

Division 32 – Exterior Improvements

32.1. Asphalt Paving

- a. Asphalt paving shall conform to the latest version of the Virginia Department of Transportation Road and Bridge Specifications, Section 315 as well as all other sections reference therein.
- b. Construction of all roads, drives and parking areas, including sub-grade preparation and all related work, must be constructed by a contractor fully qualified and equipped to perform the work.
- c. The construction of all pavements within public rights-of-way shall be in accordance with the rules, regulations and requirements of the public agency having control and ownership of such rights-of-way.
- d. Bituminous paving for pedestrian walkways shall not be used.
- e. Protect the surface course from vehicular traffic and parking until the pavement has cured.
- f. Repair depressions by cutting out the surfacing with vertical cuts to a minimum depth of 1", filling and rolling. Feathered patches are prohibited.
- g. Minimum slope for all paved surfaces shall be designed to avoid ponding of water on the roads.
- h. Curbs shall comply with 6" standard CG-2 of Virginia Department of Transportation (VDOT). Curb and gutter complying with VDOT CG-6 Standard six-inch (6") Curb and Gutter shall be used to match an existing condition or within City of Norfolk streets. Painted striped crosswalks shall be provided at all road intersections.
- i. Unless modified by documented site conditions and geotechnical recommendations, asphalt paving shall be:

Course/VDOT Specification	Roads	Parking	Pedestrian walks (not allowed)
Surface/9 -52A"	2"	1 ½ "	2"
Binder/BM 25.0	3"	2"	Not applicable
Sub-base/#21A	10"	6"	6"
Geotextile Fabric	Yes	Yes	Yes
Sub-grade compaction	*100%	95%	95%

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

- j. Pavement thickness at utility trenches shall be a minimum of one-and-one-half times (1.5x) existing pavement thickness or, as noted above, whichever is higher. Backfill in utility trenches under pavements shall be VDOT #21A above top of bedding to underside of pavement

32.2. Imprinted Asphalt

- a. Imprinted or stamped asphalt is not used on campus unless used for crosswalks in the City of Norfolk streets as directed by them.

32.3. Concrete Paving

- a. Refer to Chapter Two Campus Design for sidewalk widths. Sidewalks surface shall have a light broom finish.
- b. Use concrete for walkways, drives, dumpster pads, compactor pads, loading dock ramps, aprons and bus stop shelter pads.
- c. When repairing cracked or damaged panels, replace entire panel.

- d. Walks adjacent to lawns are to be flush. Walks adjacent to planting beds shall have rolled curb.
- e. Radiused intersections shall be poured monolithic and should extend to the outer limits of the curves. Segmented curves are not permitted.
- f. Scoring type and locations for sidewalks shall be shown on the drawings. All scoring shall be tooled. Saw cut joints shall only be permitted if routed with round over bit.
- g. Cross slope of all walks shall meet the ADA Standards for Accessible Design.
- h. Walks abutting buildings shall bear on the foundation or be dowelled.
- i. The full width of sidewalks adjacent to curbs shall be ¼" above the curb.
- j. Dropped curbs for drive and handicapped access shall be formed for all new work.
- k. Remove existing curb back to nearest existing joint when new curbs extend into existing curb lines.
- l. Where sidewalks abut existing structures, expansion joints shall be provided.
- m. Sidewalks shall be repaired in complete panels as originally scored. Cutting and replacement shall be at existing construction joints as agreed to with ODU Project Manager.
- n. All sidewalks greater than 5' wide will be constructed for vehicular traffic.
- o. The A/E shall verify all scoring patterns with the Project Manager. Scoring pattern design shall take into consideration existing scoring patterns of adjacent walks.
- p. Unless modified by documented site conditions and geotechnical recommendations, concrete paving shall be:

Course/VDOT Specification	Vehicular	Pedestrian
Surface/ Class A3 (3000 psi)	6"	4"
Reinforcing	6x6 *w1.4)	none
Sub-base/#21A	6"	6"
Sub-grade compaction*	95%	95%

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

- 32.4. Decorative Concrete Paving
 - a. Decorative concrete such as surface-imprinted, stamped, stencil-patterned, or stained finish concrete paving are not permitted on campus.
- 32.5. Unit Paving
 - a. Unit paving, if any, shall be limited due to the impact to stormwater requirements.
- 32.6. Permeable Unit Paving
 - a. Interlocking pavers Nansemond blend #239, herringbone pattern.
 - b. Pavers in pervious applications shall not be sealed.
 - c. Base for pervious pavers shall consist of:
 - Open-graded bedding course: 2" of #8 washed aggregate (was shown in COE, but not on BDC)
 - Open-graded base course: 4" #57 washed aggregate
 - Open-graded subbase on soil subgrade: 10" minimum #2 or 3 washed aggregate with 4" perforated underdrains at 10' on center.
 - Non-woven geotextile fabric on non-compacted subgrade
 - Provide drawings detailing the permeable pavement installation as required for stormwater and MS4 permit.

- d. Provide #9 washed aggregate for joint infill for permeable joints in paver system.
 - e. Paving system shall be design to allow university vehicles to plow the surface in the event of a snow emergency.
 - f. Provide a flexible, multi-height, durable mill finish aluminum edge restraint and component system with an L-shaped profile with a slotted wall to allow water runoff. Sections shall be a minimum of 8' in length
- 32.7. Parking Bumpers
- a. Where required provide precast concrete parking bumpers, each end to be pinned with 5/8" minimum steel pins.
- 32.8. *Surface-Applied Delectable Warning System.*
- a. *Reinforced Thermoset Plastic*
 - b. *Thin surface profile with perimeter beveled edge.*
 - c. *Solid one Piece construction with integral color throughout*
 - d. *Adhesive scores on the back of each panel,*
 - e. *Powder coated mechanical concrete anchors*
 - f. *Color FED 20109 (sometimes referred to as Colonial Red or Brick Red)*
 - g. Manufacturers
 - i. ADA Solutions
 - ii. Alert Tile
- 32.9. Synthetic Grass Surfacing *Synthetic grass surfacing, or artificial turf, intended for use in sports (RESERVED)*
- 32.10. Playground Protective Surfacing *Impact-attenuating, protective surfacing for use under public playground equipment. (RESERVED)*
- 32.11. Chain-link Fences and Gates
- a. Follow the guidelines of the CLFMI Manual (Chain Link Fence Manufacturer's Manual) when developing specifications. Any chain link fence used on campus shall be commercial grade vinyl coated chain link fencing, with a 9 gauge core wire and a class 2b thermally fused and bonded black vinyl coating on galvanized pipe. All aspects of the fence system shall be vinyl coated. Provide gates as necessary.
 - b. All chain link fencing, including gates, shall have either privacy slats or fence fabric.
 - i. Privacy Slats: High Density Polyethylene (HDPE) slats with ultra-violet inhibitors, self-locking and provide a minimum of 75% coverage.
 - ii. Slat Color: Prior to bid, the A/E shall select three manufacturers of slats and provide samples of the manufacturer's standard colors for selection by the University Architect. If the standard color is not acceptable, the University Architect may require a custom color. The intent is to find a dark blue similar to the ODU blue (PMS 540).
 - iii. Fence screen Fabric: Vinyl coated poly made from PVC Polyester, UV stabilized. Provide a black binding on all edges with grommets at no greater than 24" on center. Fabric shall span full height of fence. Color to match adjacent fence fabric if one exists, otherwise fabric to ODU Blue. Provide fabric that has 80% visual blockage.
- 32.12. Decorative Metal Fences and Gates
- a. Refer to **APPENDIX AH – ORNAMENTAL WALLS & FENCES** for information associated with campus brick walls and/or brick and ornamental fence walls.
- 32.13. Segmental Retaining Walls

- a. Dry-laid concrete masonry unit retaining walls are not permitted on campus.

32.14. Planting Irrigation

- a. It is the intent of the University to restrict the use of permanent irrigations systems to managed lawns. These are limited in use on campus and shall only be included in designs with prior approval of the Ground Manager.
- b. Temporary irrigation for plant establishment is desired and shall be included in each project as appropriate. Temporary irrigation will be abandoned after the establishment period which shall be defined in the specifications by the A/E.
- c. Refer to **APPENDIX N – IRRIGATION SPECIFICATIONS**

32.15. Topsoil

- a. Soils in areas to be planted that are compacted above 85% maximum density shall be mechanically loosened to a minimum uniform depth of twenty-four inches (24") below final grade. Inadequate soil conditions must be addressed prior to planting.
- b. Finish Grading: Contractor shall grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

32.16. Turf and Grasses

- a. Turf (sod) shall be certified turfgrass sod is grown from certified seed inspected and certified by the Virginia Crop Improvement Association (VCIA) and bear an official "Certified Turf" label on the bill of lading.
- b. Turf shall be nursery-grown of dense growth, with a strong, fibrous root system, and shall be composed of hybrid Cynodon dactylon, Tifway419, or approved equal, and free of pernicious weeds. Standard sections of turf to be installed shall be of enough strength to support their own weight and to retain their size and shape when held within its upper ten (10) percent and suspended vertically.
- c. Turf shall be machine cut at a uniform thickness of 3/4 inch (plus or minus 1/4 inch) at the time of cutting. This thickness shall exclude shoot growth and thatch. Turf pieces shall be cut the supplier's standard width and length with a 5% deviation acceptable. Torn or uneven pads will not be accepted.
- d. Turf shall be harvested, delivered and installed within a period of 36 hours. Do not lay turf in excessively wet or dry weather.
- e. For turf to be laid on newly graded subgrades:
 - i. Apply fertilizer directly to subgrade prior to loosening the subgrade soil. Loosen subgrade to a minimum depth of 6 inches. Remove stones larger than 1 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - ii. Contractor shall spread planting soil to a depth of 4 inches but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- f. For turf to be laid on unchanged (unaltered or undisturbed by excavating, grading, or surface-soil stripping operations) Subgrades:
 - i. Contractor shall remove existing grass, vegetation, and turf, without mixing same into surface soil.

- ii. Contractor shall loosen surface soil to a depth of at least 6 inches, remove stones larger than 1 inch in any dimension, sticks, roots, trash and other extraneous matter. Apply soil amendments and fertilizers (applied directly to soil before loosening) according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till the soil to a homogeneous mixture of fine texture.
- g. Contractor shall legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- h. Contractor shall saturate turf with fine water spray within two hours of planting.
- i. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below turf.

32.17. Turf Maintenance

- a. Contractor shall maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare, rutted, damaged, eroded or improperly graded areas and mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- b. Contractor shall mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain height appropriate for species without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings.
- c. Satisfactory Turf installations shall meet the following criteria as determined by Design
- d. Professional:
 - i. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

32.18. Plants

- a. The A/E shall provide detailed specifications covering the planting procedures for all projects no matter the size or limits of the plant materials.
- b. The selection of plant material and the planting and maintenance of trees, shrubs and herbaceous plants must be consistent with the current American Standard for Nursery Stock (AAN).
- c. Plants shall be typical of their species and variety, have normal growth habits, well developed branches, densely foliated and vigorous fibrous root systems.
- d. Plants shall be free from defects, injuries, plant diseases and insect infestations.
- e. All plants of each particular variety shall be reasonably uniform in size and configuration.
- f. Plants shall be freshly dug and nursery grown; shall have been transplanted and root pruned at least once in the past two years; shall have been grown under similar climatic conditions to those of the project locality.
- g. All trees shall be balled and burlapped while shrubs may be container grown or balled and burlapped. Burlap shall be unwrapped and laid back prior to backfilling the soil; wire cage shall be removed.
- h. All new trees shall have straight trunks with full symmetrical crowns.
- i. Staking and Guying
 - i. Staking or guying plants shall be dependent upon the plant's type, size, root system, and location. Stakes and guy wires shall be used only when necessary to protect, support, or anchor the transplant. Any device that would wound the trunk of the plant shall not be used. Staking and

guying shall be completed immediately after planting. Plants shall stand plumb after staking in accordance with the landscape plan.

- ii. Tree ties shall be used to support and protect tree trunks or limbs which are guyed with wire. Tree ties should contact the trunk or limb with a broad, smooth surface and be elastic enough to minimize abrasion.
- j. Form a watering basin of mulch around trunk holding at least 5 gallons of water for trees and 2½ gallons for shrubs.
- k. Prune dead or broken branches with sharp instruments.
- l. Root Damage during construction: If roots are bigger than your wrist, contact the ODU Grounds Manager to determine how to cut/proceed.

32.19. Warranty

- a. New trees, shrubs, perennials and ground covers shall be guaranteed for one year from the date of issuance of Substantial Completion. The contractor's responsibilities include the protection of plantings, pest control, pruning, watering and plant material during warranty period. All plant material soil conditions must be inspected by ODU Grounds Manager. Warranty shall cover death and improper planting, unsatisfactory growth, neglect or damage by others excluded. The Contractor shall replace unsatisfactory plant materials with healthy, vigorous materials, planted only during the next specified planting season. Borderline plants shall be replaced.
- b. The one year warranty will restart for all replaced plant materials, beginning the day of replanting.

32.20. Inspection for Acceptance:

- a. Inspection of planting to determine completion of Contract work shall be made to confirm that all landscaping conforms to quantities and sizes listed in the planting schedule.
- b. The Contractor shall give at least 7 days notice requesting the inspection to the A/E and the ODU Project Manager who will coordinate inspection by the ODU Grounds Manager in conjunction with the A/E. The A/E will prepare a punch list and work found not in accordance with plans and specifications shall be subject to re-inspection.

32.21. Planting Procedures

- a. The width of each planting hole should be three times (3x) the size of the root ball. The depth of the hole shall be two inches (2") less than the distance from the bottom of the root ball 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.
- b. Specific plants that require seasonal planting will be indicated on the planting plan.
- c. Actual plant installation shall occur only during periods when weather and soil conditions are favorable. As plants shall not be installed in unfavorable seasons, the Contractor shall indicate in the construction schedule when plant installation shall occur and this shall be approved by the ODU Grounds Manager when the initial schedule is published. Deviation from the approved planting schedule shall only occur if approved by the ODU Grounds Manager. If the building opening does not coincide with the appropriate planting season, this shall be brought to the attention of the ODU PM so that University Leadership can be made aware of the conditions for building opening and other arrangements made.
- d. The A/E and ODU Grounds Manager shall be notified at least 48 hours before planting begins.
- e. The Contractor shall stake the location of planting sites and the A/E will approve the location prior to beginning any planting.

- f. Plant Placement - Each plant shall be placed in a straight, upright, and centered position in its planting hole or as specified. Balled and burlapped and container-grown plants shall be handled only by their roots, balls and containers. Plants may settle after transplanting and water will collect around the trunks. In all but very well-drained soils, plants will not establish and thrive if the tops of their root balls are below the level of the surrounding soil. Some plants should be planted slightly higher than they were originally growing to allow for this settling of the backfill or soil conditions. Consult with the A/E for recommendations. In no case, should the top portion of the root ball be exposed above surrounding soil line. Any special directions for planting in poorly drained soils or other specific plant needs will be indicated on the planting plan. Balled-and-Burlapped plants shall have all synthetic materials removed from the root ball, trunk or crown as they will not decompose and will cause damage to the plant. All synthetic straps, bands and twine shall be removed from one half (1/2) to one third (1/3) of the top of the root ball and all ropes or wires shall be removed from the plant's trunk or crown. Burlap shall be left intact around the edge of the root ball, but shall not be left on the upper portion of the ball or left exposed above the soil surface.
- g. Plant Selection: The Contractor shall use only plants that are nursery grown, unless otherwise specified and approved by the ODU Grounds Manager. All plants shall be in accordance with American Standard for Nursery Stock, latest edition. All plants shall be typical of their species or cultivar and have a normal growth habit. They shall be healthy, vigorous, well-branched, and densely foliated when in leaf. Plants shall be free of disease, nematode, and insect pests, including insect eggs and larvae. They shall have a healthy, well-developed root system.
- h. Regional Materials: Refer to [APPENDIX W – PLANT PALLET](#) for the list of acceptable materials. Plants should be sources within 100 miles of the Project site. If the Contractor believes that specified plant material cannot be sourced within 100 miles, the Contractor must inform the A/E and the ODU Project Manager in writing and wait for direction on how to proceed.
- i. Plant Substitutions: All substitutions in genus, species, cultivar or size made by the Contractor must be approved by the A/E and ODU Grounds Manager. Plants larger than specified may be substituted on approval of the A/E, but such plants shall not increase the contract price. If the use of larger plants is approved, the spread of roots or ball of earth shall be increased in proportion to the size of the plant. If larger sizes are used, any future replacements shall match the size installed.

32.22. Mulching

- a. Due to ODU's location and ongoing Stormwater management, it is imperative that the civil engineer and landscape architect coordinate closely to ensure we do not place trees with planned mulch beds, planted within 10 feet of storm drains. Mulch that washes into the Stormwater system creates ongoing flooding issues that we recognize needs to be avoided. If this is unavoidable, then pine straw can be substituted, but only with approval by the Campus Grounds Manager. The university understand mulch contributes to the overall health of plants and trees, so it is a balance between that and Stormwater management.
- b. All planting areas shall receive shredded hardwood bark mulch unless directed otherwise by the ODU Grounds Manager.
- c. Shredded hardwood bark mulched areas:
 - i. All shredded hardwood bark mulch shall be 100% shredded hardwood bark mulch. Each delivery must contain only single-ground shredded hardwood bark that is clean, single-ground, uniform

particle size (no piece shall be any longer than 3" and not wider than ½"), free of foreign matter, and aged for a minimum of six months.

- ii. The mulching material shall be 100% shredded hardwood bark mulch, applied 3" to 5" thick to achieve a minimum settling depth of 3".
- iii. Note: Only shredded hardwood bark mulch will be accepted; ground wood (not bark) will be rejected.
- d. Pine Straw:
 - i. All pine straw shall be clean, fresh, and free of branches and foreign matter.
 - ii. The mulching material shall be pine straw, applied four inches (4") to six inches (6") thick to achieve a minimum settling depth of three inches (3").
- e. Contractor shall mulch all trees and shrubs immediately after planting, NOT at the end of the entire planting project.
- f. The contractor shall mulch the planting holes and staked areas of individual trees shall be mulched, while the entire planting areas of shrub and ground cover beds shall be uniformly mulched. No soil, rocks, clods, or drip irrigation lines shall be visible through the mulch.
- g. Trees and tree like shrubs planted in turf areas shall have a circular mulch ring with a four-foot radius from the trunk of the tree. All areas that are not turf or hardscape shall be mulched, unless otherwise specified. Do not place mulch within 3 inches of trunks or stems.

32.23. Underground Utility Offsets

- a. New utilities should be located so that the construction will not damage or destroy the plants to remain. Utility trenching shall not be located closer than one foot (1'-0") for each (1") in diameter, with a minimum of five feet (5'-0") and a maximum of twenty feet (20'-0") for trees to remain. Damaged trees and plants shall be restored to the satisfaction of the ODU Grounds Manager.
- b. To preserve trees and manage underground utilities, new trees shall not be planted:
 - i. Within ten feet (10'-0") of any existing underground utility lines with joints
 - ii. Within five feet (5'-0") 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)
 - iii. Where new storm and sanitary sewer piping alignment cannot be avoided within ten feet (10'-0") of an existing or new tree, use HDPE butt-welded pressure piping.

32.24. Landscape Edging

- a. Landscape edging shall not be used.

32.25. Initial maintenance of trees and shrubs

- a. Trees and shrubs shall be maintained by the Contractor after final planting until final acceptance by the ODU Grounds Manger.
- b. Refer to section 32.15 Planting Irrigation.
- c. The Contractor shall remove weeds, replace mulch and restore eroded watering basins around trunks if needed.
- d. The Contractor shall remove all plant identification tags and labels.
- e. The Contractor shall apply insecticides, fungicides and herbicides if necessary to prevent or correct insect infestation or disease. Contractor shall apply pre-emergent herbicides for all plant beds.
- f. The Contractor shall dig up and correct any trees that are not plumb

32.26. Pruning

- a. If pruning of roots is required of existing plants or trees, Contractor must contact ODU Project Manager and arrange for ODU Grounds manager to review the conditions and advise.
- b. B. If pruning of roots is required for new plants, Contractor must seek approval from A/E prior to proceeding.
- c. Contractor shall remove only dead, dying, or broken branches as approved by ODU Grounds Manager. Do not prune for shape.
- d. Contractor shall prune and thin trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by A/E, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.
- e. Pruning of plant material shall be limited to fine pruning. Fine pruning is the removal of dead, diseased, injured, broken, rubbing, or crowded branches or twigs. Minor branches and branches that connect to the trunk may be fine pruned. Fine pruning should not result in large voids in the general outline or structure of the plant.
- f. Protruding branch stubs, left on the tree after pruning, is not acceptable. It will increase the possibility of decay and may result in the growth of undesirable shoots from the stub.
- g. The normal shape of the plant shall be left intact unless otherwise directed by the A/E. Additional pruning may be required on trees of special use or character.
- h. All pruning cuts on woody plants shall be made in accordance with standards set forth in the National Arborist Association's Pruning Standards for Shade Trees, Class I Fine Pruning. Improperly pruned shrubs and trees may result in rejection of plants by the Design Professional.

32.27. Transplanting

- a. Mechanically transplanted trees:
- b. Trees dug and transplanted with a mechanical tree spade (on site) shall be placed in a planting hole dug by a mechanical tree spade of the same size.

32.28. Vegetated Roof Assemblies

- a. Refer to **CPSM APPENDIX A - DEB ROOFING POLICY & TECHNICAL STANDARDS FOR STATE-OWNED BUILDINGS** for additional requirements regarding vegetated roof systems.
- b. General Requirements
 - i. During schematic design, the objectives for installation of a vegetated roof must be defined (stormwater benefit, aesthetics, amenity space, etc). The specific design of the landscaped roof must be preapproved by Facilities Management and the Department of Design and Construction.
 - ii. Vegetated roof installation must be minimum 1,000 sf.
 - iii. Design and details must be developed by an experienced vegetated roof consultant, who must be a member of the design team as soon as a green roof concept is identified .
 - iv. Design must provide reasonable, safe access for landscape maintenance personnel and must be approved by the University Grounds Manager.
 - v. Provide access to roof top equipment such as drains, skylights, etc., avoiding frequent foot traffic over planted areas.
 - vi. Design shall include a perimeter zone, free of any vegetative roof components to a depth of at least 12' or as recommended by the vegetative roof consultant.
- c. Acceptable Vegetated Roofing Systems

- i. Modular Tray Extensive: 1'x2' trays with interlocking capability and positive drainage cells, made with recycled content. Trays shall be set on a slip sheet/root barrier of 45-60 mil with bonded seams, of a material compatible with roofing membrane system. Trays shall be pre-grown for 1 growing season, exposed tray edges shall be protected with sturdy aluminum "L" shaped edging (4.5"x3"), and growth media shall cover tray edges by 1" depth.
- d. Warranty
 - i. Provide single-source, full assembly vegetated roof system replacement in the event of membrane failure; to include membrane plus all overburden, including soil media and plant replacement, for minimum 20 years.
 - ii. Provide 50% vigorous plant coverage warranty in 1 year, 80% vigorous plant coverage in 2 years.
- e. Engineered Growth Medium
 - i. Design must be specific to the depth of medium and type of plants specified, meet German FLL requirements for engineered growth medium and submit certified laboratory tests for approval.
- f. Leak Detection
 - i. Provide electric field vector mapping leak detection systems reviewed and approved by Facilities Management. Components of the vegetated roof system, including the membrane, must be compatible with the leak detection system.
- g. Irrigation
 - i. Provide a hose-bib for irrigation during establishment and dry periods.
 - ii. Tap non-potable irrigation sources such as condensate or storm water cisterns. Irrigation piping material to be stainless steel or PVC schedule 40. Galvanized and copper piping are not acceptable due to potential leachate damage to plants.
- h. Installation
 - i. Installation shall be by qualified, certified, experienced vegetated roof contractor. Coordinate installation such that other trades have limited, managed access to the area receiving a vegetated roof to avoid damage to the waterproofing membrane.
 - ii. The vegetated roof design consultant shall inspect and approve installation of all layers of the system, and shall submit approval(s) to Facilities Management.
 - iii. Prior to installation of waterproofing membrane, the vegetated roof contractor and the University Project Inspector shall visually inspect the substrate surface to verify it is clean, dry, smooth and acceptable for the membrane installation.
 - iv. Waterproofing membrane to be water-tested, witnessed, confirmed in writing and approved by the University prior to installation of any over burden of vegetated roof system components.
 - v. UV or temperature sensitive roofing materials must be protected prior to and during vegetated roof installation.
 - vi. Planting shall be installed in an appropriate season. Sedum pots shall be planted March-April-May, or in fall if acceptable to the University Grounds Manager. Pre-grown trays and carpets may not be installed in freezing temperatures. Sedum carpets must be installed immediately upon arrival at project site.

32.29. Pavement Markings

- a. Parking spaces shall be delineated with a single stripe line configuration between 90 degree and angled parking spaces. All parking space lines shall be 4” in width. Ninety degree parking spaces shall be 9 feet wide center to center of the line configuration and 18 feet deep.
- b. Accessible parking spaces shall be in compliance with the Americans with Disabilities Act Standards as promulgated by the United States Access Board (link: <https://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-ada-standards/guide-to-the-ada-standards/chapter-5-parking>)
- c. Parking space pavement marking paint for asphalt or porous concrete shall be water based traffic paint (without glass beads) that meets federal specification TTP-1952-E (Traffic and Airport Marking) and the Department of Transportation (DOT) specification 971-3.
- d. Only standard pre-tinted paint colors shall be used for white, yellow, blue, red, green, and black traffic paint markings.

Pavement Marking Color	Location Used
White	Parking space lines
Blue	Accessible parking spaces including: parking space lines, hashed areas, curbs, and symbols
Yellow	Fire lanes, no parking zones, and designated clear areas at the ends and/or corners of parking aisles
Green	Electric Vehicle charging areas – including parking space and curbs surrounding charging equipment

- e. For asphalt surfaces, apply two coats, each wet application shall be a minimum 15 mils.
- f. For concrete surfaces apply 1 coat, and the wet application shall be a minimum of 15
- g. A/E shall coordinate with ODU Project Manager to include Transportation and Parking Services as well as the University Fire Safety officer in the review of parking layouts, fire lane and fire hydrant markings during the preliminary design phase.

32.30. Manufactured Metal Bollards

- a. Refer to Chapter two – Campus Design regarding bollards locations.
- b. Landscape Forms 6” black Annapolis Bollard (or equal). Surface mount or removable style with supplied embedded galvanized steel socket. Removable bollards to have a keyed lock to secure the bollard when in the socket. Provide a cover plate flush with the surface and secured with a chain when the bollard is removed. The cover plate and chain store in the sleeve when the bollard is in the socket. Lighted bollards, when used shall be LED. Install per manufacturer’s directions in a 24” diameter (min.) concrete footing 30” deep with drainage pipe to engineered fill. When desired, based on location, the bollard can be filled with concrete for added security. If filled with concrete, extend the drain line to the top of the concrete, keeping it unobstructed.
- c. When approved by the Department of Design and construction, on a limited basis, 6” concrete filled, steel bollards may be used. Factory pre-filled with concrete, factory finished painted yellow with welded dome cap. Schedule 40 or 80 pipe.

32.31. Skateboard Deterrents

- a. Skateboard Deterrents shall be indicated in the working drawings by the A/E.
- b. Material: 6061-T6 Aluminum in a clear anodized finish.

- c. Dimensions: 2" Wide x 4 3/4" deep x 1" tall with a 1/8" to 3/8" radius edge.
- d. Anchoring: minimum of two offset anchors set in two-part epoxy.
- e. Spacing: set 18" from end of planters and walls and then 36" +/- on center.
- f. Product: FR 0.12 By Skate Stoppers or equal.