commissioning Plan.

b. The Test Engineer organizes and conducts all on-site building commissioning activity, including acceptance testing, which is witnessed by UM staff. The Test Engineer also coordinates the Prime Contractor's efforts in the areas of Operator Training, As - built documentation, Operation and Maintenance Manual preparation.

6. UM asks that the A/E respond to legitimate design-related questions of the Test Engineer and Commissioning Authority during the construction phase. Note that commissioning in the construction phase takes place on a parallel track with routine UM construction administration. The A/E is welcome at testing, but is not required to be present. No additional meetings during the construction phase are foreseen as a result of UM's building commissioning activity unless there are design-related issues.