

		<b>Page</b>
<b>SW.1</b>	<b>GENERAL</b>	<b>3</b>
.1	Introduction	
.2	Design Document Requirements	
.3	Construction Fencing	
.4	Utility Trench Cuts in Roadway	
.5	Underground or Above Grade Petroleum Storage Tanks	
.6	Oil Interceptors	
<b>SW.10</b>	<b>SITE PREPARATION</b>	<b>5</b>
.1	Mud and Dirt Control	
.2	Plant Protection	
.3	Earthwork	
.4	Site Clearing	
.5	Site Demolition	
.6	Soil Treatment	
<b>SW.20</b>	<b>SITE DEVELOPMENT</b>	<b>6</b>
.1	Planting	
.1	Plant Selection	
.2	Soil Preparation	
.3	Planting Procedures	
.4	Tree Planting	
.5	Warranty Period	
.2	Site Lighting	
.1	Light Fixtures and Design Requirements	
.2	Installation Requirements	
.3	Signage	
.4	Paving and Curbs	
.5	Sidewalks	
.1	Concrete Sidewalks	
.2	Brick Sidewalks	
.6	Exterior Steps	
.7	Bicycle Racks	
.8	Emergency Telephones	
.9	Benches	
.10	Trash and Ash Urn Receptacles	
.11	Recycling Receptacles	
.12	Bollards	
.1	Metal Bollard 1	
.2	Metal Bollard 2	
.3	Wood bollard	
.13	Dumpster Pads	

		<b>Page</b>
<b>SW.30</b>	<b>SITE DRAINAGE SYSTEMS</b>	<b>15</b>
.1	Building Drainage	
.1	.1 Disturbance of Land in Excess of 500 Square Feet	
.2	.2 Building and Roof Drainage	
.2	Storm Sewer Systems	
.1	.1 Piping and Installation	
.2	.2 Manholes	
.3	Inlets and Structures	
<b>SW.35</b>	<b>SITE PLUMBING SYSTEMS</b>	<b>16</b>
.1	Sewer Piping	
.2	Sewer Manholes	
.3	Exterior Domestic Water and Chilled Water Piping	
<b>SW.40</b>	<b>SITE ELECTRICAL SYSTEMS</b>	<b>18</b>

**FIGURES**

<b>SW-1</b>	<b>Cast Iron Light Fixture</b>
<b>SW-2</b>	<b>Parking Lot/Roadway Light Fixture</b>
<b>SW-3</b>	<b>Observatory Sensitive Zone</b>
<b>SW-4</b>	<b>Integral Concrete Sidewalk and Curb</b>
<b>SW-5</b>	<b>Brick Walk Paving</b>
<b>SW-6</b>	<b>Bicycle Racks</b>
<b>SW-7</b>	<b>Freestanding Emergency Telephone Standard</b>
<b>SW-8</b>	<b>Metal Bollard 1</b>
<b>SW-9</b>	<b>Wood Bollard</b>
<b>SW-10</b>	<b>Metal Bollard 2</b>
<b>SW-11</b>	<b>Traditional Railing/Guardrail</b>
<b>SW-12</b>	<b>Traditional Stair Railing with Pickets</b>
<b>SW-13</b>	<b>Construction Fencing</b>

**SW.1 GENERAL**

**SW.1.1 INTRODUCTION**

For requirements that effect site work and landscape design, see the following: GENERAL REQUIREMENTS, **GR.3.6**, **GR.3.7**, **GR.3.15**, **GR.3.16**, and **GR.5.5**.

Additional information, subject to confirmation from the Office of the Architect for the University, is available from University website:

<http://fac.mgmt.virginia.edu/uarch/>.

All projects involving site work and/or landscaping shall be reviewed by the University Landscape Architect, Facilities Management Landscape Superintendent, and Arboretum and Landscape Committee (A&L). Exterior signage shall be reviewed with the Architect for the University.

Project Manager shall coordinate review by the University Police Department for security and safety issues. Additional review may be determined for certain projects by the University Safety and Security Committee (lighting and shrubbery), and Architect for the University.

Within Facilities Management the Department of Utilities reviews site work documents related to any site utilities, the location of utilities in respect to landscaping, and established practices for installation.

**SW.1.2 DESIGN DOCUMENT REQUIREMENTS**

Site plans shall be drawn at a minimum scale of 1"=20'-0".

Building site contours shall be drawn at a maximum of 2'-0" intervals.

Profile views of all existing and new utilities shall be shown on the drawings.

In addition to applicable code requirements, minimum separation of 12" vertically and 5'-0" horizontally, wall-to-wall, shall be provided between any two utilities and utilities structures (except as required by the building code and Virginia Department of Health Regulations for water and sanitary lines and structures).

Also see SITE WORK, **SW.35.3**.

**SW.1.3**      **CONSTRUCTION FENCING**

As illustrated in **Fig. SW-13**, the University utilizes a standard construction fencing for aesthetic enclosure of construction sites. Having been designed to permit reclamation of the fencing materials for future construction utilization, the Project Manager and Architect/Engineer shall coordinate specific requirements for availability of reclaimed fencing materials as University furnished, contractor installed materials.

Specifications shall state if the contractor is to repaint the fence at the end of its use and deliver it to the University at a designated storage site, or if the contractor is to own and remove the fencing.

Specifications shall be explicit that the contractor is to promptly remove any graffiti and repaint the fencing if necessary to restore its finish. Specifications shall prohibit the contractor from painting wording or graphics on the fencing.

**SW.1.4**      **UTILITY TRENCH CUTS IN ROADWAY**

Utility trench cuts in roadways shall be covered with traffic rated steel plates at the close of construction activities for the day.

**SW.1.5**      **UNDERGROUND OR ABOVE GRADE PETROLEUM STORAGE TANKS**

No underground tanks are permitted without documented approval of the Chief Facilities Officer.

Drawings and specifications for any tank, above grade or underground, shall be reviewed and approved by the University Office of Environmental Health and Safety for compliance with both Federal Department of Environmental Quality (DEQ) and more restrictive Spill Prevention, Countermeasures and Control (SPCC) plan established by a negotiated agreement between the University and the Federal Environmental Protection Agency (EPA).

The Office of Environmental Health and Safety is required by DEQ to obtain building permits from the County of Albemarle or the City of Charlottesville for tanks installed on University property.

**SW.1.6**      **OIL INTERCEPTORS**

Parking garages and similarly large parking lots where wash-down maintenance will be maintained require oil interceptors designed to established standards for size and water quality control.

**SW.10 SITE PREPARATION**

**SW.10.1 MUD AND DIRT CONTROL**

For projects requiring removal of excavation material from the site, the specifications shall require the Contractor to provide a workable truck wheel wash facility complete with frost proof hydrant for a 3/4" hose. Details shall be shown on the contract documents. Specifications shall stipulate that the Contractor shall remove mud or dirt deposited on roadways within one hour of occurrence.

**SW.10.2 PLANT PROTECTION**

Trees, shrubs and planting beds within the Contract Limit Lines are to be protected with rigid fencing (wood or chain link) to prevent damage by cranes and all external construction activities. Selection of trees to be protected shall be coordinated through the Facilities Management Landscape Area Supervisor specifically applicable to the general academic University Grounds or the University of Virginia Health Systems (Hospital and Medical School).

Underground utilities shall be located so that construction will not damage or destroy the plants to remain. Utility trenching shall not be located closer than 1'-0" for each 1" in diameter, with a minimum of 5'-0" and a maximum of 20'-0" for trees to remain. Damaged trees and plants shall be restored to the satisfaction of the Facilities Management Landscape Area Supervisor.

The parking of vehicles and storage of any construction materials shall not occur under the drip lines of trees to be protected.

**SW.10.3 EARTHWORK**

All suitable topsoil shall be stockpiled in a location designated by the University for reuse in the project.

Clean fill, other than that used for backfilling, may be disposed of on the Grounds when approved by the Chief Facilities Officer. All other surplus material (excavated material and construction debris) shall be disposed of by the contractor off-site legally.

Stone over 1", debris, wood, metal etc. shall be removed from the top 6" layer of final backfilling for all areas to be seeded or planted.

Specifications shall state that where hazardous materials are encountered in sitework, work shall be stopped and the University Project Manager notified.

**SW.10.4     SITE CLEARING**

All logs, stumps, brush, wood and refuse shall be disposed of off the University Grounds in an approved landfill. On-site burning shall be prohibited.

**SW.10.5     SITE DEMOLITION**

When buildings are to be removed, procedural requirements and approval are required prior to demolition. The University Project Manager, through the Facilities Management Office of Real Estate and Space Management shall have obtained required State approval. The University shall perform an asbestos and lead paint survey and the information shall be included in the Contract Documents.

All tree removals require prior approval by the Arboretum and Landscaping Committee

**SW.10.6     SOIL TREATMENT**

A licensed professional shall chemically treat all new excavations for termite and insect infestation. Specify under slabs, along foundation walls, around all openings and protrusions in slabs on grade.

**SW.20     SITE DEVELOPMENT**

**SW.20.1.     PLANTING**

Planting shall be in compliance with an approved landscape plan. See **SW.1.1**.

The selection of plant material and the planting and maintenance of trees, shrubs and herbaceous plants must be consistent with the current AAN American Standard for Nursery Stock. In addition, planting details and specifications shall address the SITE WORK **SW.20.1.1** through **SW.20.1.5**.

**SW.20.1.1     Plant Selection**

Prior to planting, all plant material must be approved by the Facilities Management Landscape Area Supervisor as healthy specimens of the specified planting.

**SW.20.1.2.     Soil Preparation**

Soils in areas to be planted that are compacted above 85% maximum density shall be mechanically loosened to a minimum uniform depth of 24" below final grade.

Planting holes shall be excavated one day prior to planting and tested for soil porosity. Holes left open over night should be roped off for public safety.

**SW.20.1.2** (continued)

Soil conditions, which are inadequate for sustaining the growth and development of plants, must be reported to the Facilities Management Landscape Area Supervisor and/or the University Landscape Architect. Inadequate soil conditions must be addressed prior to planting.

**SW.20.1.3 Planting Procedures**

The width of each planting hole should be three times the size of the rootball. The depth of the hole shall be 2'' less than the distance from the bottom of the rootball to the root collar.

The bottom and sides of the each hole should be scarified to encourage root development.

Upon planting, all plants must be inspected to ensure that the root collar is exposed. Any dirt or mulch covering the root collar should be removed at this time. Inspection of plants will be made by the Facilities Management Landscape Area Supervisor at completion of planting.

**SW.20.1.4. Tree Planting**

To preserve the assets of trees and manage the assets of underground utilities, new trees shall not be planted:

- Within ten feet of any existing underground utility lines with joints
- Within five feet of any existing underground utility lines without joints (joints may occur when they are at least ten feet from the tree center in both directions)

Where new storm and sanitary sewer piping alignment cannot be avoided within ten feet of an existing or new tree, use HDPE butt-welded pressure piping.

**SW.20.1.5. Warranty Period**

The contractor shall maintain all plantings for the duration of the warranty covering plant material. The contractor's responsibilities also include the protection of plantings as necessary during the warranty period, including pest control, pruning and watering.

**SW.20.2**     **SITE LIGHTING**

**SW.20.2.1.**   **Light Fixtures and Design Requirements**

All exterior lighting fixtures shall conform to University approved types.

All fixtures shall be cut-off type, designed to meet Illumination Engineering Society (IES) standards for cut-off optics, unless otherwise directed. Point-by-point footcandle calculations of the site lighting and voltage drop calculations for site lighting circuits shall be provided with the contract document submission.

Photometric data shall be provided that shows the percentage of up light. Foot-candle calculations shall include the IES design level/classifications used.

All exterior steps, roadways and main pathways shall be lighted. In addition to exterior exit way requirement of 1.0 horizontal foot-candle (fc) uniform lighting level, light levels for general parking and pedestrian areas shall be 0.2 horizontal footcandle (fc) on the surface. Lighted pathways shall have a minimum level of 0.125 fc on the surface.

In addition to required exit ways described above, all steps shall have a continuous 0.2 fc path from the top to the bottom. Average-to-minimum uniformity shall not exceed 4:1.

All new or replacement site lighting in proximity to the University's astronomy observation facilities shall be reviewed by designated personnel of Facilities Management and the Department of Astronomy. See **Fig. SW-3** Observatory-Sensitive Zone.

All exterior lighting fixtures are to use metal halide HID lamps only. High and low pressure sodium, and mercury vapor lamped fixtures are to be used by exception and only with prior written approval by the Chief Facilities Officer.

Light fixtures (**Fig. SW-1**) for use in the Central Grounds, and where established in design criteria by the University Landscape Architect, are to be cast iron fixtures and poles. The fixture and pole color is to be dark green matching Sherwin Williams #94341 Rookwood Shutter Green. Actual matching color to be approved by Facilities Management prior to ordering fixtures. Acceptable manufacturers and product descriptions are:

**SW.20.2.1** (continued)

Fixtures:

- Spring City Edgewater EFED-###-MH-UVA with frosted panels
- Holophane UVA ### MH00x63RG Antique Octagon
- King K56-S-R-EAO-V-###-MH-277-UVA Cutoff

(Lamp wattages and IES distribution type to be determined by layout and design.)

Poles:

- Spring City 12 ESCT/7 Series
- Holophane “West Point”, 12’
- King Luminaire 20” Octagonal, 12’

When approved by the Director of Facilities Design and Construction, aluminum poles of similar design may be used in locations where it can be demonstrated that vehicular impact is not probable.

“Shoe Box” type fixtures (**Fig. SW-2**) for parking lots and roadways are generally applicable to other areas of the University, subject to verification by the Project Manager and/or approval of the Landscape Architect for the University

Lens shall be impact-resistant tempered glass with a minimum 0.125” thickness.

**SW.20.2.2. Installation Requirements**

All outside steps shall be lighted. Step light fixtures built into concrete or masonry shall be constructed of corrosion resistant material, and listed for wet location installation.

Site lighting shall be photocell controlled in logical groups. Individual unit photocell controls are to be used only where grouping of lights is not practical.

Site lighting fixtures are to be powered with underground copper wiring in 1-1/4” PVC conduit. Burial depth shall be 18” minimum. Circuit wire sizes shall be such that site lighting voltage drops do not exceed the following:

- 2% for new site lighting circuits
- 3% total for existing circuits to which lights are added

All pole and post-mounted lighting fixtures shall be numbered on the construction documents and on the erected fixture. Obtain fixture ID number and label size/style from Facilities Management Department of Utilities.

**SW.20.2.2** (continued)

“As-built” or record documents plans for outdoor lighting shall provide a Utilities Lighting Chart with fields designating the following:

- Light fixture ID number (from Utilities)
- Lamp type (adequate for ordering lamps)
- Fixture Manufacturer and catalog/model number
- Electrical feed (building name and number, and panel designation)
- Watts (lamp and fixture wattage)
- Voltage
- Pole height
- Pole Manufacturer and catalog/model number

**SW.20.3**      **SIGNAGE**

New buildings and major building renovations shall provide permanent exterior signage in compliance with the established University Exterior Signage Standard Manual. This manual may be viewed and printed from the Architect for the University website: <http://fac.mgmt.virginia.edu/uarch>.

The Architect/Engineer is to develop a conceptual signage plan consistent with the exterior signage standard manual for approval of the University Landscape Architect.

Construction signs, when approved by the Project Manager, shall be limited to a maximum 4'-0" x 6'-0" sign erected at the contractor's expense, with lettering in compliance with the University Exterior Signage Standard Manual. See Facilities Management Division 1 Specifications Guidelines, 01580, available at website <http://www.fm.virginia.edu/fpc/Links.htm>.

**SW.20.4**      **PAVING AND CURBS**

Minimum slope for all paved surfaces shall be 1%. Maximum slopes for streets, service drives and parking lots shall be 8%.

Curbs shall comply with Standard 6" Curb, CG-2, Virginia Department of Transportation (VDOT). Use curb and gutter complying with VDOT CG-6 Standard 6" Curb and Gutter to match an existing condition or within City of Charlottesville streets.

Painted striped crosswalks shall be provided at all road intersections.

**SW.20.4** (continued)

Unless modified by documented site conditions and geotechnical recommendations, asphalt paving is to be:

<u>Course/VDOT Spec.</u>	<u>Roads</u>	<u>Parking</u>	<u>Pedestrian Walks</u>
Surface/SM-2A or 9 · 5A	2"	1½"	2"
Binder/BM-2 or 25 · 0	3"	2"	not applicable
Sub-base/21A	10"	6"	6"
Sub-grade Compaction*	100	95	95

\*Maximum dry density (ASTM D698, Method D)

New or improved roads of sufficient width shall include bicycle lanes on both sides of the street. Demarcation of the bicycle lanes through striping and signage shall be consistent with established Virginia Department of Transportation standards.

**SW.20.5**      **SIDEWALKS**

The Office of the Architect for the University shall establish use of concrete or brick over concrete sidewalks as part of the project design criteria. If not so determined, the choice shall be in consultation with the University Landscape Architect. The minimum sidewalk width shall be 6'-0". Where used for truck access minimum width shall be 10'-0".

Except where restricted by urban site needs, sidewalks will be separated from curbs by planting areas for pedestrian safety. Where separation is not feasible, comply with **Figures SW-4** and **SW-5**

**SW.20.5.1. Concrete Sidewalks**

Sidewalks shall be 5" minimum thickness, 3000 psi air-entrained concrete, reinforced with welded wire fabric, 6x6 W2.9x2.9, over 6" compacted aggregate stone base. Joints shall be sawed or tooled at a maximum of 6'-0" o.c. Walks to be **float** finished with 2" troweled edging. See **Figure SW-4**. Where sidewalks abut exiting structures, expansion joints shall be provided.

See BUILDING ENVELOPE, **BE.2.2** Fiber Reinforced Concrete.

New construction projects shall use an approved concrete if appropriate for color matching existing concrete. Questions about color should be referred to the Office of the Architect for the University, unless the use of color is established as part of the design criteria determined by the Architect for the University.

**SW.20.5.2. Brick Sidewalks**

Brick sidewalks shall be constructed on concrete per **Figure SW-5**. Concrete, other than finish, shall comply with **SW.20.5.1**. Brick patterns, more typically herringbone, shall be determined in University design criteria. Where not predetermined, questions may be directed to the Office of the Architect for the University. For guidelines regarding the selection of brick patterns for walks and paving areas, see the 1998 Landscape Master Plan.

**SW.20.6 EXTERIOR STEPS**

All exterior stairs shall have handrails on both sides regardless of the number of risers. Where handrails would exceed 5'-0" center-to-center, an intermediate handrail is required. For monumental stairs, whether required fire egress exit ways or not, handrails shall be located along the most direct path subject to approval of the University Facilities Management Review Team

Consideration shall be given to professionally recognized proportioning of tread and riser dimensions, as well as to maximum riser and minimum tread requirements.

Positive drainage (1.5 to 2.0 percent slope) shall be achieved to prevent accumulation of water.

Where post-mounted hand railing supports occur, careful consideration with drawing details shall be given to the embedment of posts to minimize deterioration of the posts and/or the concrete slab or system into which it penetrates. Whenever this embedment occurs in a pre-cast concrete system specifications shall be explicit regarding galvanization of the embedded sleeve and any anchors (as a unit after any welding) prior to placed in the form work.

**SW.20.7 BICYCLE RACKS**

The design of all University facilities, or major site renovations, shall include adequate bicycle storage with permanently installed racks (see **Fig. SW-6**). Questions about the location and design of bicycle storage may be referred to the Office of the Architect for the University.

**SW.20.8 EMERGENCY TELEPHONES**

New buildings, new parking lots and major site work projects shall provide the location(s) for emergency telephone(s) that are handicapped accessible, hands free operated, and located on or near lighted walkways providing visibility and comfort in their use. Project Manager shall determine approved locations and type(s) of installation in consultation with the University Safety and Security Committee.

(SW.20.8 continued)

Two types of emergency telephone styles are applicable. In all installations the telephone shall be University provided and installed on or in the assembly.

The type applicable to most locations is a Facilities Management fabricated and installed assembly as illustrated in **Fig. SW-7** at the end of this category. Specifications shall state the requirements of the contractor. In some cases Facilities Management will be fully responsible for installation including necessary wiring and telephone cabling to a University point of connection. Facilities Management Department of Utilities will procure and install the **Fig. SW-7** fabricated assembly including the telephone and light fixture.

For areas determined by the University Safety and Security Committee and large parking lots (more than 49 cars), the use of pre-manufactured emergency telephone assembly is appropriate. For each additional 99 parking spaces, an additional emergency telephone is required. Where approved by the University Landscape Architect this “tower” type assembly may be taller than 8-feet for large parking lots for visibility over vans and similar taller vehicles.

Where the “tower” type emergency telephone is applicable, the design shall be similar to Gai-tronics Corporation Model 234 Stanchion and/or model ETP-MT/R by Talk-A-Phone Co., and shall be ADA compliant. Color(s) shall be approved by the University Landscape Architect.

Power for emergency telephones is to be an emergency circuit where available.

**SW.20.9**      **BENCHES**

Benches approved for use at the University are:

- Kingsley Bate “Hyde Park” #HP60
- Country Casual “Mendip” #4603
- Gardenside “Parkside Bench” #2606

**SW.20.10**      **TRASH RECEPTACLES**

Trash and ash urn receptacles will be University furnished and installed. For the Architect/Engineer’s consideration in the design of new or renovated sites, the receptacles will be Victor Stanley Bethesda Ironsites Series Model S-42 (trash) and Model S-20 (stand-alone ash urn) or an equivalent. Trash and ash urn receptacles shall be painted black. Ash urns will not be integral with trash receptacles.

**SW.20.11 RECYCLING RECEPTACLES**

Recycling receptacles will be University furnished and installed. Project Manager shall determine in consultation with University Landscape Architect and the Office of Facilities Management Recoverable and Disposable Resources where and what kind of recycling receptacles are deemed applicable. For the Architect/Engineer's consideration in the design of new or renovated sites, the Project Manager will provide information on the selected receptacles.

**SW.20.12 BOLLARDS**

Three types of bollards are approved for use at the University. Choice of the appropriate bollard for a project site shall be coordinated through the Project Manager in consultation with the Office of the Architect for the University. General guidelines include:

**SW.20.12.1 Metal Bollard 1**

The Newburyport bollard shall be utilized on all sites within the Historic Grounds, except in alleys. It may also be used throughout the Grounds in sites where obstructing vehicular traffic on wide areas of paving is the primary purpose. Where bollards are not to be removable for University vehicular or emergency vehicle access, cast iron bollard will be used. For removable bollards a cast aluminum bollard will be used. The University Landscape Architect shall approve removable bollards of a similar style on a case-by-case basis, unless the University adopts a new standard. **Fig. SW-8** illustrates a removable bollard.

These bollards should be primed and painted to match the color Sherwin Williams #94341 Rookwood Shutter Green.

When incorporated as part of a project, the drawings and specifications shall state that these bollards are owner furnished and contractor installed. Site preparation and finishing shall be by the contractor.

**SW.20.12.2 Metal Bollard 2**

The locking metal bollard, **Fig. SW-10**, shall be used throughout the University, including the Historic Grounds, where restricting vehicular access to sidewalks. These bollards should be primed and painted to match the color Sherwin Williams #94341 Rookwood Shutter Green.

**SW.20.12.3. Wood Bollard**

The wood bollard, **Fig. SW-9** shall be used in the alleys of the Historic Grounds.

**SW.20.13 DUMPSTER PADS**

Reinforced concrete pads, sized to include the front wheels of the truck, are to be constructed for all dumpster pad sites.

**SW.30 SITE DRAINAGE SYSTEMS**

**SW.30.1 BUILDING DRAINAGE**

**SW.30.1.1 Disturbance of Land in Excess of 500 Square Feet**

Any project that disturbs the land in excess of 500 square feet, whether increasing or decreasing impermeable areas, is required to address storm water management. This more restrictive threshold is related to University property within the various watersheds of Moore's Creek and Meadow Creek. Facilities Management Directive 564 when published will address this in greater detail.

**SW.30.1.2 Building and Roof Drainage**

All building roof drainage, including external downspouts, areaway drains, and foundation drains shall be connected to a storm drainage system. Connections shall preferably be made to a manhole or a drop inlet directly. Where the preferred connection is not feasible or economically justified, the connection shall be to the storm sewer with a "Y" a maximum of 50-feet away from the building. Provide cleanout at roof drain and at a change in direction of any drainage piping. Where a storm system is not available, a new system shall be provided.

Exceptions to the above shall be coordinated with the Facilities Management Department of Utilities, and if necessary the Chief Facilities Officer, through the Project Manager.

**SW.30.2 STORM SEWER SYSTEMS**

**SW.30.2.1 Piping and Installation**

Perforated polyvinyl chloride pipe surrounded by stone wrapped in geotextile fabric shall be used for all foundation and retaining wall drainage systems.

Class III reinforced concrete pipe, minimum 15" size, shall be used for all infrastructure systems. HDPE pressure or HDPE double wall corrugated pipe may be used for mains under 24". See **SW.20.1.4** for piping within ten feet of new or existing trees.

Polyvinyl chloride (PVC) Schedule 40, solvent welded piping is permitted:

- For yard drains, 8" minimum through 12" maximum
- For roof, area drains, and foundation drains, 4" to 6" as required for single drain lateral; and 8" to 12" maximum for multiple drain collector lateral.

**SW.30.2.1** (continued)

Minimum cover on pipe shall be 24". Slope of piping shall result in self-cleaning velocity (2-fps minimum) for the diameter of piping used. Storm sewer piping on a 20% or greater slope shall be secured with concrete anchors.

**SW.30.2.2 Manholes**

Manholes are required:

- At change of direction for main storm sewer piping
- At intervals not exceeding 400-feet in a straight run

By exception drop inlets having a minimum inside diameter of 48" may be used in lieu of above manhole requirements.

Manholes shall have a minimum 48" inside diameter with shaped flow troughs at bottom. Manhole covers shall be heavy-duty traffic rated, providing a minimum 24" clear opening for access. Patch precast manhole joints with non-shrink grout inside and outside. Apply bitumastic/coal tar waterproof coating from outside

Pipe connections to new manholes and inlets shall be with flexible rubber boots. At existing structure install sleeve prior to connection using flexible rubber boot.

**SW.30.2.3 INLETS AND STRUCTURES**

Curb inlets shall be used for all surface drainage for roadways and parking lots.

All grates for yard inlets shall meet handicapped accessibility standards, unless otherwise authorized by Facilities Management in writing. Grate inlets shall be used for all lawn areas.

Inlet grates shall be bicycle-safe and oriented with the long axis of the openings perpendicular to the direction of bicycle traffic.

The tops of all structures shall be flush with the pavement surface.

Inlet structure grating shall be heavy-duty traffic rated, providing a minimum 24" clear opening for access.

Minimum inside size for drop inlets shall be 24" with up to 18" pipe diameter and 4-feet maximum depth. Minimum inside size of drop inlet shall be 48" for pipe size larger than 18" pipe diameter or greater than 4-feet depth.

Area drains and yard drains installed with minimum pipe size and cover shall use shallow cast iron fittings or heavy-duty HS 20.traffic rated PVC/HDPE fittings.

**SW.30.2.3** (continued)

Virginia Department of Transportation (VDOT) standard structures are to be used except where not practical. The intent of this requirement includes minimal dimensions as accessibility for maintenance. In historic precincts or locations, smaller dimensioned structures will require approval on a case-by-case basis by Facilities Management.

**SW.35 SITE PLUMBING SYSTEMS**

**SW.35.1 SEWER PIPING**

Piping diameter size shall be a minimum of 4" for laterals and 8" for mains. Provide a 3'-0" minimum ground cover.

Sewer piping shall be located as approved by the Facilities Management Department of Utilities and other applicable authorities when located in streets, right-of-ways or easements not on University property. Sewer piping shall not be located within areas of flooding or drainage channels. Also see SITE WORK SW.1.1.

Every effort shall be made for domestic waterlines to cross above sanitary sewer in accordance with applicable code requirements. If site conditions do not allow this to happen, domestic water lines may cross under sanitary sewers constructed with joint-less or welded joint pipe in accordance with code, supported for twenty feet on either side and tested for leaks at 50-psi internal pressure.

Pipe shall be cast iron (CI), ductile iron (DI), H2, HDPE pressure pipe or solvent weld jointed PVC, Schedule 40.

Minimum slope of piping shall result in self-cleaning velocity (2 fps minimum) for the diameter of piping used. Sewer piping on a 20% slope or greater shall be secured with concrete anchors.

**SW.35.2 SEWER MANHOLES**

Provide a sanitary sewer manhole adjacent to all buildings to which laterals (maximum 20-foot length) from building are preferably connected directly. Provide a cleanout at the building for a lateral longer than 20-feet, not to exceed 50-foot maximum. Manholes shall occur at a change in direction and at a maximum of 200 feet in a straight run.

Manholes shall have a minimum 48" inside diameter with flow troughs at bottom. Manhole frame and cover shall be heavy-duty traffic rated, providing a minimum 24" clear opening for access. Manholes with an invert change of 18" or two times the inlet pipe inside diameter, whichever is greater, shall be provided with drop piping outside the manhole.

**SW.35.2** (continued)

Pipe connections to manholes shall be made with flexible rubber boots. At existing manhole install sleeve for connection. Use flexible rings, mechanical clamps, grout and waterstop for a leak-proof connection.

Precast manhole joints (inside and outside) shall be filled with non-shrink grout and finished smooth. Manholes shall be coated from inside with vapor/moisture penetration preventing epoxy coating, and from the outside with bitumastic/coal tar based waterproof coating.

**SW.35.3**      **EXTERIOR DOMESTIC WATER AND CHILLED WATER PIPING**

Piping mains shall be a minimum of 6" in diameter. Domestic water piping shall have a minimum of 3'-0" ground cover. Chilled water piping shall have a minimum of 4'-0" ground cover.

Underground water distribution pipe shall be asphalt coated, cement lined ductile iron, Class 52 or higher, with flexible restrained joints.

Water lines shall be wet tapped with resilient seat gate valve at connection point to main.

The entry point into buildings shall be with factory flanged ductile iron, Class 53 or higher.

Water lines 2 ½" and smaller shall be copper type "K".

Water lines shall be tested to 200 psig.

Domestic water lines shall be bacteria tested.

**SW.40**      **SITE ELECTRICAL SYSTEMS**

See SITE WORK, **SW.20.2 SITE LIGHTING** for electrical work associated with site lighting.

See BUILDING SERVICES, **BSRV.50.1 SERVICE AND DISTRIBUTION** for primary electrical requirements.