

Board of Regents University System of Georgia

Facilities Management /Design & Construction

Georgia Tech Green Book

Design Standards



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311000 - Site Preparation & Demolition

1.01 General

- A. Site preparation and demolition standards assist Georgia Tech in establishing expectations and communication during the initial phases of construction.

2.01 Execution

- A. Establish, protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated. Wrap a 1-inch blue vinyl tie tape flag around Insert requirement each tree trunk at 54 inches above the ground.
- C. Protect existing site improvements to remain from damage during construction.
- D. Restore damaged improvements to their original condition, as acceptable to Owner.
- E. Temporary Erosion and Sedimentation Control
 - 1. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion and sedimentation control drawings and requirements of Design Professional as defined by City of Atlanta Department of Watershed Management.
 - 2. Design Professional to obtain “Courtesy Land Disturbance Permit Review” and pay necessary fees to obtain approved plans with City of Atlanta.
- F. Tree and Plant Protection
 - 1. Protect trees and plants remaining on-site according to requirements in section “Temporary Tree and Plant Protection.”
 - 2. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Owner.

3.01 Existing Utilities

- A. Design Professional and Project Manager to coordinate with Facilities Operations and Maintenance to remove or abandon public utilities as indicated on plans.

- B. Locate, identify, disconnect, and seal or cap private utilities indicated to be removed or abandoned in place.
- C. Owner will arrange to shut off indicated utilities when requested by Contractor.
- D. Prior to site and erosion control fencing installation contractor to meet with Landscape Services Irrigation Specialist to review existing irrigation system to determine where contractor needs to temporary cap existing irrigation lines entering the site. Modification of existing irrigation system outside project limits, if necessary, shall be reviewed and approved by Landscape Services Irrigation Specialist and Design Professional.
- E. Contractor to coordinate with Owner and Design Professional for utility disconnection and provide minimum of one week notice of disconnection and potential temporary disruption to utility supply to surrounding buildings.
- F. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
- G. Notify Design Professional not less than 7 days in advance of proposed utility interruptions.
- H. Do not proceed with utility interruptions without Design Professional written permission.

4.01 Clearing, Grubbing and Tree Removal

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
- B. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
- C. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed sub-grade.
- D. Use only hand methods for grubbing within protection zones.
- E. Chip removed tree branches and stockpile in areas approved by Owner or transport at Contractor's expense to grinding/mulching facility in area.
- F. Tree removal shall follow Georgia Tech's tree cycling program that includes the harvesting and processing of lumber.

[Link to Tree Cycling Document](#)

- G. Smaller limbs should be chipped and delivered to the current mulch pile near the MARC Building (135) 801 Ferst Drive, N.W. Coordinate with Georgia Tech Landscaping Services.
- H. Dried, sawn lumber should be delivered to the Georgia Tech's storage facility (Building 163) located at 645 Northside Drive, N.W. Coordinate with Georgia Tech Facilities Management.
- I. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
- J. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

5.01 Topsoil Stripping

- I. Remove sod and grass before stripping topsoil.
- J. Strip topsoil to depth of 6 inches to 12 inches as needed in a manner to prevent intermingling with underlying subsoil or other waste materials.
- K. Remove subsoil and non-soil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- L. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
- M. Limit height of topsoil stockpiles to 72 inches or as approved by Site Engineer.
- N. Do not stockpile topsoil within protection zones.
- O. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
- P. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.
- Q. If space is limited on site and topsoil is exported from the site, then the Contractor shall import the topsoil back to the site at no additional cost.

6.01 Site Improvements

- A. Remove existing above and below grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

- C. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
- D. Paint cut ends of steel reinforcement in concrete to remain with two coats of anti-rust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.
- E. Disposal of Surplus and Waste Materials
- F. Refer to Georgia Tech Yellow Book Construction Waste Management and Disposal specifications.
- G. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Legally dispose of non-recyclable items off campus. Do not interfere with other Project work.

7.01 Campus Standard Quality Assurance

- A. Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
- B. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner or City of Atlanta.
- C. Provide alternate routes around closed or obstructed traffic ways if required by Owner or City of Atlanta.
- D. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Georgia Tech's property, cleared materials shall become Contractor's property and shall be removed from campus.
- E. Obtain authorization from Facilities Management prior to performing any site clearing on adjoining property.
- F. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises. Coordinate location with Owner and Architect.
- G. Utility Locator Service: Notify utility locator service for area where Project is located a minimum of 72 hours before site clearing.
- H. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.
- I. The following practices are prohibited within protection zones:

- a. Storage of construction materials, debris, or excavated material.
- b. Parking vehicles or equipment.
- c. Foot traffic.
- d. Erection of sheds or structures.
- e. Impoundments of water.
- f. Excavation or other digging unless otherwise indicated.
- g. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- j. Do not direct vehicle or equipment exhaust towards protection zones.
- k. Heat sources, flames, ignition sources, and smoking are prohibited within or near protection zones.
- g. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.
- h. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

311300 - Temporary Tree and Plant Protection



City of Portland, OR



City of Philadelphia, PA

1.01 Application

- A. The trees on the Georgia Tech campus are to be protected from all construction activities that impact areas within tree root protection zones. The design professional should consult a certified arborist before, during and after construction to assist in determining adequate tree protection and remediation. All remediation and tree health care operations during and after construction shall be performed by certified arborist. Designer shall review all tree care methods and procedures as part of Pre-construction meeting

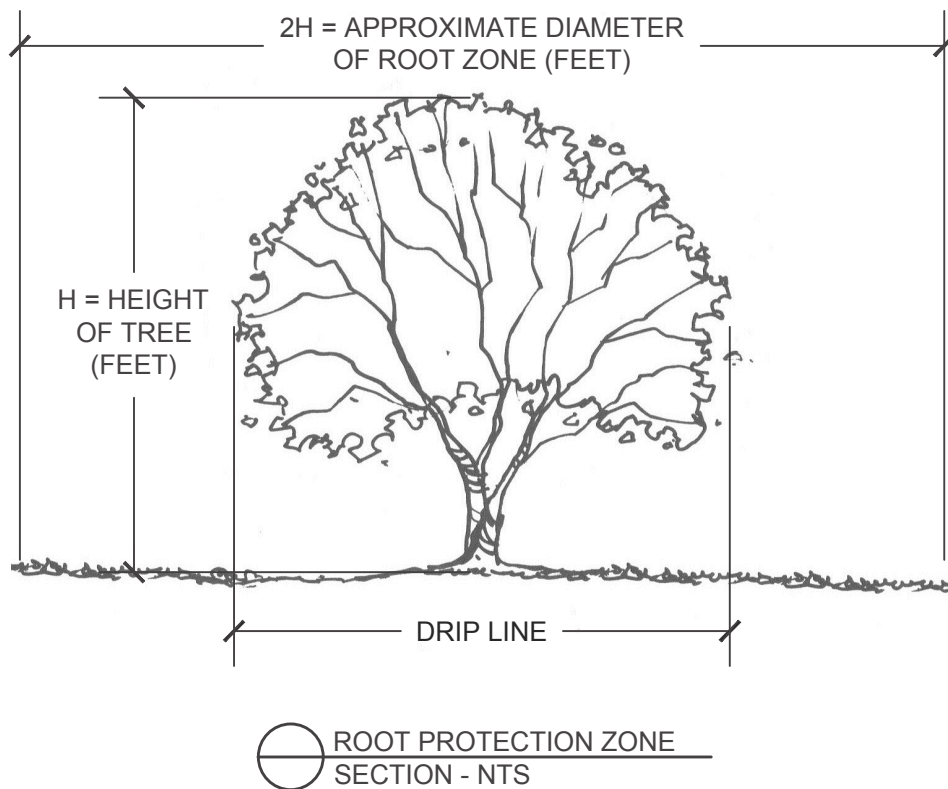
1.02 Definitions

Root Protection Zone:

- A. The root protection zone as defined in the Landscape Master Plan shall consist of a circle having a radius equal to the height of the tree.
- B. Georgia Institute of Technology Tree Protection and Recompense policy acknowledges up to 33% of the root protection zone may be disturbed with tree protection fencing established around 67% of the root protection zone. A silvicultural prescription is required for 33% disturbance. A silvicultural prescription is not required for up to 20% disturbance.

- C. The structural root zone is the zone of rapid root taper that provides a tree stability against windthrow. In general, the structural root zone consists of a circle having a radius equal to one half of the root protection zone. The structural root zone may not be disturbed. If the structural root zone must be disturbed then the tree shall be removed in full. See Landscape Master Plan Recompense Guidelines, page 62.

2.01 Design Guidelines

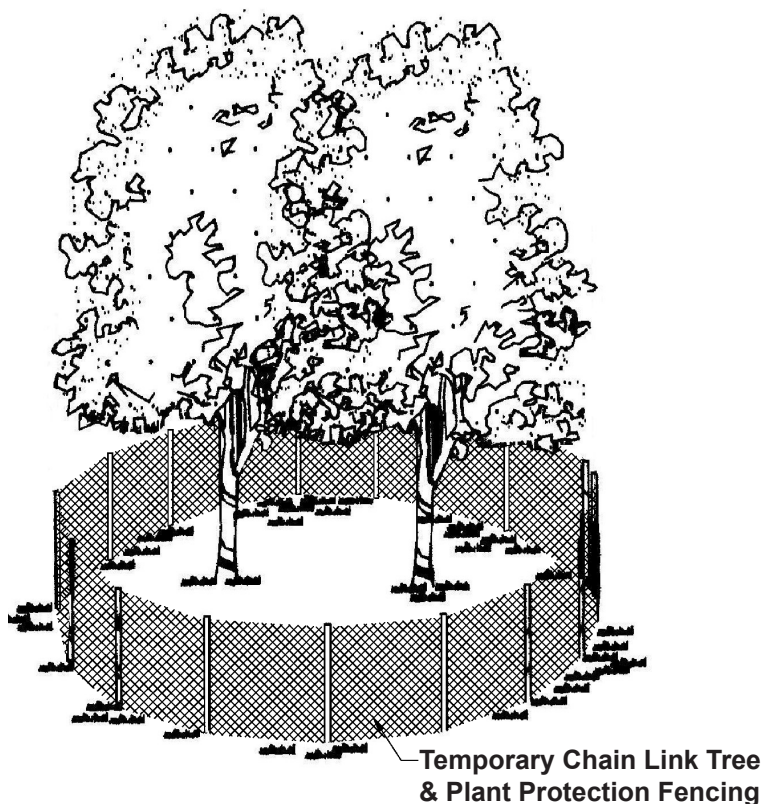


3.01 Material: Campus Standard Tree and Plant Protection Fencing

- A. Chain link fencing with 9-gauge galvanized steel wire and 2 inch mesh. Posts to be installed 2' below grade. No gates. Height to be determined on a site specific basis and reviewed by the office of Facilities Management. Signage indicating the tree and plant protection area is optional. Removal or modification of fencing shall be reviewed by Georgia Tech Facilities Management.

- B. The tree and plant protection fencing must be noted on construction plans.

- C. Removal of dead or broken branches on existing vegetation prior to establishing the plant protection zone will create a safer construction site and will also help to monitor if any new damage occurs throughout the construction process.



312000 - Earthwork

1.01 General

- A. Earthwork allows design professionals to modify existing conditions on the Georgia Tech campus. It is important to consider that any proposed changes will have to meet existing conditions outside the project limits. Design professionals must remember that grading will also adjust a site's hydrological flow and must therefore be prepared to mitigate stormwater runoff and soil erosion.

2.01 Design Guidelines

- A. Preserve or restore the campus physiography that is based on the natural lay of the land.
- B. Use project-related grading and earthwork in combination with soil enhancement as an opportunity to enhance overall landscape performance and stormwater management.
- C. Minimize the extent of rock removal required for the construction of building foundations and underground utilities.
- D. Strive to achieve a balanced cut and fill to minimize the need for haul-in of additional fill or need to dispose of excess soils.

3.01 Campus Standard Earthwork & Grading

- A. Site grading shall be designed and executed in context of the overall topography, natural landforms and drainage of the campus. Grading should have continuity with the larger campus landscape.
- B. Slopes may be 1:1 or steeper in areas associated with existing scarps and rock outcroppings.
- C. Maximum slope for landscape planting and lawn areas shall be 3:1
- D. Exterior finish grade at buildings shall be 6" minimum below finish floor elevation
- E. Landscape plantings and lawn areas are to slope away from buildings at 3% minimum for first ten feet.
- F. No construction activities shall be conducted within a 25-foot buffer along the banks of all state waters without acquisition of necessary permits from Georgia EPD.

- G. All designs will conform to the standards and specifications of the Georgia Department of Transportation and the publication titled *Manual for Erosion and Sediment Control in Georgia* published by the Georgia Soil and Water Conservation Commission.
- H. Control overland flow and encourage infiltration of stormwater into the soil to reduce strain on the campus stormwater piping infrastructure.

321233 - Bicycle Lane Markings



1.01 General

- A. Bike lane markings define a travel lane that is free of vehicular traffic, where bicyclists are encouraged to ride. Enhancing the network of bike lanes on the Georgia Tech campus will promote bicycle ridership and support the institute's vision for cycling on campus.

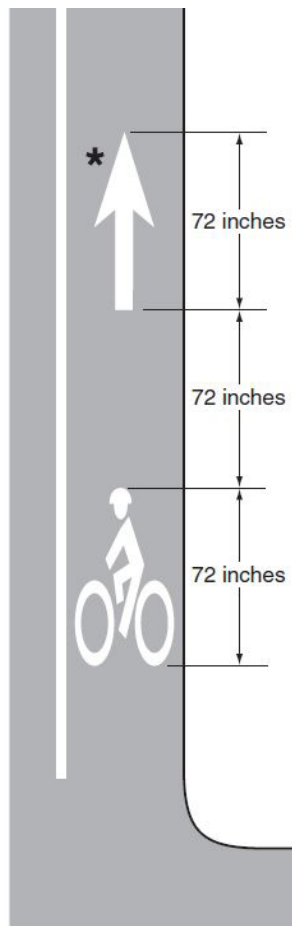
2.01 Design Guidelines

- A. Coordinate bicycle facilities with the Georgia Tech Campus Bicycle Master Plan publication.
- B. Use pavement grates that are not a bicycle hazard.
- C. Avoid impeding bicycle circulation flows with furnishings and signs.
- D. Provide a visual change in bike lane striping to notify cyclists of potential vehicular traffic within the bike lane. This is found at bus bays throughout the campus.

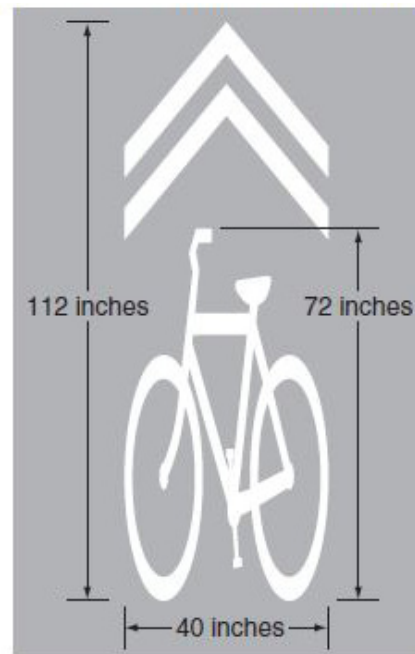
3.01 Campus Standard

- A. Multi-purpose walkways shall be designed to accommodate bicycle circulation. Patterning and or signage should be design consideration, to segregate Bike/peds, during design phase.
- B. Dedicated, striped bicycle lanes are preferred for the campus' arterial and collector streets. Lanes should be a minimum of 4 feet wide and conform to City of Atlanta, MUTCD, and AASHTO Standards.

- C. Provide bicycle-related signs that conform to unified system of standard signs and pavement markings developed by Georgia Tech to indicate shared roads, bike lanes, directions to short and long term parking areas, etc.
- D. Pavement marking material specifications shall be submitted for review by Georgia Tech Facilities Management during the design development phase.
- E. The following are permissible striping details from the 2009 Manual for Uniform Traffic Control Devices (MUTCD). Please refer to the current version.



B - Helmeted Bicyclist Symbol



Pavement Markings for Shared-Use Paths (MUTCD, v 2009)

321300 - Handrails & Guardrails



1.01 General

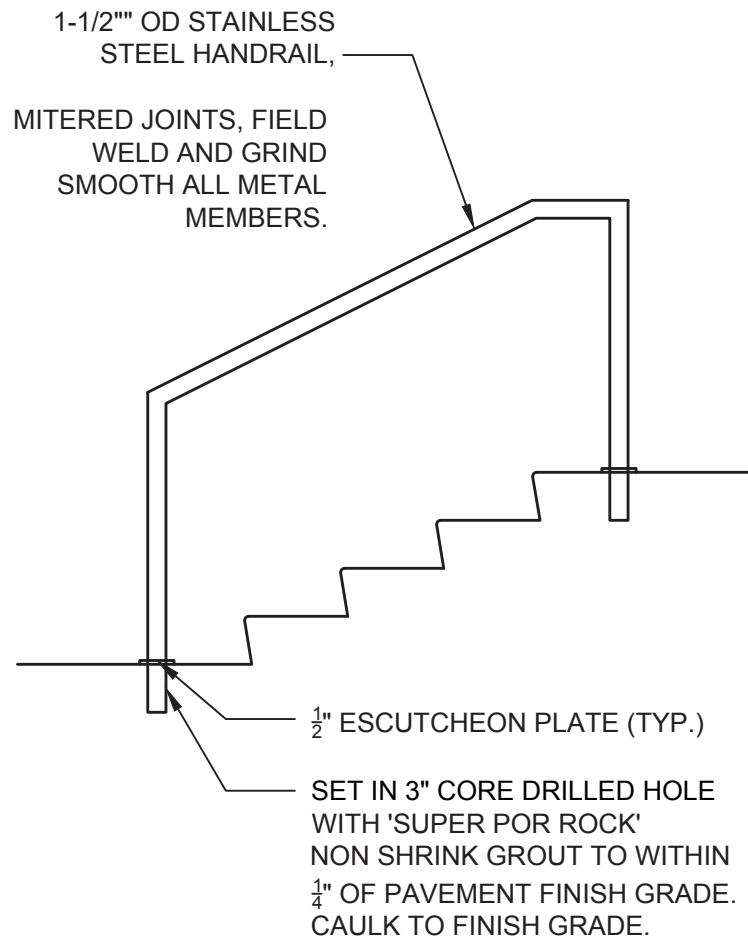
- A. Rails of a consistent design shall be used in a consistent manner throughout campus to provide a sense of unity with the overall landscape fabric.

2.01 Design Guidelines

- B. Handrails are required for all stairs and ramps.
- C. Guardrails are required for grade transitions of 30" or greater.
- D. Handrails and guardrails are to be set in core drilled holes either centered on top of walls or set 4" in from the edge of pavement.
- E. All handrails are to extend 12" beyond the edge of stairs or ramp, and turn down to grade.
- F. Guardrails to include handrails where necessary
- G. Use of under-rail lighting considered at stairs where significant numbers of pedestrians are anticipated and to be reviewed by Landscape Committee.

3.01 Campus Standard Handrail

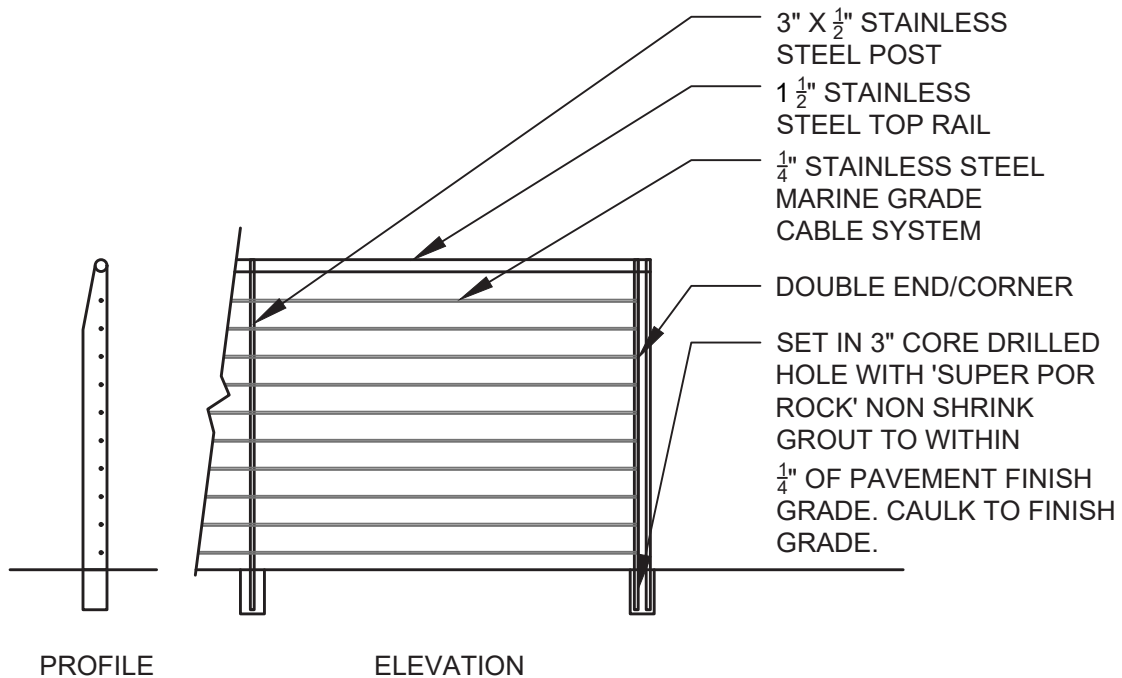
- A. Material: 1 -1/2" OD steel round tube w/ 1/2" flat escutcheon plate at pavement tie in.
- B. Dimensions: To follow grade at a consistent height of 34" min./38" max. and extend 12" beyond stair or ramp.
- C. Finish: Brushed Stainless Steel



○ STANDARD SITE HANDRAIL SECTION - NTS

4.01 Campus Standard Guardrail

- A. Material: Top rail: 1 1/2" OD steel round tube.
 Posts: 3" x 1/2" steel post (taper top 8" from 3" to 1/12" to accept top rail)
 Cables: 1/4" Marine Grade steel cables
- B. Dimensions: Top rail: to follow grade @ 42" height
 Posts: to be spaced equally @ approx. 4' OC
 Cables: to be spaced @ 3 1/2" OC (2" from top of wall)
- C. Finish: Brushed Stainless Steel (all)



○ STANDARD GUARDRAIL SECTION - NTS

321313 - Concrete Paving

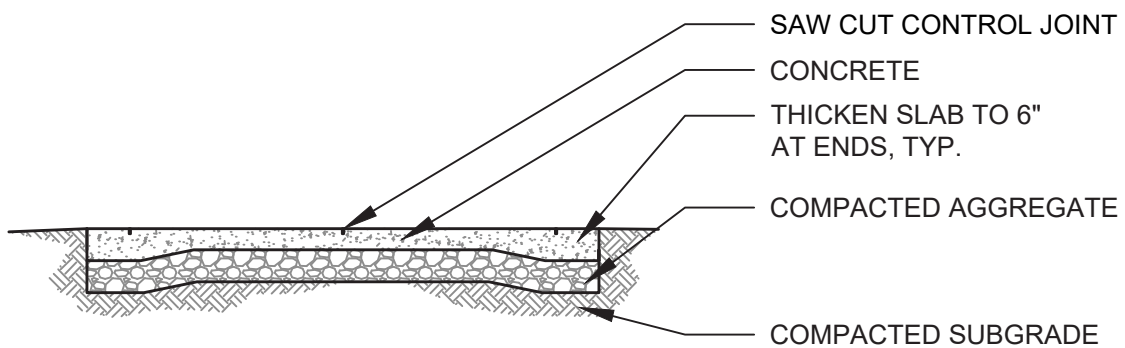
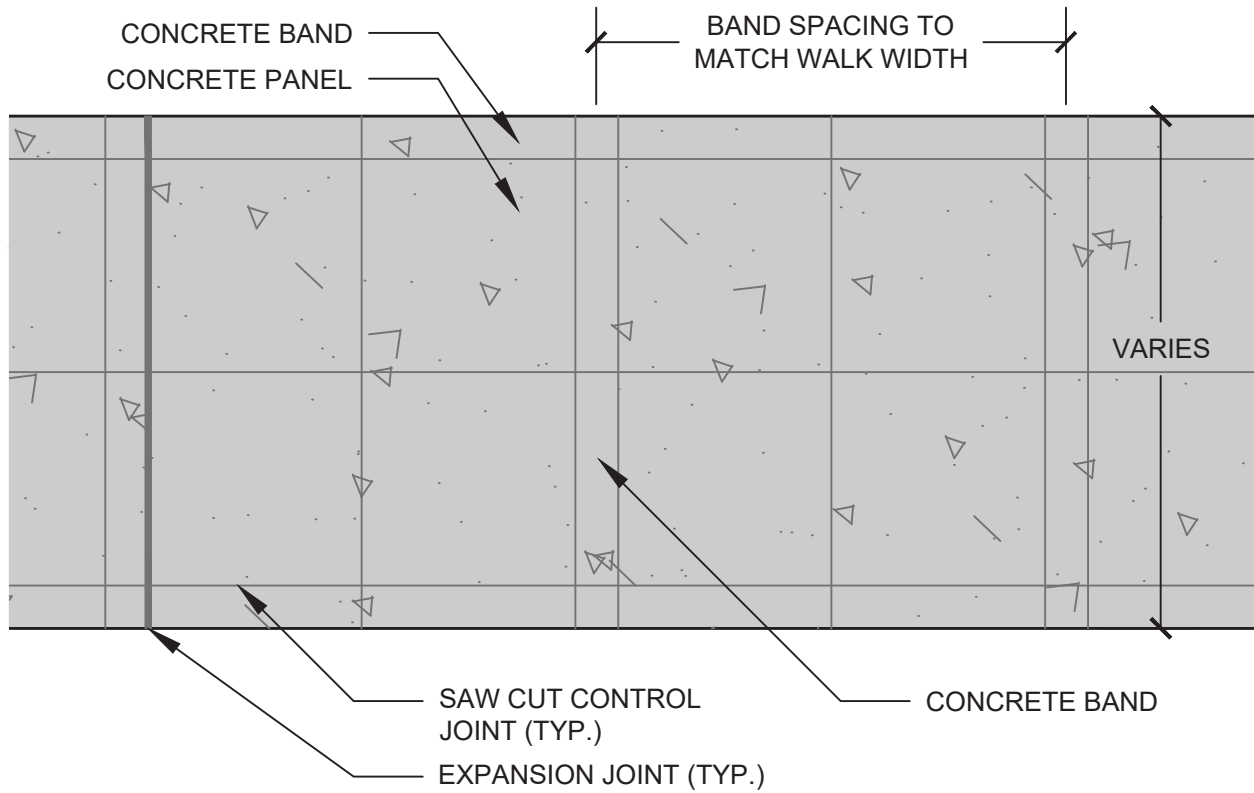


1.01 Application

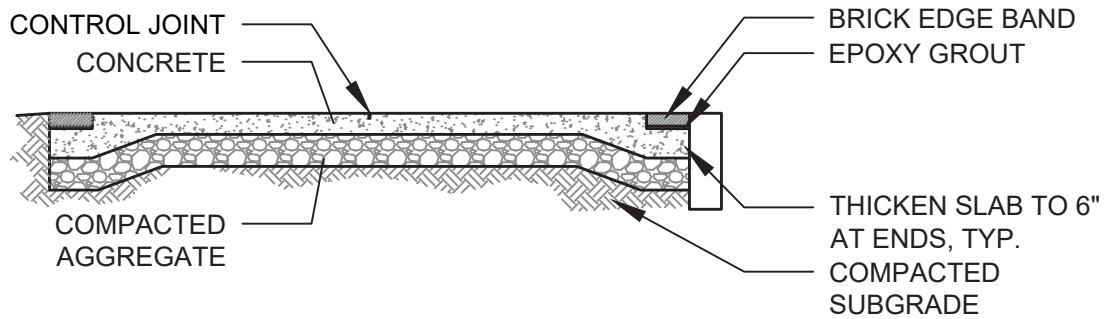
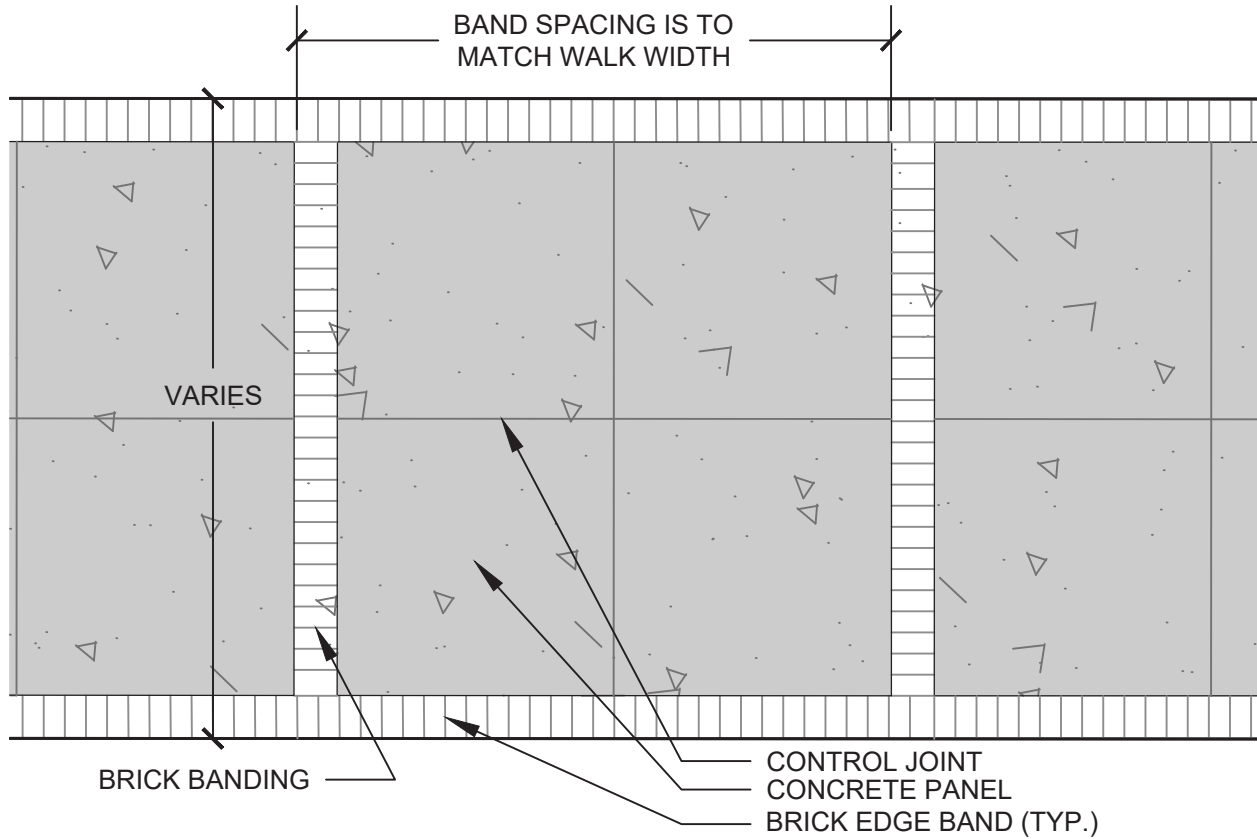
- A. Site paving plays a critical role in the organization of both pedestrian and vehicular circulation. Concrete paving adds to the overall character of the campus aesthetic and plays an essential role in indicating the hierarchy of travel connections throughout campus.

2.01 Design Guidelines

- A. All concrete walkways are to contain 8” bands. Distance between bands is to match the total width of the walkway
- B. Concrete pavement should be used as specified in the landscape master plan circulation types.
 - 1. Campus Standard Concrete Pavement
 - a. Material: 3500 PSI Portland cement concrete
 - b. Profile: 4” thick concrete with 4” deep GAB base
 - c. Finish: light broom finish. Control joints to be struck as shown on concrete sidewalk surface finish detail. Provide full depth expansion joint at intervals five times walk width for walks less than 8 feet wide and three times walk width for walks 8 feet and greater. Provide “zipstrip” or equivalent removable top. Remove plastic cap and caulk joint with single component, self-leveling silicone joint sealant for concrete meeting astm d5893, type sl. Submit manufacturer’s spec sheet for review and approval. All joints to be perpendicular with edges of walk. Of walkway is curved, joints to radiate from radius point. Over caulked or messy joints will require removal and repair.



○ CONCRETE PAVING WITH CONCRETE BANDS
SECTION - NTS



○ CONCRETE PAVING WITH BRICK BANDS
SECTION - NTS

321325 - Access Ramps

1.01 General

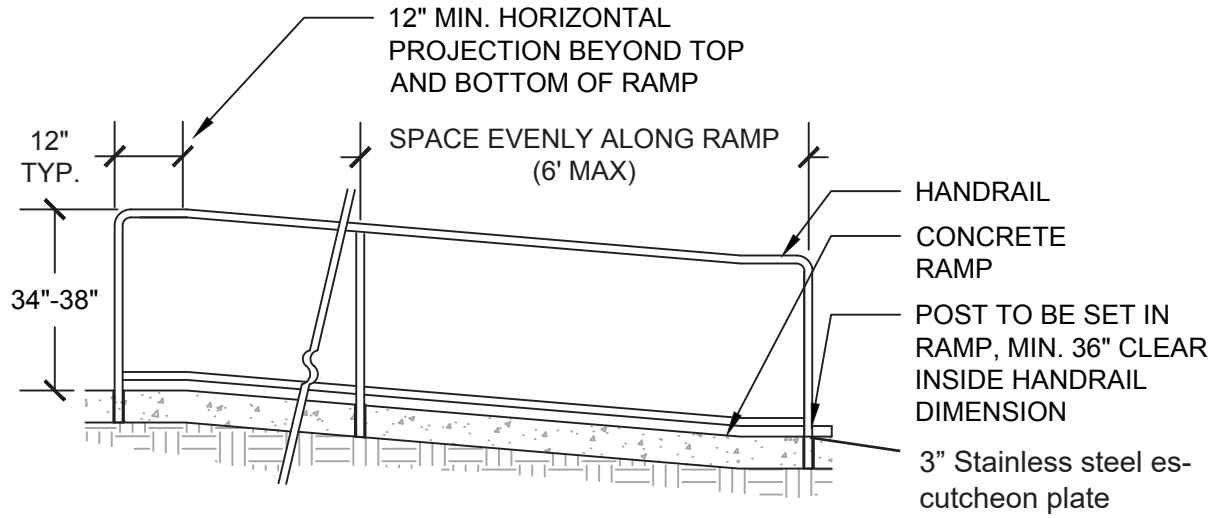
- A. When slopes become too steep ramps become necessary to provide proper accessibility to buildings and site features. Ramps should be incorporated to feel like a part of the main path of travel. Accessible routes should always be provided to the primary point of entry.

2.01 Design Guidelines

- A. All ramps shall conform with current ADA requirements
- B. Ramps shall be designed with a max. 8% slope to allow for flexibility in construction.
- C. All ramps to contain campus standard handrails set 4” inches inside the edge of pavement.
- D. Straight ramps should match the style of the adjacent walkway.
- E. Switchback ramps will require an edge treatment. Edge can either be 6” concrete cheek wall to match stairs, or the campus standard site wall.

3.01 Campus Standard Access Ramp

- A. Material: 3500 PSI Portland cement concrete
- B. Profile: 4” thick concrete with 4” deep GAB base
- C. Finish: Light broom finish



ACCESS RAMP SECTION - NTS

321443 - Pervious Paving

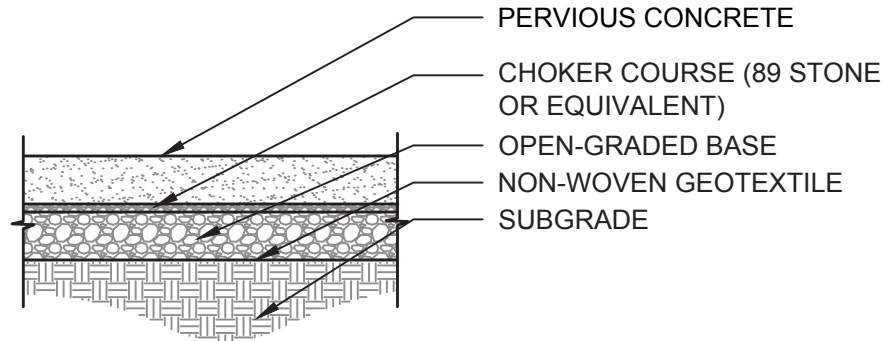


1.01 General

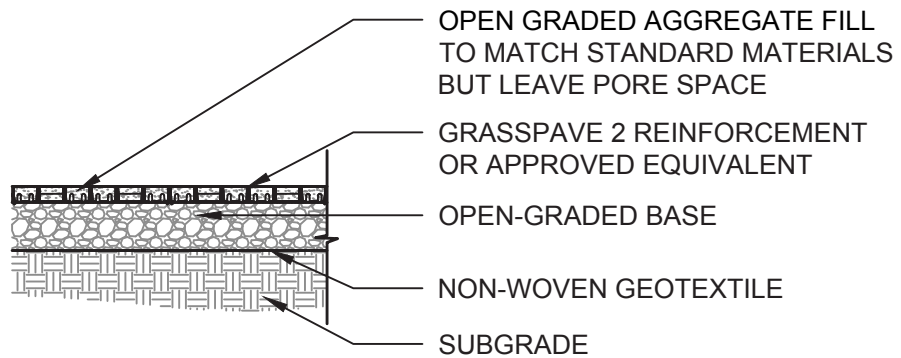
- A. Porous paving is to be used in select locations to mitigate storm water impact on campus. Porous paving types should follow the same details and design guidelines as their standard paving counterparts, and seamlessly blend into the landscape fabric.

2.01 Design Guidelines

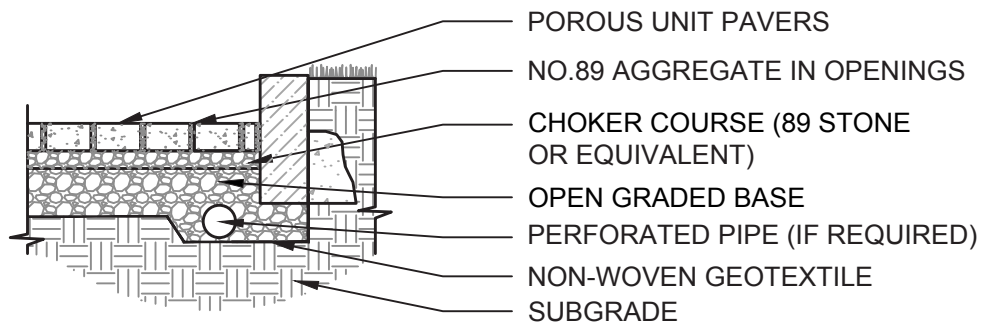
- B. Runoff from the landscape should not cross porous pavement areas. Excess sediment buildup will disrupt pavement function.
- C. The design of all pavements and drainage structures must comply with campus wide storm water planning.
- D. All pavement to have a 6" open graded base with a min. 30% void space to store water quality volume.
- E. Soil sub-grade below open-graded base to be tested for infiltration rate of 1/2" per hour or greater.
- F. Perforated pipes required if infiltration rate is below 1/2" per hour. Slope pipe at 1% min. and tie to adjacent storm drainage system.



PERVIOUS CONCRETE PAVING SECTION - NTS



PERVIOUS AGGREGATE PAVING SECTION - NTS



PERVIOUS PAVERS SECTION - NTS

321416 - Unit Paving



1.01 General

- A. Site paving plays a critical role in the organization of both pedestrian and vehicular circulation. Unit paving adds to the overall character of the campus aesthetic and plays an essential role in indicating the hierarchy of travel connections throughout campus.

2.01 Design Guidelines

- A. All unit paving to be brick or granite and meet adjacent surfaces flush.
- B. The design of all pavements and drainage structures must comply with campus wide stormwater planning.
- C. All paving shall follow installation methods herein. Alternate installation/patterns methods are to be reviewed for approval by Landscape Committee. Patterns provided in this document are guides. Existing patterns should be studied to determine the appropriate pattern for both function and aesthetics.

3.01 Granite Gutter

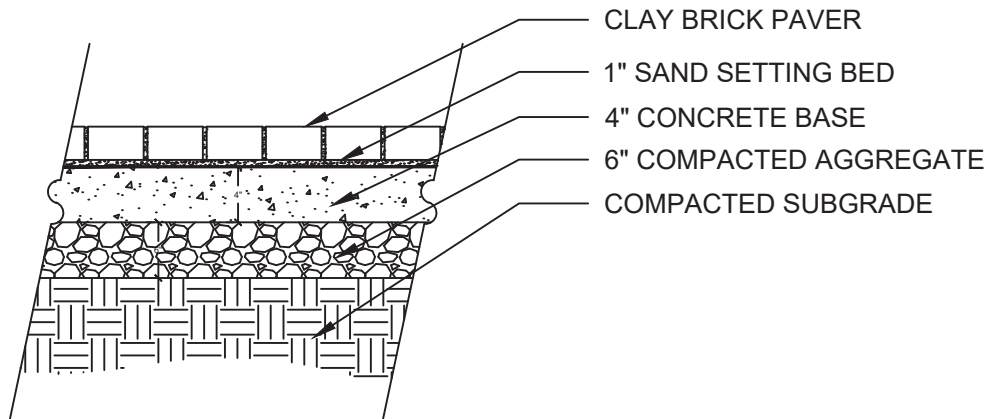
- A. Material: 8" x 8" x 2-1/2" granite paver with broken top face and sawn edges
- B. Base: 4" thick 3000 PSI concrete base with 3/4" - 1" thick mortar setting bed. Increase base thickness to 6" min. for vehicular applications.
- C. Color: Elberton Gray from Elberton, Georgia
- D. Pattern: Square stack bond with mortar joints

4.01 Campus Standard Brick

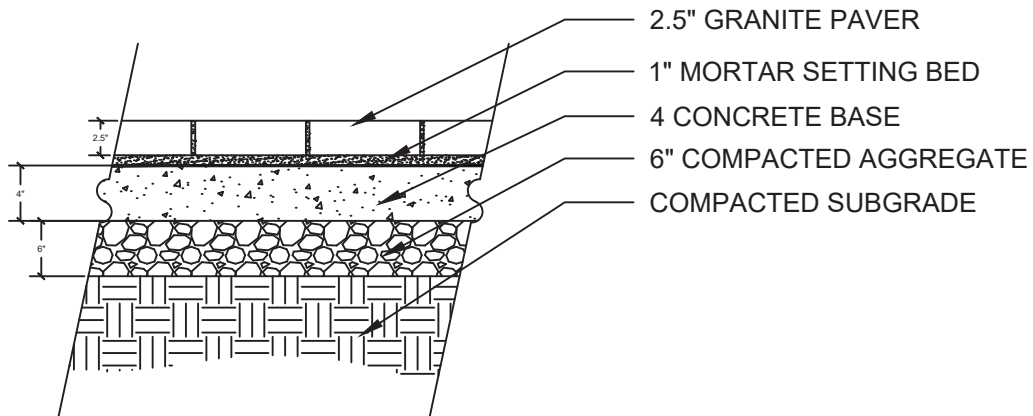
- A. Material: Whitacre Greer 4" x 8" standard bevel-edge vacuum dry pressed clay brick paver. Use 2 1/4" thickness for pedestrian applications and 2 3/4" thickness for vehicular applications.
- B. Base: 1/2" thick sand setting bed on 4" thick 3000 psi concrete base and 4" thick compacted aggregate. Increase base and compacted aggregate thickness to 6" min. for vehicular applications. Eliminating the concrete base is permissible for pedestrian only walkways as reviewed and approved by Desihn Professional.
- C. Color: Mix the following colors and proportions
 - Shade 30 Rustic Clear (15%)
 - Shade 32 Antique (25%)
 - Shade 33 Dark Antique (20%)
 - Shade 34 Mulberry (15%)
 - Shade 36 Red Sunset (25%)
- D. Pattern: Primary pattern is Herringbone with hand tight polymeric sand swept joints. Delineation of Pedestrian/Bike and Scooters should be considered.
- E. Edge Restraint: Col-Met 6" x 3/16" unfinished commercial grade steel edging

5.01 Campus Standard ADA Truncated Dome Pavers

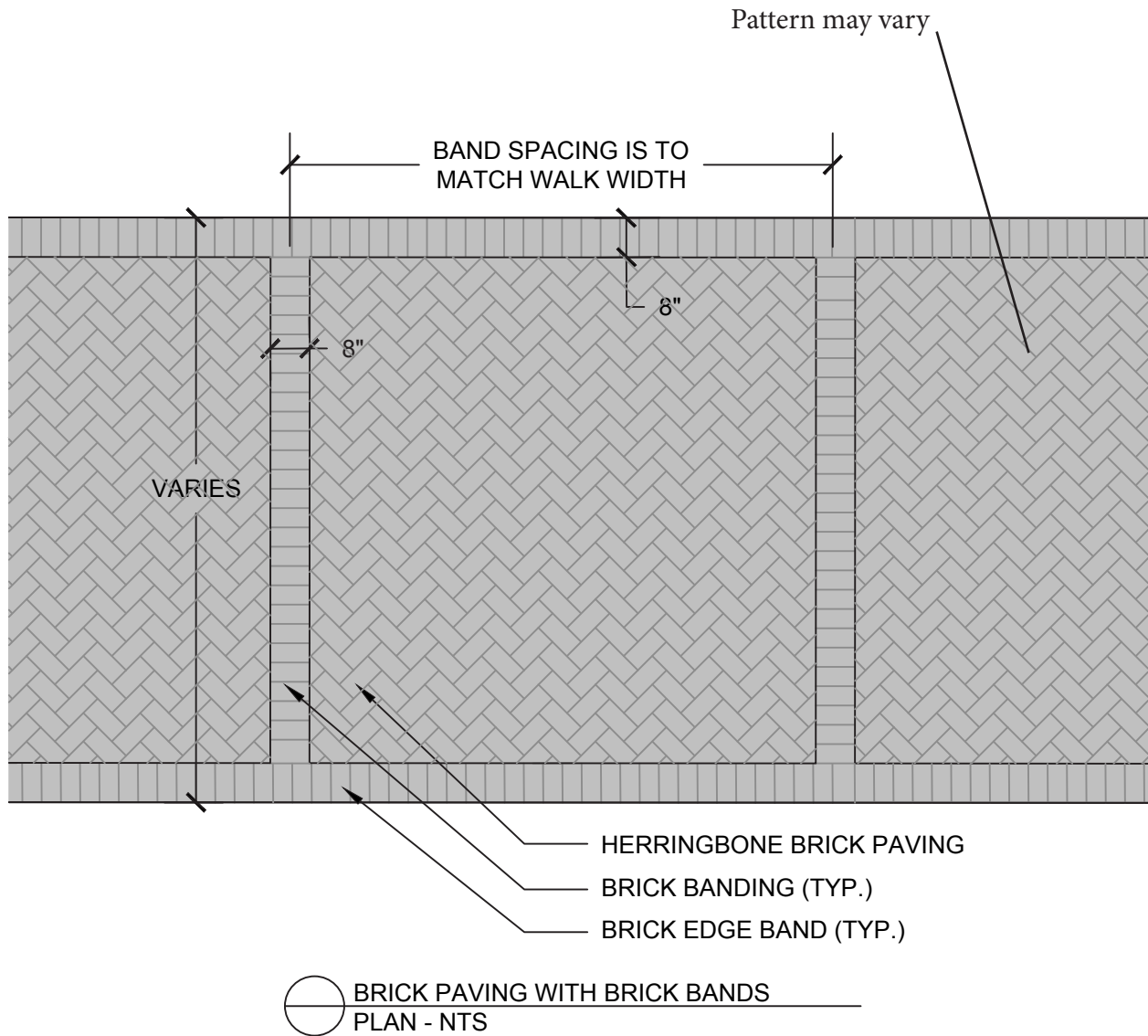
- A. Material: Cold Spring Granite 12"x12"x2" sawn.
- B. Base: 1/2" thick sand setting bed on 4" thick 3000 psi concrete base and 4" thick compacted aggregate. Increase base and compacted aggregate thickness to 6" min. for vehicular applications.
- C. Color: Academy Black

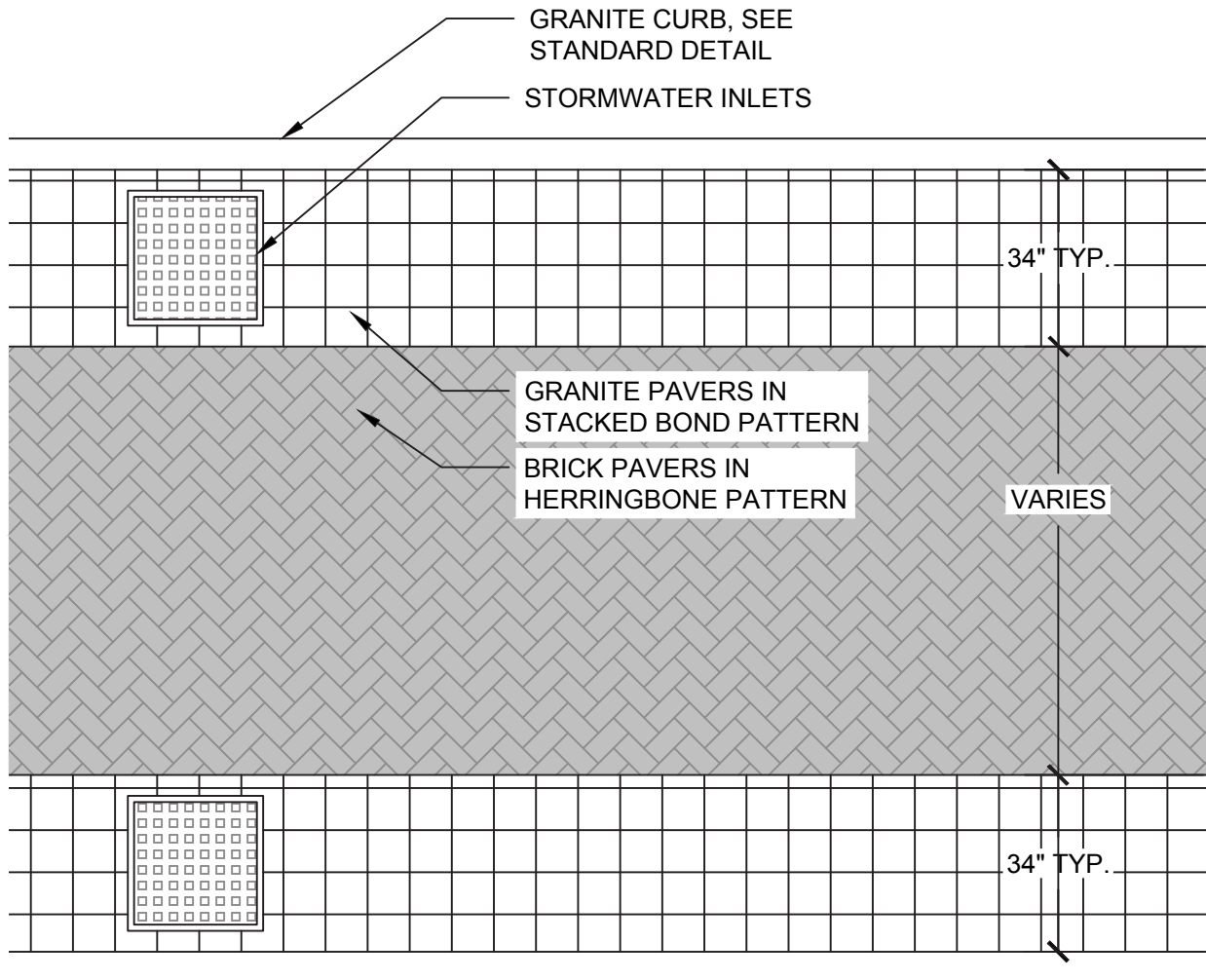


BRICK PAVERS
SECTION - NTS

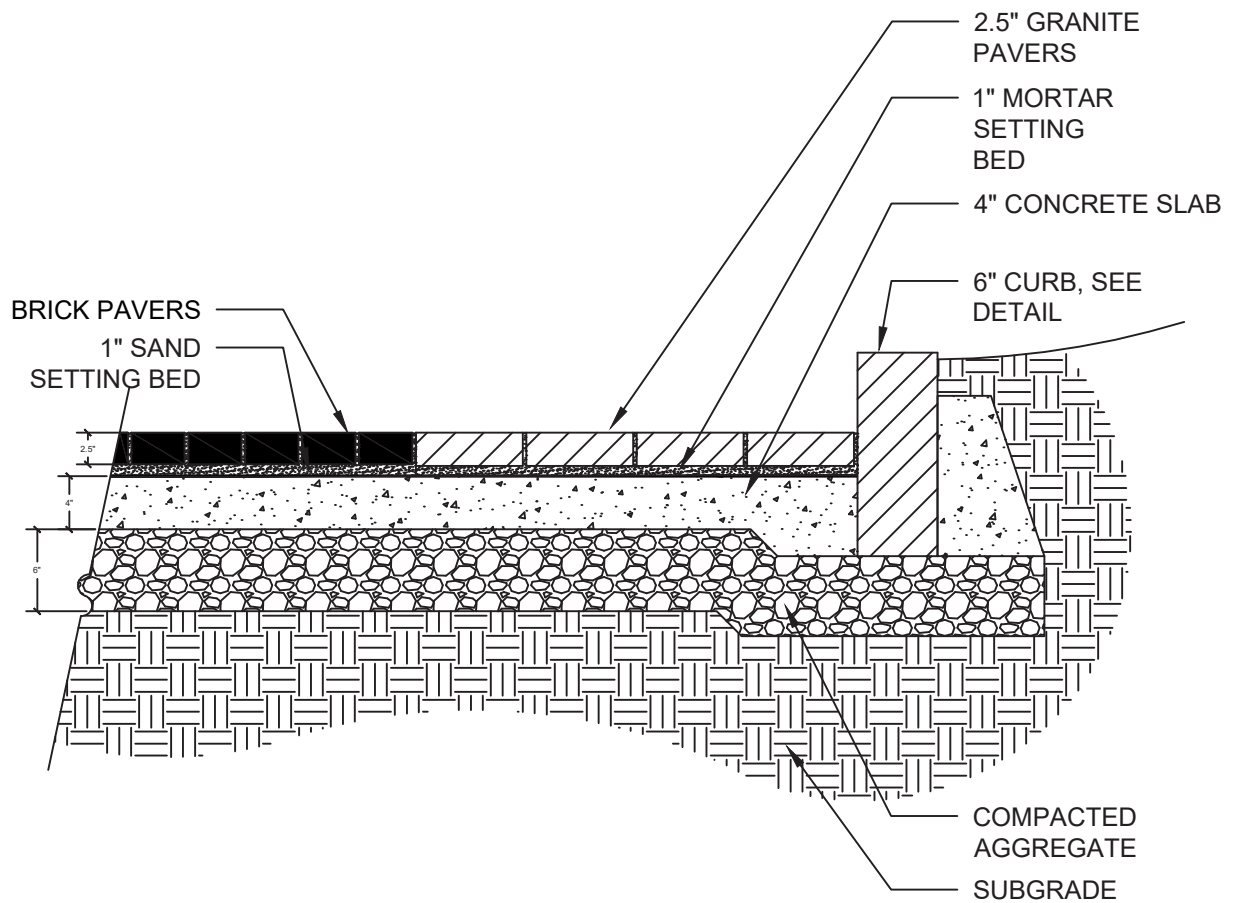


GRANITE PAVERS
SECTION - NTS





○ BRICK PAVING WITH GRANITE CURB AND GUTTER
PLAN - NTS



BRICK PAVING WITH GRANITE CURB AND GUTTER
SECTION - NTS

321500 - Aggregate Paving



1.01 General

- A. While brick and concrete are the main pavement types on campus, aggregate paving can be used in certain circumstances to provide a more informal aesthetic. The two standard aggregate materials are a pea gravel mix and SlateScape. The choice should be based on which material best complements the overall site design. Approved by Landscape Committee.

2.01 Design Guidelines

- B. Walkway dimensions shall adhere to the landscape master plan based on use & location.
- C. Benches and bike racks are to sit on a “Mini Chips” SlateScape mix.
- D. All aggregate paving requires a stable edge. Paving used as paths will be edged w/ 8” wide granite rubble. Paving incorporated into a landscape design can be edged with the appropriate material for the design. All bike racks and bench pads are to be edged w/ an 8” wide pavement band or steel edge.

3.01 Campus Standard Pea Gravel Mix

- A. Material: Aggregate Mix consisting of:
 - 2 parts M10 Stone Dust
 - 1 part Sandy Pea Gravel
 - 1 part Trail Blend 1/2” minus.
- B. Profile: 3” Compacted Aggregate Paving on 4” Compacted GAB base
- C. Finish: Paving to be thoroughly washed after compaction.

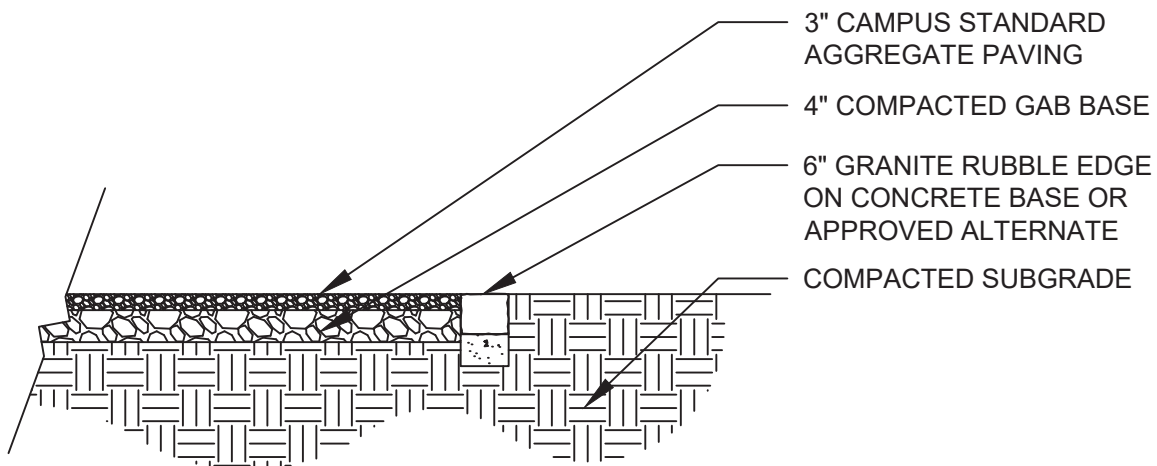
4.01 Campus Standard SlateScape Mix

- Material: SlateScape “Trail Mix”
- Profile: 3” Compacted Aggregate Paving on 4” Compacted GAB base
- Finish: Paving to be thoroughly washed after compaction.

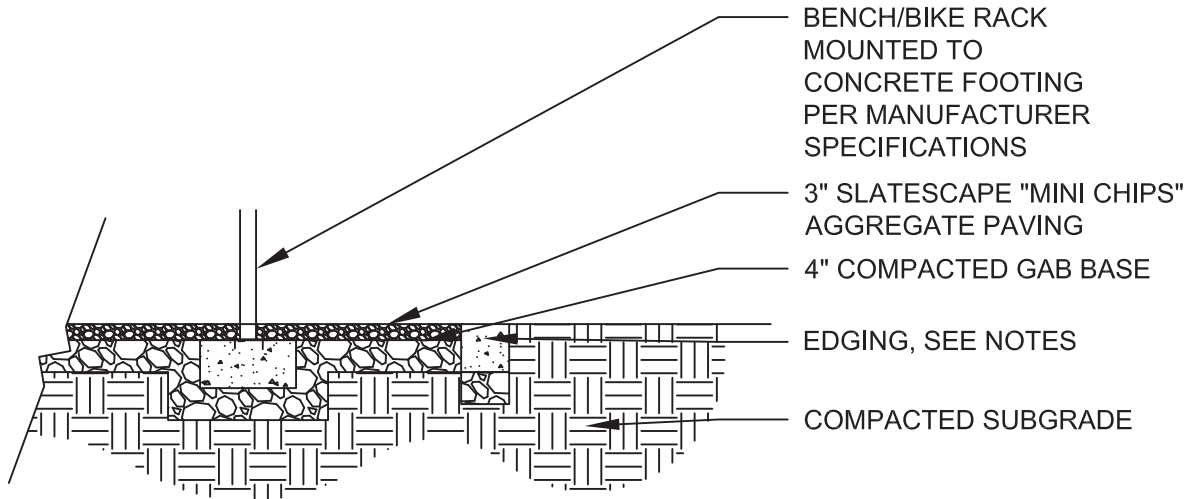
5.01 Bench & Bike Rack SlateScape Mix

- Material: SlateScape Medium “Mini Chips”
- Profile: 3” Compacted Aggregate Paving on 4” Compacted GAB base
- Finish: Paving to be thoroughly washed after compaction

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○ STANDARD AGGREGATE PAVING
SECTION - NTS



NOTE:

1. EDGING TO BE LOCATED ALONG ALL UNCONFINED EDGES.
2. EDGING TO BE ONE OF THE FOLLOWING
 - STEEL EDGING
 - STANDARD 6" CONCRETE CURB, FLUSH
 - STANDARD 6" GRANITE CURB, FLUSH
 - COL-MET 6"X $\frac{3}{16}$ " UN-PAINTED COMMERCIAL GRADE STEEL.
3. EDGING TO MEET ADJACENT PAVING FLUSH.


 BENCH AND BIKE RACK AGGREGATE PAVING
 SECTION - NTS

A. All concrete and granite edging material to be 6" wide

321640 - Curbing



1.01 General

- A. Curbing is to be used primarily to define the edge of roadways. Curbing can also be used as a decorative edge to planted areas.

2.01 Design Guidelines

- A. Granite is the only approved curbing material. Concrete curbs can be implemented in certain utilitarian, such as driveways and parking area applications and must acquire approval from campus Landscape Committee.
- B. All roadway curbs should have 6” reveal and be 6” in width. Sawn top; split-faced on reveal side.
- C. All curbing is to meet City of Atlanta standards.

3.01 Campus Standard Concrete Header Curb (Parking Lots Only)

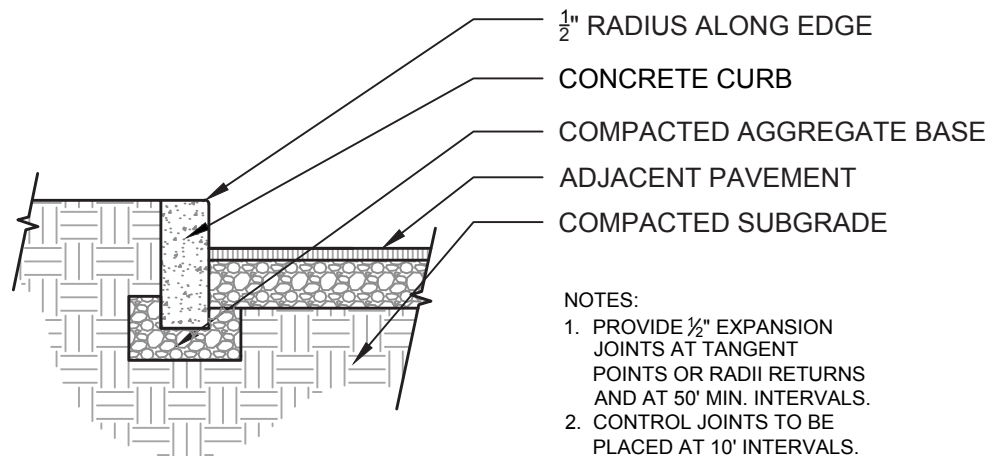
- A. Material: 6” x 18” 3500 PSI concrete curb meeting Georgia DOT Office of Materials and Research approval. Contractor shall provide written documentation of concrete approval.
- B. Base: 4” compacted aggregate. 1 cubic foot of 3000 PSI concrete footing at all joints.
- C. Finish: Light broom finish all exposed sides

4.01 Campus Standard Granite Curb (Road Way)

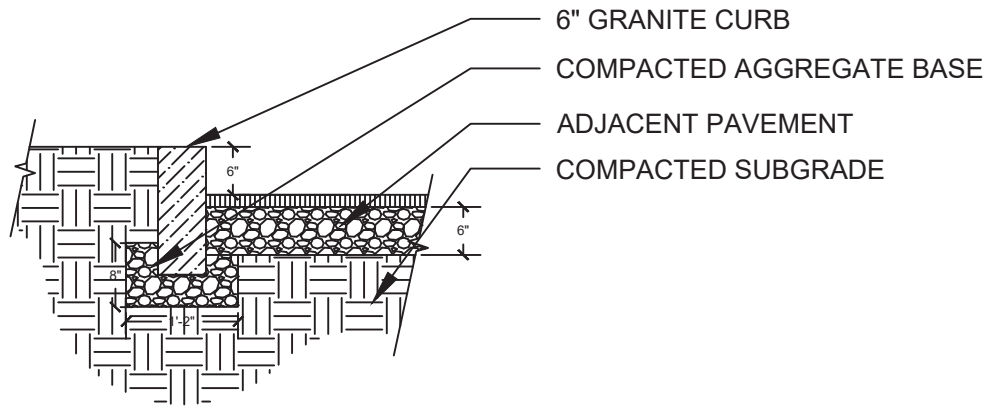
- A. Material: Elberton Grey 6” x 18” granite curb
- B. Base: 4” compacted aggregate. 1 cubic foot of 3000 PSI concrete footing at all joints.
- C. Finish: Sawn top, split-faced on reveal side.

5.01 Campus Standard Granite Curb (Landscape Edge)

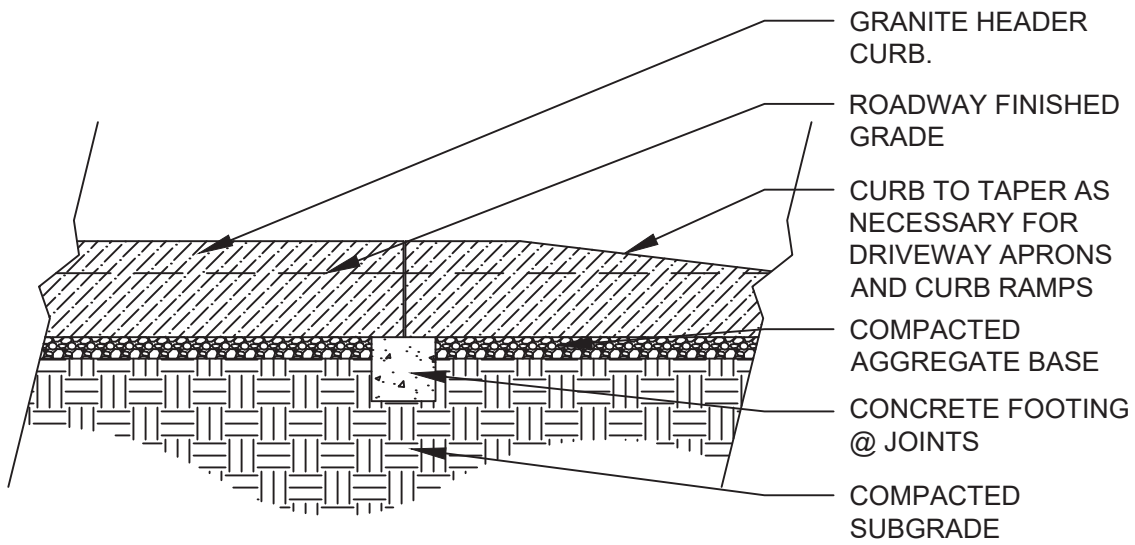
- A. Material: Elberton Grey 9” x 18” granite curb & 18” x 18” x 18” curb anchor w/ 6” point at ends.
- B. Base: 4” compacted aggregate. 1 cubic foot of 3000 PSI concrete footing at all joints. 8” concrete footing at curb anchor.
- C. Finish: Sawn top



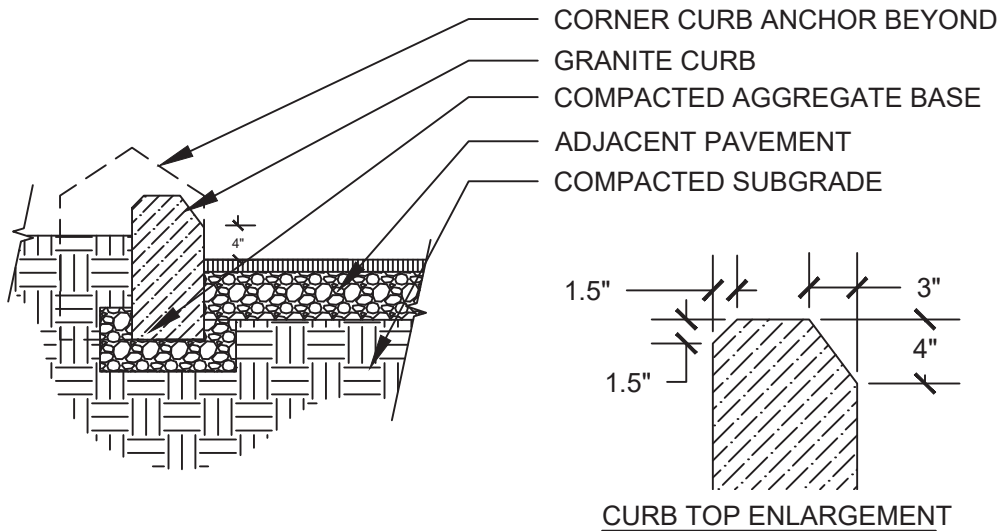
○ CONCRETE HEADER CURB (PARKING LOT)
SECTION - NTS



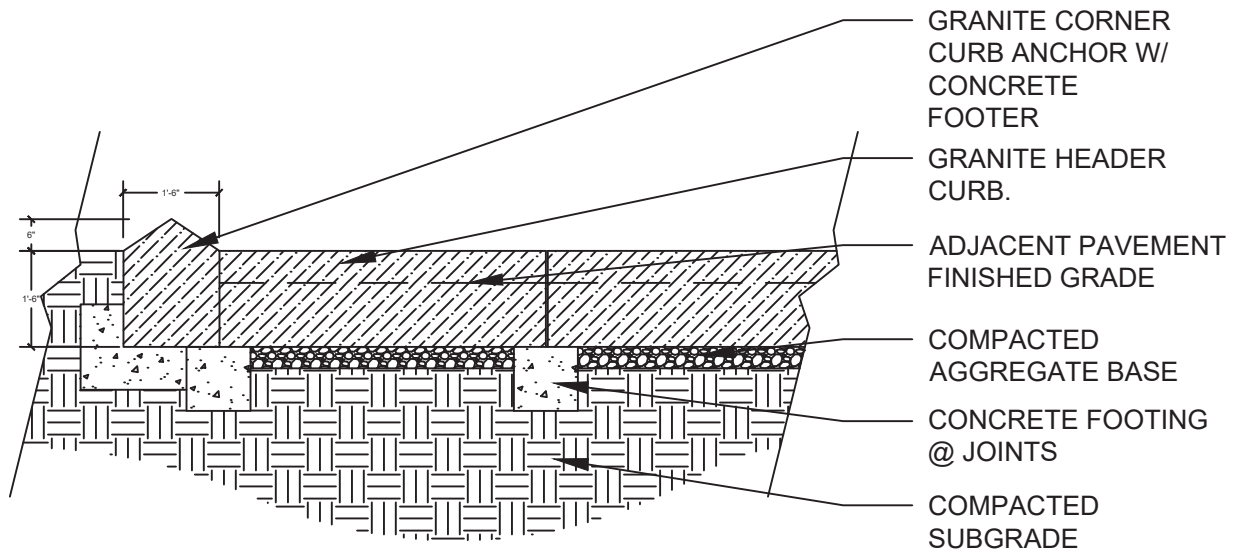
○ GRANITE HEADER CURB (ROAD WAY)
 SECTION - NTS



○ GRANITE HEADER CURB (ROAD WAY)
 ELEVATION- NTS



⊙ **GRANITE HEADER CURB (LANDSCAPE EDGE)**
 SECTION - NTS



⊙ **GRANITE HEADER CURB (LANDSCAPE EDGE)**
 SECTION - NTS

323200 - Exterior Stairs



1.01 Application

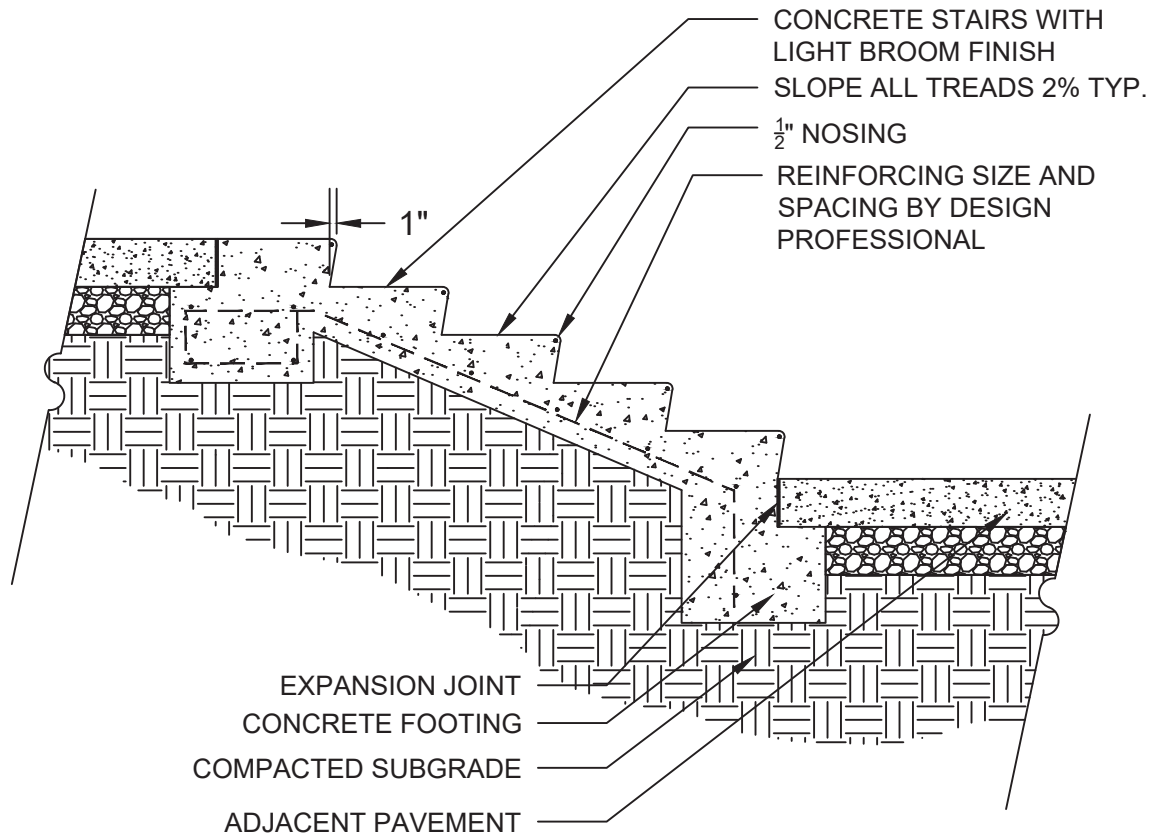
- A. Stairs are a necessary component for many sites, and should serve to enhance the landscape design in addition to their utilitarian function. Exterior stairs should always feel comfortable and inviting. They can provide an extra level of structure and geometry to a site and should be used to frame and highlight focal points.

2.01 Design Guidelines

- B. Tread and Riser dimensions shall comply with the following formula: $2 \times H(\text{Riser}) + W(\text{tread}) = 27$ inches.
- C. Risers may be no less than 4" and no greater than 6". Preferred 5" riser 15" tread.
- D. Treads to maintain a 2% slope and provide positive drainage.
- E. Brick, granite and precast stairs can be used in certain circumstances, but require approval by Landscape Committee.
- F. No stair shall exceed a 60" total vertical rise without a 5' landing.
- G. All stairs should include a 8" concrete cheek wall on either side unless adjacent to a site wall. Where applicable cheek walls should include a bicycle runnel or gutter.

3.01 Campus Standard Stair

- A. Material: 3500 PSI Portland cement concrete
- B. Profile: 6" Min. Concrete on 6" compacted GAB base
- C. Finish: Light broom finish



○ CONCRETE STAIRS
SECTION - NTS

323200 - Site Walls



1.01 General

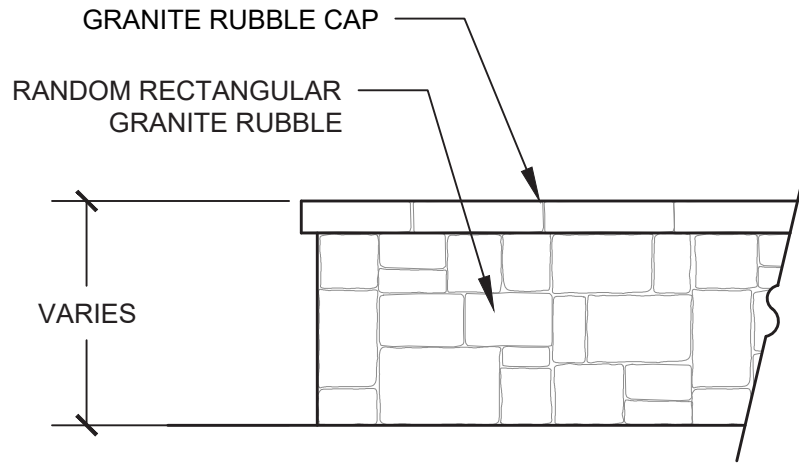
- A. Site walls are useful in unifying sites into the overall landscape, and are to be used for seating, grade retention, and storm water management.

2.01 Design Guidelines

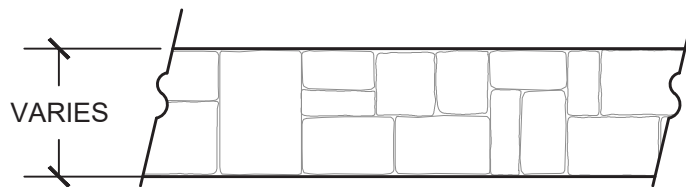
- B. All site walls are to be constructed using 'Elberton Grey' rectangular granite rubble w/ broken face exposed. Wall cap is to be the same material.
- C. Brick walls are only to occur as extensions from buildings, and will be subject for approval by Landscape Committee.
- D. Walls should be level unless approved by Landscape Committee. Walls should step with grade and maintain a level cap. Vertical step should be minimum of 8". No vertical step should exceed 18".
- E. No weep holes in face of walls. Use back of wall drainage. If weep holes are required use 4"x2" rectangular weeps; 6" from finish grade.

3.01 Campus Standard Granite Wall

- A. Material: Approx. 4” thick granite rubble blocks in random sized, roughly rectangular pieces squared on joints, beds, and faces, with at least one broken face. Granite pieces that are exposed in the final masonry construction shall be roughly rectangular and show only broken face(s).
- B. Cap: 4” thick granite rubble to match wall. Cap to overhang 1-1/2” all sides.
- C. Color: Elberton Gray from Elberton, Georgia
- D. Pattern: Random Ashlar pattern with 3/4” max. joints
- E. Mortar: Mortar shall be a fresh mixture of one-part Portland or masonry cement to three parts of mortar sand and water in a color to match granite material. Hydrated lime may be added when Portland cement is used in amounts not exceeding 10 percent of the weight of cement. Masonry Cement to meet ASTM C 91. Hydrated Lime to meet ASTM C 207, Type S. Aggregate for Mortar to meet ASTM C 144, uniform quality and color, obtained from one source. Water to be potable, non-alkaline. Mortar which has been mixed more than 45 minutes shall not be used. Retempering of mortar will not be permitted.
- F. Mock Up: Prior to commencement of exposed masonry work, Contractor shall erect a sample panel (60” long x 24” high x 20” wide). Upon the Architect’s approval, the mock-up will serve as the standard of appearance and workmanship for all granite masonry throughout the project.



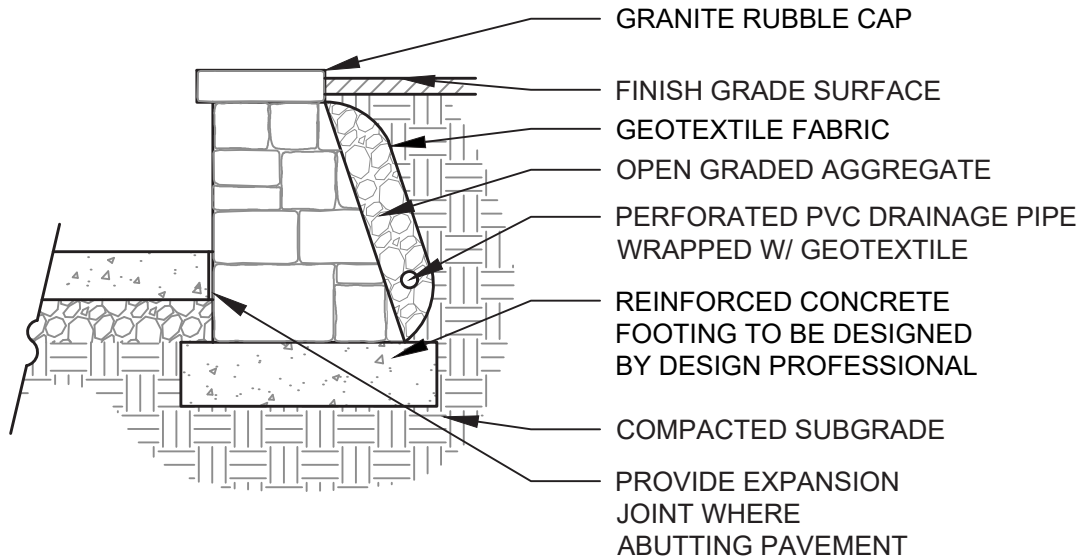
ELEVATION



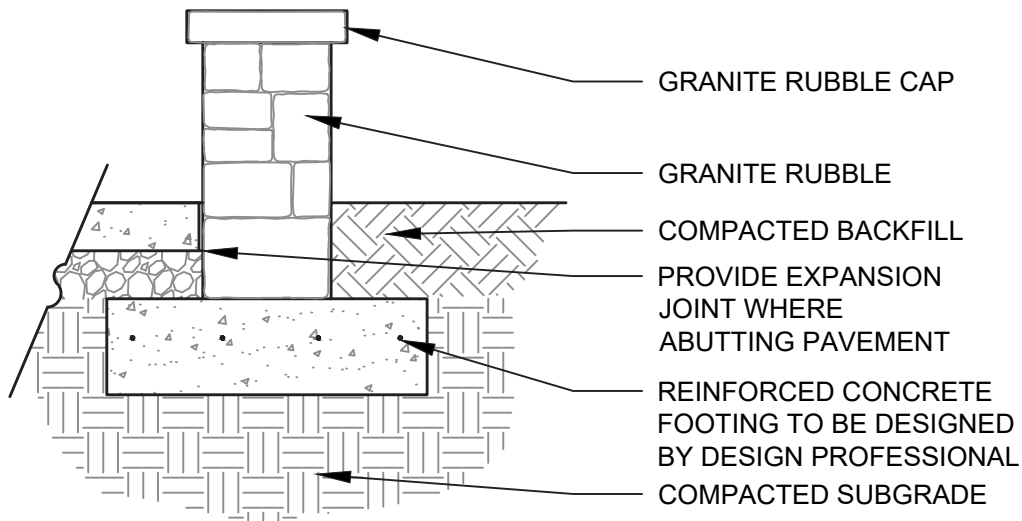
PLAN

⊙ GENERAL WALL DETAILS
NTS

Note: Behind wall drainage piping shall be coordinated with civil drawings

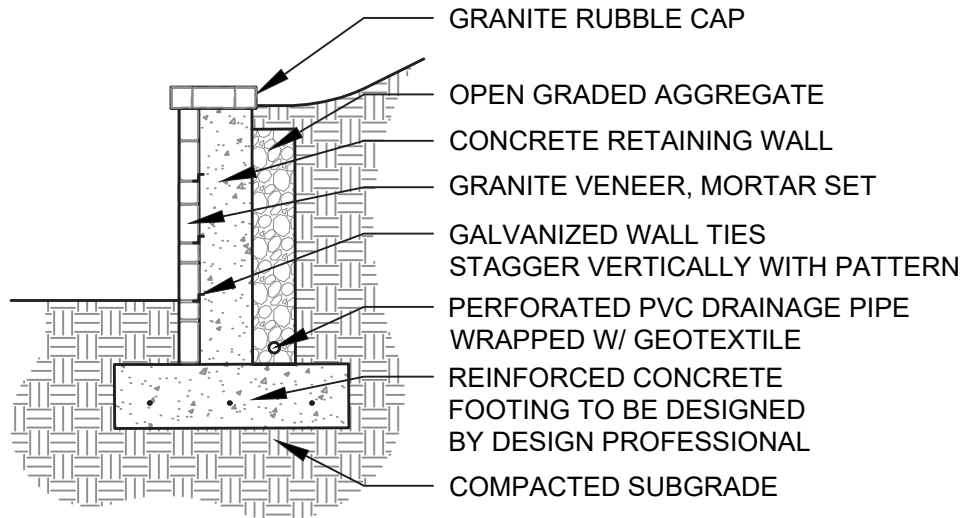


○ SOLID GRANITE RUBBLE RETAINING WALL
SECTION - NTS

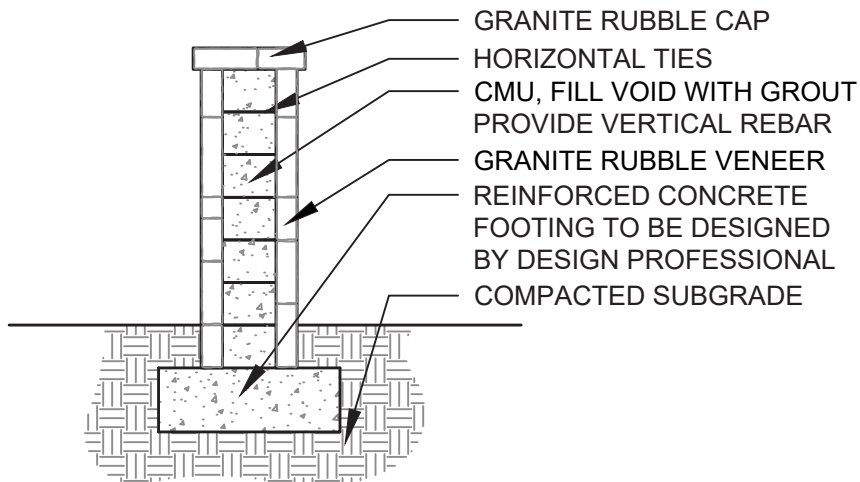


○ SOLID GRANITE RUBBLE FREE-STANDING WALL
SECTION - NTS

Note: Behind wall drainage piping shall be coordinated with civil drawings



⊙ GRANITE VENEER CONCRETE WALL
SECTION - NTS



⊙ GRANITE VENEER CMU WALL
SECTION - NTS

320000 - Site Seating & Tables



1.01 General

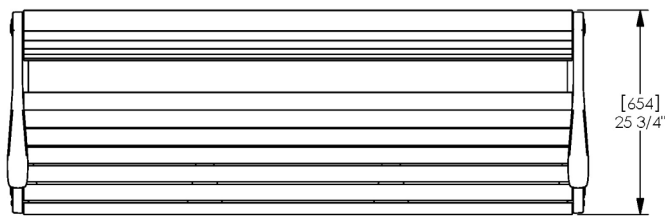
- A. Site seating comes in many forms including benches, tables w/ chairs, and even walls. The appropriate seating type depends on the site use. Along circulation routes and small intimate plazas benches should be the primary seating type. Larger plazas and gathering spaces should utilize tables w/ chairs as the main seating opportunity. Site walls can be used in conjunction with either of these to provide additional seating.

2.01 Design Guidelines

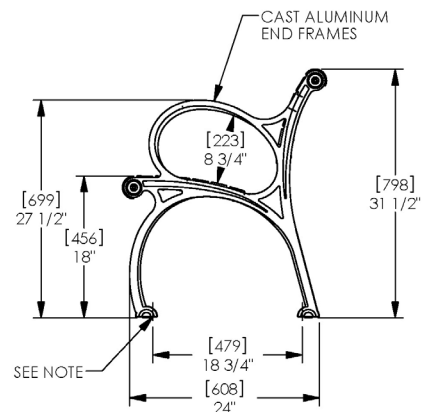
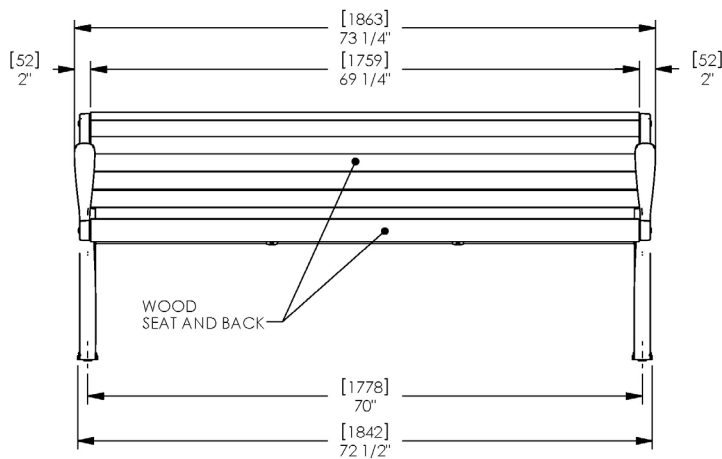
- A. All site walls used for seating shall be 18" in height.
- B. Benches should be set off of paths and plazas, and be bordered by landscape plantings.
- C. Bench pads are to be 4' x 8' campus standard slate pavement w/ 8" pavement band edge to match adjacent pavement. Align edge w/ walkway bands when possible.
- D. Tables are to be spaced to provide a minimum of 6' between edges.

3.01 Campus Standard Traditional Bench

- A. Manufacturer: Landscape Forms
- B. Product: “Plainwell” 72” W/ no center arm, wood slats, aluminum frame
- C. Finish: Frame: Bronze powder coat
- D. Slats: Ipe

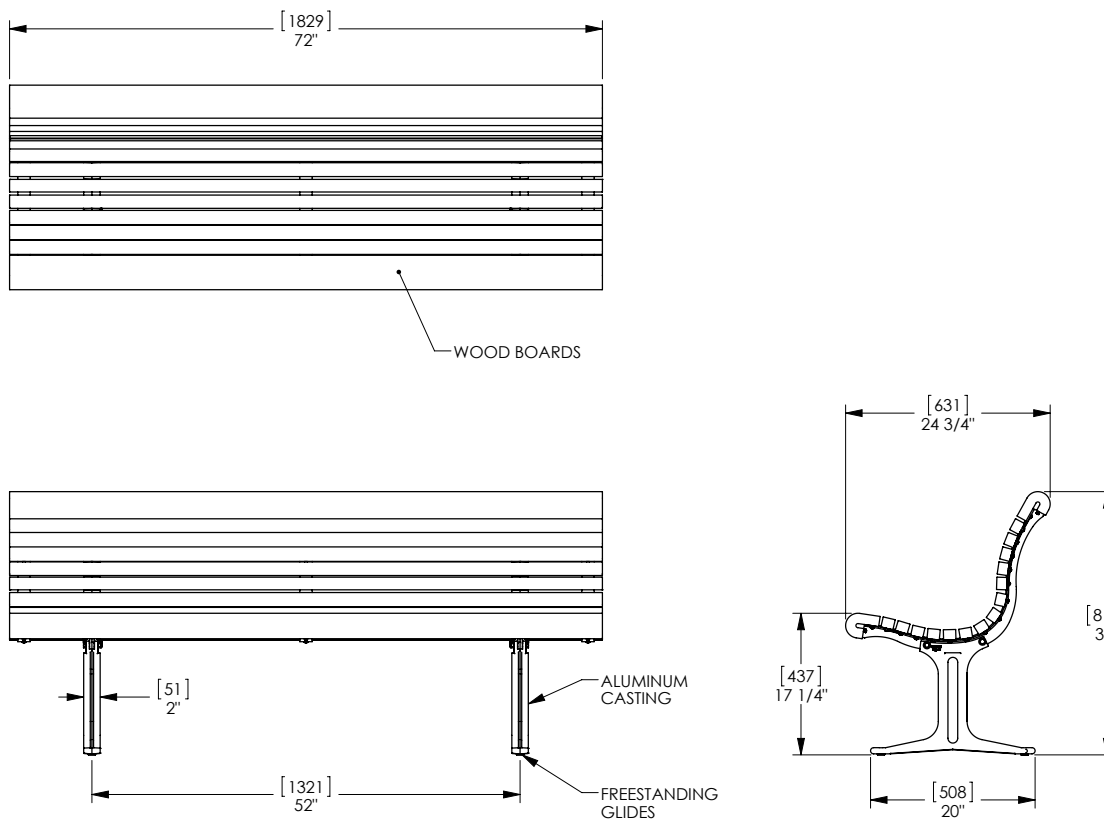


NOTE:
 FREESTANDING OR SURFACE MOUNT
 OPTIONS. CORROSION-RESISTANT
 ANCHORING HARDWARE SUPPLIED BY
 OTHERS. Ø13/32" HOLES WITH COUNTERBORE
 PROVIDED FOR SOCKET HEAD CAP SCREWS.



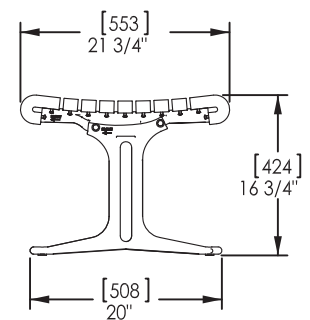
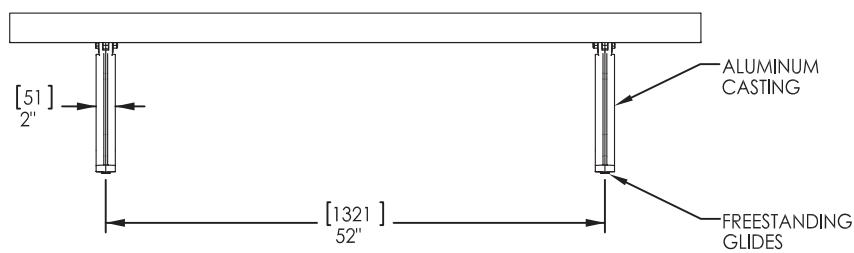
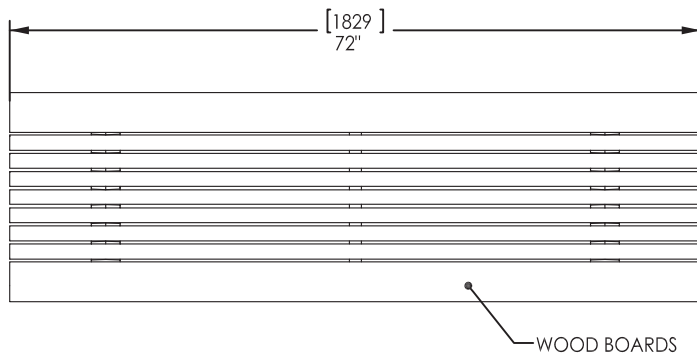
4.01 Campus Standard Contemporary Bench

- A. Manufacturer: Landscape Forms
- B. Product: “Gretchen” 72” W/ back & no arms, wood slats, aluminum frame
- C. Finish: Frame: Bronze powder coat
- D. Slats: Ipe



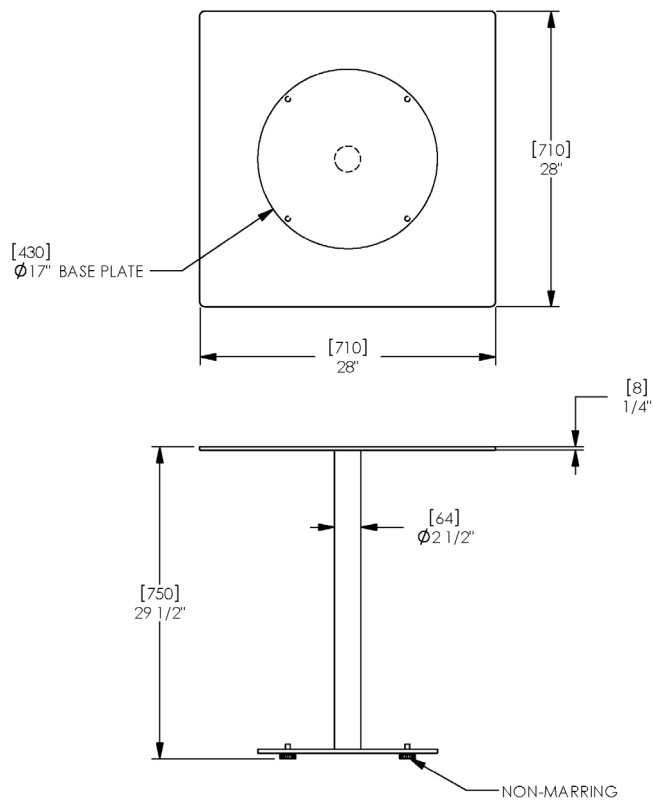
5.01 Campus Standard Contemporary Backless Bench

- A. Manufacturer: Landscape Forms
- B. Product: “Gretchen” 72” W/ back & no arms, wood slats, aluminum frame
- C. Finish: Frame: Bronze powder coat
- D. Slats: Ipe



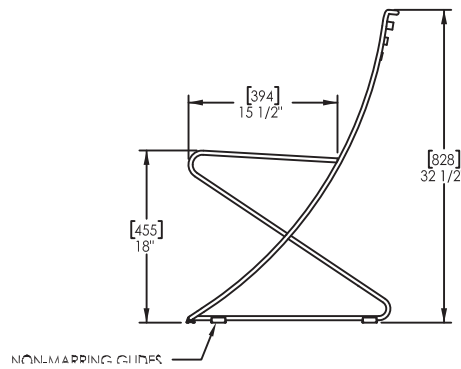
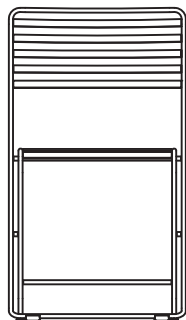
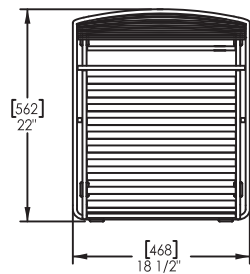
6.01 Campus Standard Movable Table

- A. Manufacturer: Landscape Forms
- B. Product: “Parc Centre” 28” Square
- C. Finish: Silver powder coat



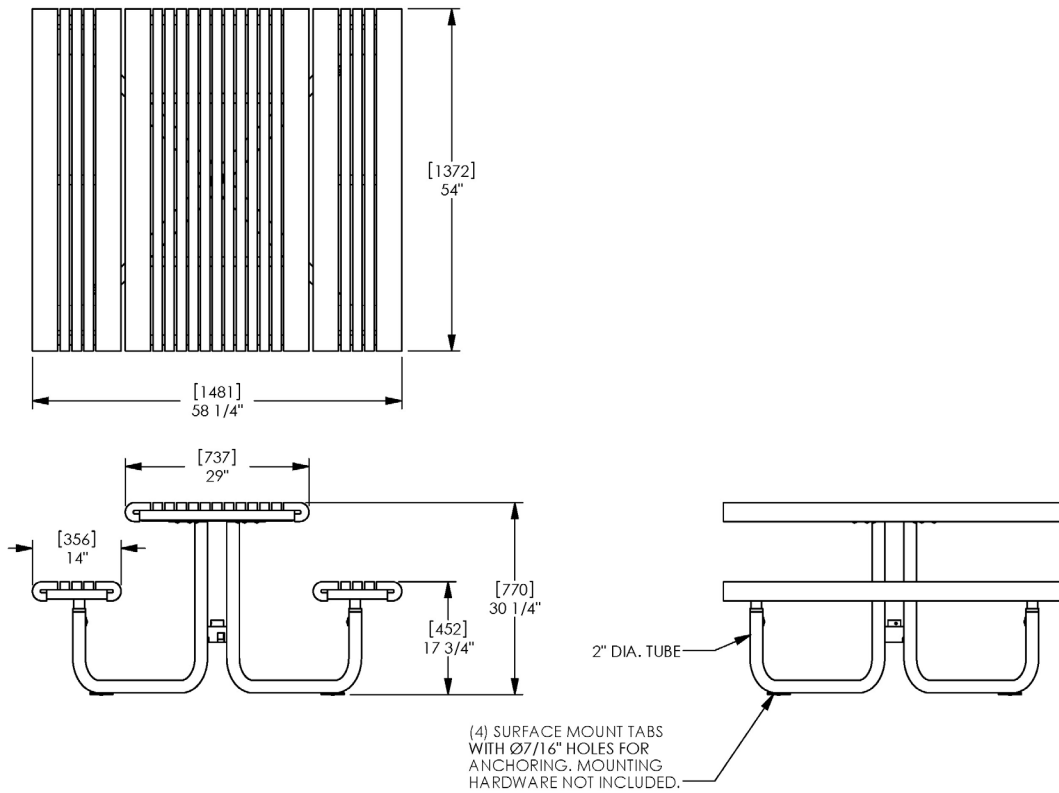
7.01 Campus Standard Movable Chair

- A. Manufacturer: Landscape Forms
- B. Product: “Parc Centre Chair” , w/o arm rests
- C. Finish: Silver powder coat



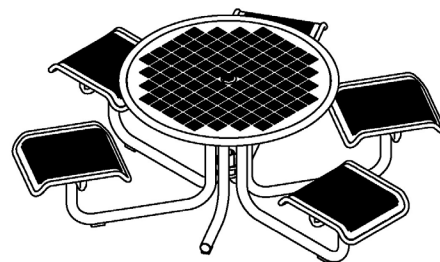
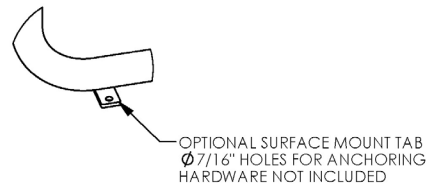
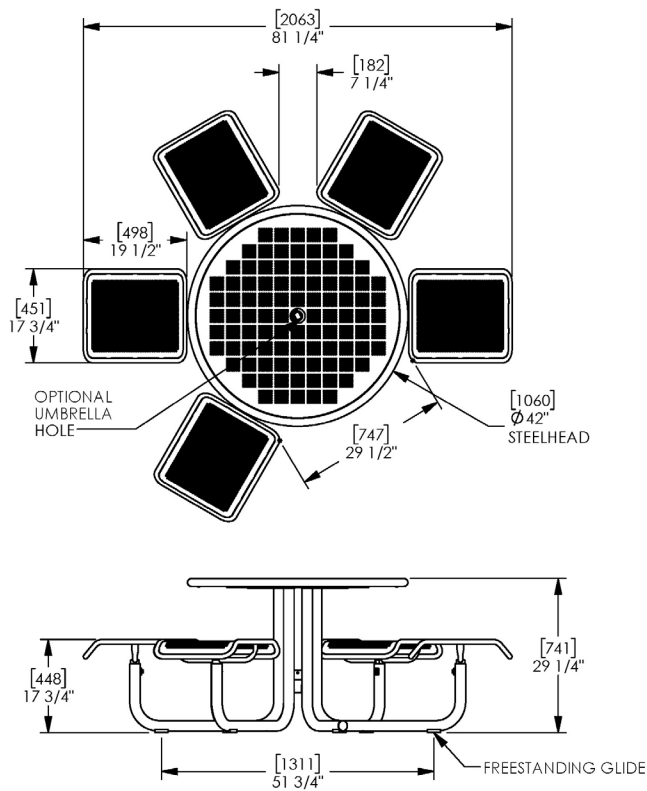
8.01 Campus Standard Traditional Fixed Table

- A. Manufacturer: Landscape Forms
- B. Product: “Gretchen” wood slats, metal frame
- C. Finish: Frame : Bronze powder coat
- D. Slats: Ipe



9.01 Campus Standard Contemporary Fixed Table

- A. Manufacturer: Landscape Forms
- B. Product: “Carousel” Dining backless w/ 5 seats & perforated top
- C. Finish: Bronze powder coated



323119 - Ornamental Fencing and Gates



1.01 General

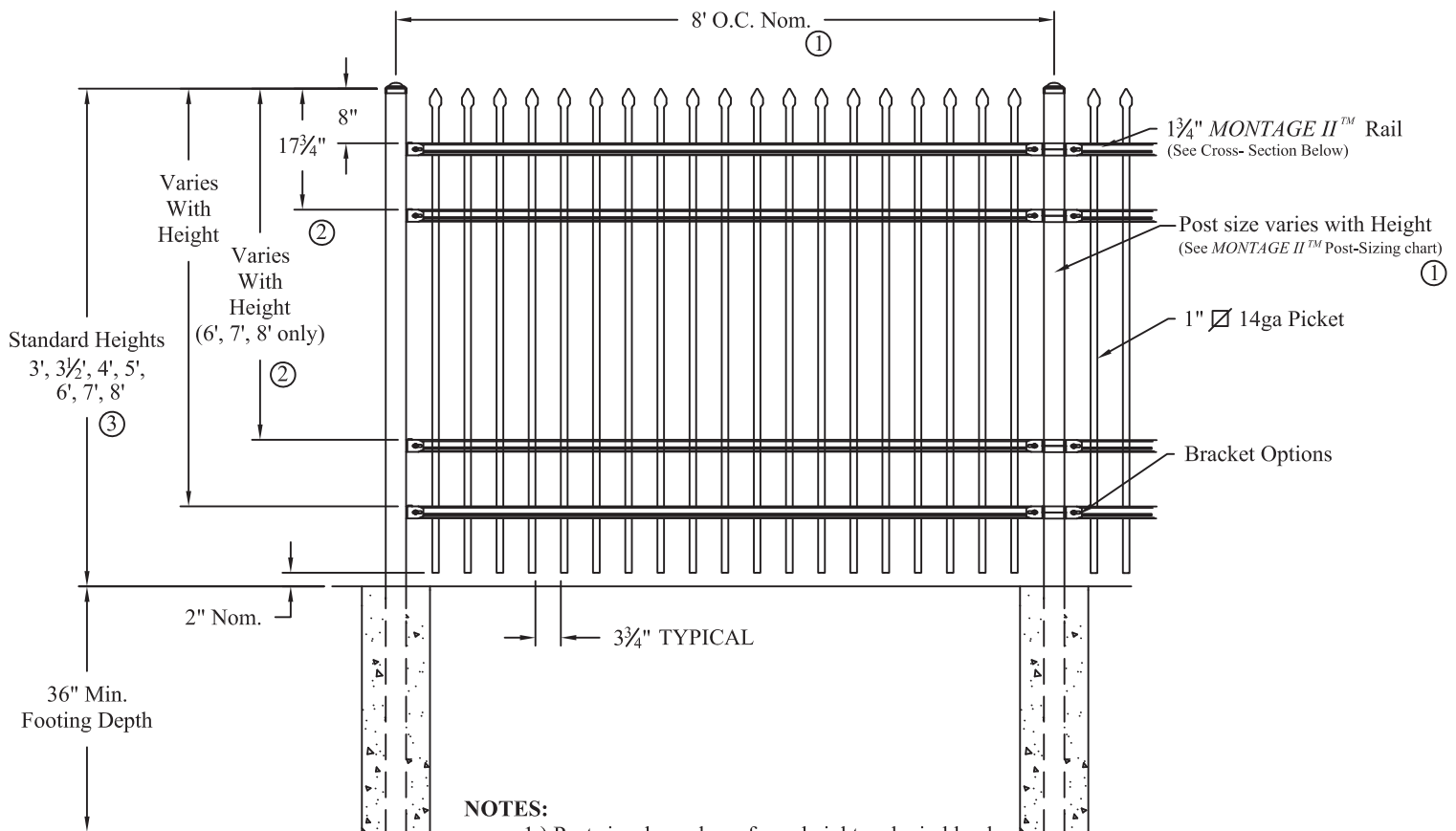
- A. Fencing is not only used as a physical barrier, but as a visual delineation as well. Whether fencing is being used for security, screening, or any other function it should be aesthetically pleasing, and serve to tie the site into the overall campus landscape.

2.01 Design Guidelines

- A. Height of fence is to be determined by application. Fencing for security purposes will be 8' in height. All other fencing is to be 7' in height.
- B. Fences can be fastened to the top of site walls (2' max height). Top of wall fences will still be required to meet standard height (measured from bottom of wall.)
- C. Fencing will follow grade, and not step. The only exception is top of wall fencing when the wall is required to step.

3.01 Campus Standard Ornamental Fence

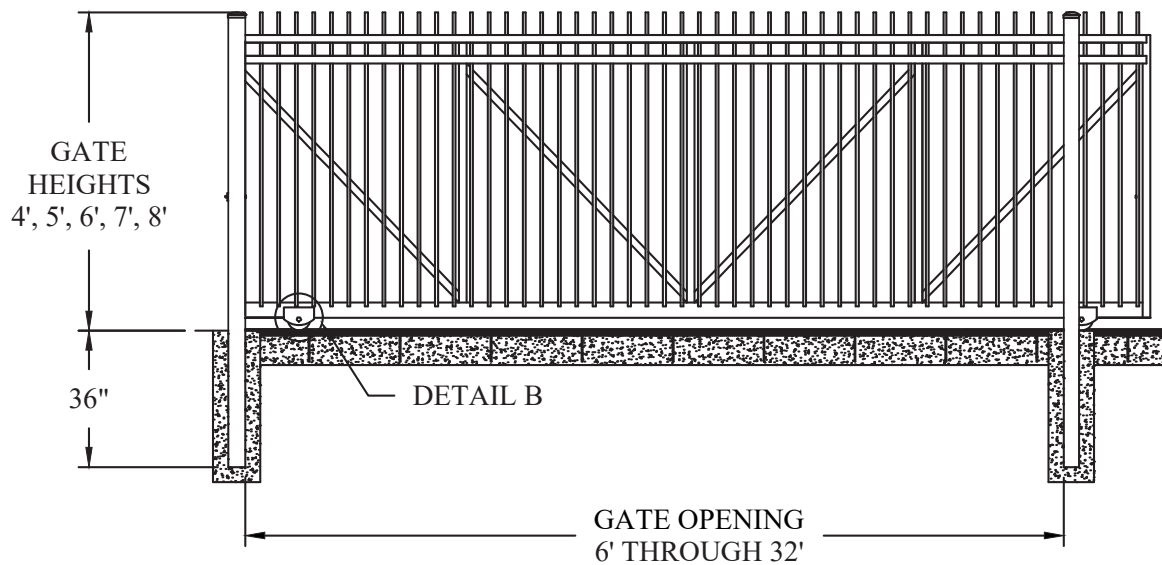
- A. Manufacturer: Ameristar
- B. Style: Montage II, Classic style, 3- Rail
- C. Height: 7' Standard; 8' Security fencing
- D. Color: Black



- NOTES:**
- 1.) Post size depends on fence height and wind loads. See MONTAGE II™ specifications for post sizing chart and setting dimensions.
 - 2.) Third & Forth rail optional.
 - 3.) Available in Flush Bottom.

4.01 Campus Standard Security Gate

- A. Manufacturer: Ameristar
- B. Style: PassPort Commercial, Genesis style,
- C. Height: 7' or 8'
- D. Color: Black



323313 - Bicycle Racks/Bike Parking



1.01 General

- A. Providing expanded bicycle facilities on the Georgia Tech campus is one way to promote bicycle ridership and support the institute’s goal of increasing cycling on campus.

2.01 Design Guidelines

- A. Coordinate bicycle facilities with the Georgia Tech Campus Bicycle Master Plan publication.
- B. Where possible provide secure bicycle racks within 200 yards of a building entrance for 5% or more of building users measured at peak periods. Ten percent of the required secure bicycle racks shall be located within 50 feet of a building entrance.
- C. Provide no less than 10 spaces per rack.
- D. Where there is more than one building on a site or where a building has more than one main entrance, locate short term bicycle parking to serve all buildings or entrances.
- E. Locate short term parking in highly visible locations.

- F. Provide the minimum required parking spaces as indicated by the following chart. Phasing the implementation of the required number for a project is permissible, but in no case shall the first phase be less than 66%.

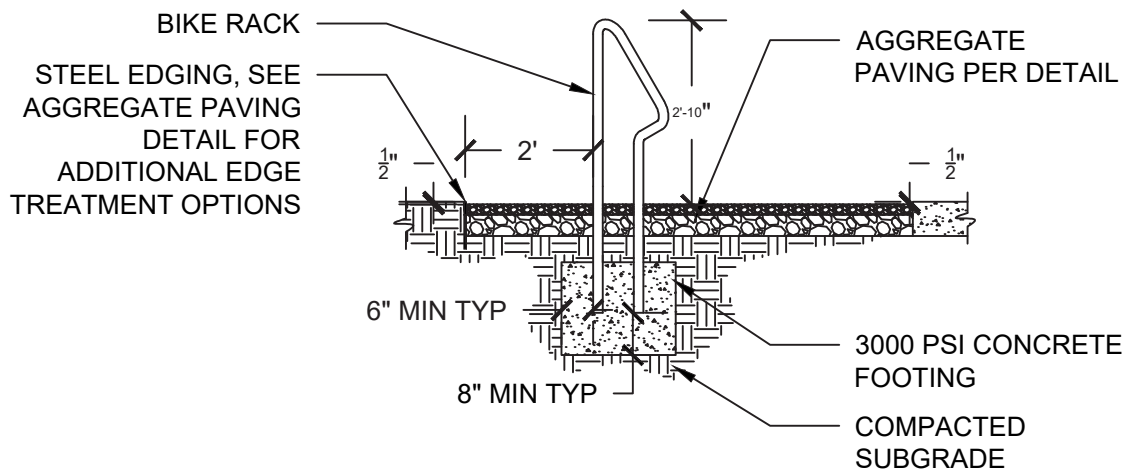
BUILDING TYPE	LONG-TERM SPACES	SHORT-TERM SPACES
Classroom Buildings	2 per 20,000 sf of net building area or 1 per 15 staff/researchers, whichever is greater	1 per 12 seats
Dining Halls	2 per 20,000 sf of net building area or 1 per 15 staff/researchers, whichever is greater	2 per 5000 sf of net building area or 1 per 15 seats, whichever is greater
Mixed Use Buildings	2 per 20,000 sf of net floor area	2 per 10,000 sf of net building area
Multi-Family Housing	1 per 4 units	2 per 20 units
Offices and Laboratories	2 per 20,000 sf of net building area or 1 per 15 staff/researchers, whichever is greater	2 per 40,000 sf of net building area or 1 per 30 staff/researchers, whichever is greater
Residence Hall	1 per 6 residences	2 per 20 units

3.01 Campus Standard

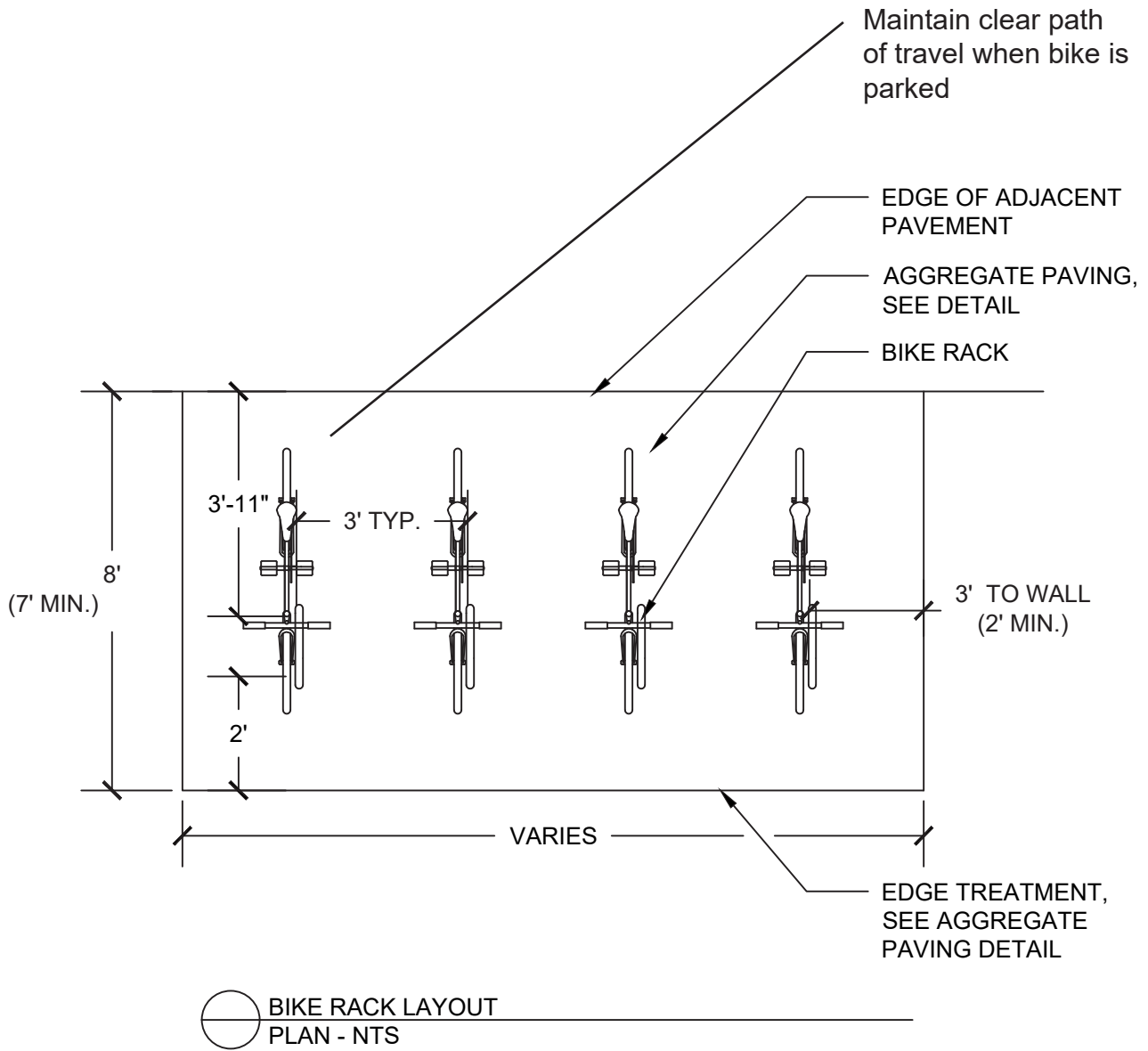
- A. Product: Dero Swerve Rack
- B. Manufacturer: Dero, a Playcore Company
- C. Product Number: 1.9” o.c. diameter schedule 40 pipe, in ground mount
- D. Finish: Stainless steel
 - 1. Bicycle racks shall provide a parked bicycle with 2 points of support and accommodate a U-shaped locking device.
 - 2. Racks located in the public right-of-way shall conform and be permitted by the City of Atlanta.
 - 3. Bicycle racks to be in-ground mounted in aggregate paving. See Aggregate Paving specification.
 - 4. Surface mount option only on slopes of 2% or less.
 - 5. Bicycle racks shall be separated from car parking by a physical barrier to protect bicycles from damage by cars. Provide an aisle of at least 5 feet between rows of bicycles. Provide a minimum distance of 3 feet between racks. The minimum dimensions of a bicycle parking space shall be 2 feet by 6 feet.

6. Bicycle rack location shall provide the following setbacks at a minimum:

- a. crosswalk: 10 feet
- b. public stairs: 10 feet
- c. street curb: 5 feet
- d. bus stop, shelter: 5 feet
- e. loading zone: 5 feet
- f. fire hydrant: 5 feet
- g. street tree: 5 feet
- h. tree in pavement: 5 feet
- i. kiosks: 5 feet
- j. light or sign pole: 3 feet
- k. newspaper rack: 3 feet
- l. mailbox: 3 feet
- m. trash or recycling can 3 feet
- n. bench: 3 feet
- o. utility meter, manhole: 3 feet
- p. building wall: 2 feet
- q. major doorway: 10 feet
- r. minor doorway: 5 feet



BIKE RACK
SECTION - NTS



Designs with multiple rows of racks shall include minimum clear aisle distance of 60"

323343 - Trash & Recycling Receptacles



1.01 General

- A. Trash and recycling receptacles are a necessary part of every campus. Receptacles should be located at major gathering spaces where they enter circulation routes (building entrances, plaza entrances, bus stops, etc.)

2.01 Design Guidelines

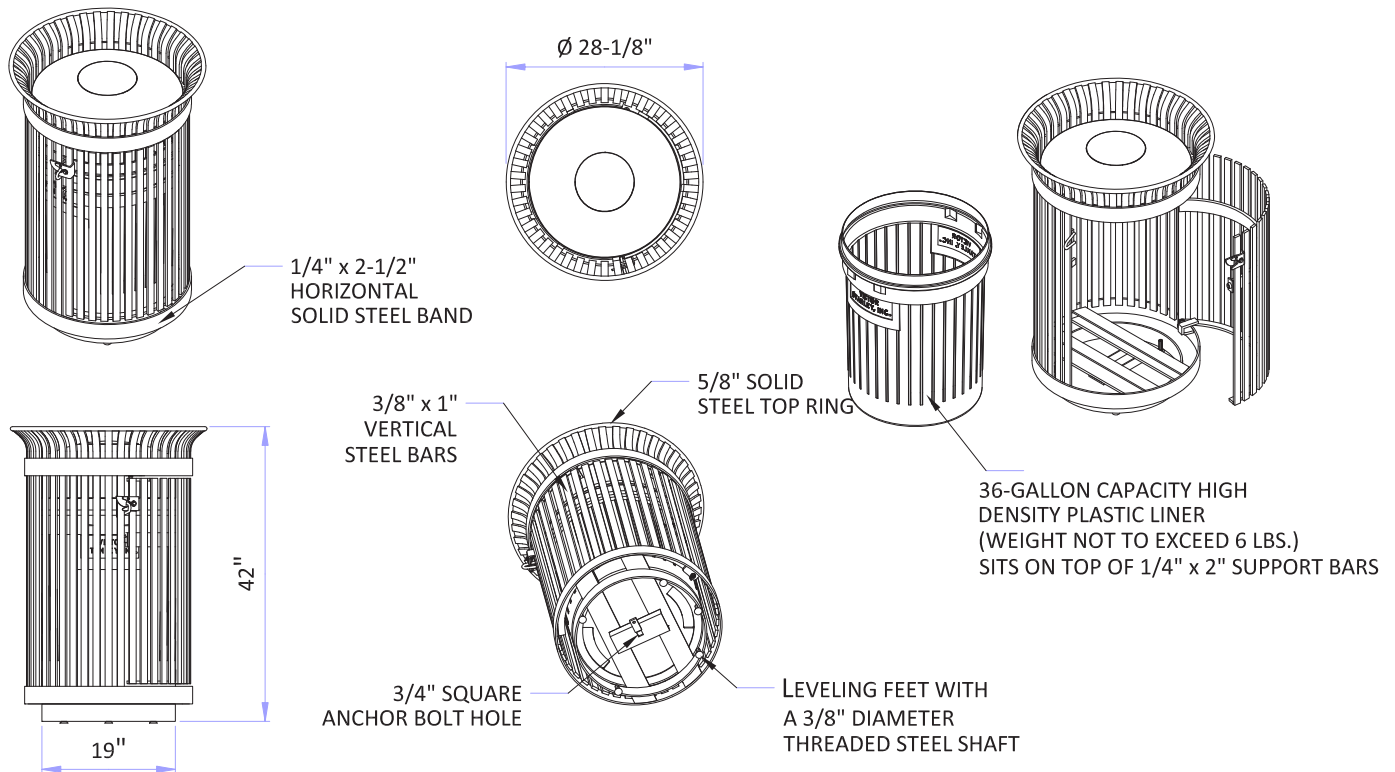
- A. Trash and recycling receptacles are always to be located together.
- B. Multiple, specific recycling cans can be used when necessary.
- C. No receptacles should be located closer than 10' to any seating element.
- D. Receptacles are to be centered on, and fastened to a 4' x 8' pavement pad with concrete anchor. Pavement should match the adjacent treatment or work with the overall site design.
- E. Trash and recycling areas should blend into the site design and be bordered by landscape plantings on at least 2 sides.

3.01 Campus Standard Trash/Recycling Receptacle

- A. Manufacturer: Victor Stanley
- B. Product: "SD-42" w/ dome lid, & in-ground mount. Recycling cans to include standard recycling plaque and decal
- C. Finish: Trash: Bronze
Recycling: Green

•

* ALL DIMENSIONS ARE IN INCHES *



AVAILABLE OPTIONS:

POWDER COATING

10 STANDARD COLORS, 2 OPTIONAL METALLIC COLORS,
CUSTOM COLORS (INCLUDING THE RAL RANGE)

SECURITY

STANDARD WITH LOCKABLE LATCH (AS SHOWN), AVAILABLE
WITH OPTIONAL KEYED LOCK BOX, OPTIONAL TRIANGLE
LOCK BOX. LID BOLTED IN PLACE, AVAILABLE WITH
OPTIONAL MOUNT WITH 3 IN-LINE ANCHOR HOLES AND
OPTIONAL BOTTOM PLATE COVER.

LIDS

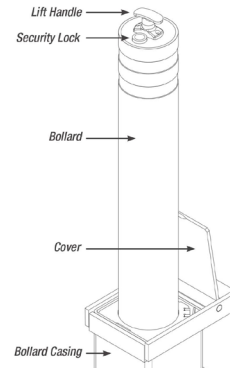
STANDARD TAPERED FORMED LID. AVAILABLE WITH OPTIONAL DOME LID,
DOME LID WITH STAINLESS STEEL ASHTRAY, CONVEX LID, CONVEX LID
WITH SELF-CLOSING DOOR (AS SHOWN), RAIN BONNET LID, RAIN BONNET
LID WITH STAINLESS STEEL ASHTRAY, AND RECYCLE LIDS. ASHTRAYS
AVAILABLE WITH OPTIONAL ASHTRAY COVER.

CUSTOM PLAQUES & DECALS

AVAILABLE WITH STEEL PLAQUES IN VARIOUS SIZES AND PRESSURE SENSITIVE
VINYL OUTDOOR DECALS.

Touch-up paint to be Sherman-Williams 991 Bronzitone Industrial Enamel Gloss

323900 - Security Bollards



1.01 Application

- A. Bollards can be used to control vehicular traffic flow in the pedestrian and bicycle corridors that run through the Georgia Tech campus. Bollards shall be retractable to allow for service and emergency vehicle access.

2.01 Campus Standard

- A. Product: Retractable manual traffic bollard
- B. Manufacturer: Ameristar Security Products/ATG Access
- C. Product Number: 963221-US-35.5, 36" high, 6" diameter, in ground mount
- D. Key: cylinder #00076
- E. Finish: Bronze powder coated

328000– Irrigation

1.01 General

- A. The work consists of providing a fully operational irrigation system, consisting of furnishing all labor, materials, accessories, services and equipment necessary for the complete installation of the following items of work, as shown on the Drawings and/or specified herein, including, but not limited to, the following:
- B. Irrigation system, completely installed as noted on Irrigation Drawings.
- C. All necessary automatic controller, rotary sprinklers, drip-line, wiring, piping, valves, spray sprinklers, air/vacuum relief valve, isolation valves, sleeves and all appurtenances.
- D. Conduit for irrigation control wire from externally mounted controller to below surface grade by irrigation contractor. Power for controller (110VAC) supplied by others, provide dedicated circuit for irrigation controller. Conduit and power wire from electrical source to exterior of building, at controller location, by electrical contractor.
- E. Trenching and backfilling for the irrigation system, including piping and wiring through walls and sleeves.
- F. Testing, instruction, operations and maintenance manual, inspection, co-ordination with site work, preparation of as constructed documents, clean up and disposal.
- G. First seasonal winterization and subsequent spring start up with Owners Representative present.

2.01 Submittals

- A. The Contractor shall maintain a current and continuous Record Drawing of the improvements as the project continues. During progress of work the contractor shall keep a daily field log, in writing, detailing extent and areas of that days' work, including quantities installed, of pipe, wire, valves, sprinklers, etc. Keep field log available on site for review by the Owner, Owners Representative and the Project Landscape Architect. Include a copy of the daily field log in record drawings, operation and maintenance manual. Record Drawings shall specify sprinkler type and nozzle for each sprinkler. Isolation valves, electric zone control valve, quick coupler valves and shall show location as-constructed document. Submit two (2) blueprint copies prior to acceptance, Manufacturer's literature and instructions for operation and maintenance of all sprinkler equipment including a replacement parts list with catalogue numbers. Include drip irrigation installation and maintenance procedures guidelines.
- B. Typewritten instructions for operation and maintenance of the complete system including process for start-up blow-out for winter and periodic adjustment, troubleshooting and maintenance of system.

- C. Upon Final Acceptance furnish three (3) copies of 'as built' drawings, in a vinyl covered loose-leaf binder (two inch minimum size) of accepted Record As Built Drawings to the Owner.
- D. The Contractor shall provide, within 15 working days of receipt of signed contract from Owner, two (2) copies of product specification sheets and shop drawings on all proposed equipment to be installed to the Owner's Representative. Begin no work until these submittals received, revised as needed and approved, in writing, by the Owner's Representative. The submittal sheets shall include, but not limited to:
 - 1. Various Sprinkler Types and Nozzles
 - 2. Swing Joints
 - 3. Electric valves
 - 4. Automatic Controller
 - 5. Quick Coupler Valves
 - 6. Polyethylene and drip-line piping
 - 7. Insert fittings
 - 8. Wire
 - 9. Valve boxes
 - 10. Materials / methods of waterproofing electrical connections below ground
 - 11. Materials / methods of marking and identifying zones in field
 - 12. Isolation valves
 - 13. Miscellaneous special fittings, parts or equipment
 - 14. Copy of dated irrigation specifications being used
 - 15. Copy of dated irrigation plans being used. (Reduced copy allowed)
- E. Submittals must be complete and shall clearly indicate the particular size and model numbers, flow rates, electrical characteristics, valve sizes, pressures and optional features provided.
- F. Furnish operating manual as specified in Article 1.15 of this Section.
- G. Furnish certificate and permits called for in this Section.

3.01 General Requirements

- A. Due to the nature of the Work, pipe routing must stay within the prescribed areas as noted on the plans.
- B. The Owner is not responsible, nor liable for damages or loss of material stored on site during construction. The Contractor shall provide and secure storage of materials on site.
- C. Coordinate with wall, edging divider installation, by others, to identify sleeve location(s) for irrigation pipe and wire installation.
- D. All necessary adjustments to avoid any obstacles in the field shall be made by the

Contractor with the concurrence of the Owner's Representative and the Project Landscape Architect.

- E. Locate on site, all interim storage of material for the irrigation system improvements and appurtenances, at the direction of the Owner.
- F. All work shall conform to any and all Conservation Commission Order of Conditions.
- G. Trench excavation, backfilling and bedding materials, together with the testing of the irrigation included in this work.
- H. All landscape irrigation shall be completed, that is all irrigation heads are installed and operational prior to planting installation. Landscape Architect to review and accept irrigation installation prior to the beginning of planting installation.

4.01 Design and Layout

- A. Prior to the installation of any section or unit of the irrigation system, inspect the site and with the Owners Representative, stake and clearly mark all proposed pipe routing. The Contractor, the Owner's Representative must all sign-off and approve in writing, in a pre-approved form provided by the Owner all pipe routing within the scope-of-work area.
- B. The layout of the irrigation system shall follow the schematic design shown on the Drawings as closely as possible. Make no alterations or changes in layout without review and approval in writing.
- C. Note location of all pipes, stake location and depth of all valves, sprinklers and piping in the field prior to installation for review by the Owner's Representative. Provide As-Constructed drawings, as herein specified to the Owner's Representative at the end of construction for review and approval, as a condition of acceptance.

5.01 Coordination

- A. The Contractor shall be responsible for the proper execution of their work as shown on the Drawings and hereinafter described. It shall be the Contractor's responsibility to coordinate his work closely with the Construction Manager and the Owner's Representative. The Contractor shall report to the Owner's Representative and the Project Landscape Architect any condition that may adversely affect their work.

6.01 Testing

- A. Test prior to the completion of the Work, the irrigation system in the presence of the Owner, Owner's Representative and the Project Landscape Architect. The tests shall clearly demonstrate that each and every part of the system function as specified and intended.

- B. Test piping prior to backfilling. Co-ordination expected and required. If temporary water is required to perform the test, the Owner will provide access to a temporary water source for the testing and acceptance.
- C. Adjust sprinkler head patterns as required to provide complete and adequate irrigation coverage of the areas and plants. Verify zone valve settings and sprinkler nozzle sizes.
- D. Test features of the irrigation controller system for satisfactory operation. Operate each zone of the controller for not less than three minutes or as requested by the Owner's Representative during which time, add each remaining zone to the cycle. If unsatisfactory performance develops, correct the condition and repeat the testing procedures until obtaining satisfactory operation.

7.01 Cleaning and Adjusting

- A. The inside of PVC pipes shall be pre-washed to remove any debris. Use a PVC pipe cleaner on the fitting ends prior to gluing.
- B. At the completion of the Work, clean all parts of the installation. Clean all equipment, pipe, valves and fittings of grease, metal cuttings and other containments that may have accumulated by the operation of the system for testing.

8.01 Protection

- A. The Contractor shall immediately notify the Owner's Representative when existing or new water or drainage appurtenances discovered broken or malfunctioning. Replace, in kind, damaged water or drainage appurtenances due to the Contractor's negligence at no additional cost to the Owner.
- B. It shall be the responsibility of the Contractor at the close of each day's work to block all open ends of installed water lines with an inflatable membrane or other type of plug, to prevent the introduction into the pipe of ground water, debris, animals, insects, and other contaminants.

9.01 Operation

- A. At a time designated by the Owner's Representative, the Contractor shall furnish the services of a competent operator to instruct the Owner and the Owner's Representative, in the maintenance and operations of all systems.
- B. Upon completion of the Work, furnish to the Owner's Representative, for review and approval, two (2) copies, of an operating manual containing approved Shop Drawings and Details and typewritten instructions relative to the care and operation of the equipment, all properly indexed and bound in a three-ring, hard-cover binder.
- C. Manufacturer's data where multiple model, type and size listing are included shall clearly and conspicuously indicate those that are pertinent to this installation, as follows:

- D. Description: Literature, drawings, illustrations, certified performance charts, technical data, and related information.
 - 1. Operation
 - 2. Maintenance, including complete troubleshooting charts
 - 3. Part's list
 - 4. Names, addresses and telephone number of recommended repairs and service companies
 - 5. Standard manufacturer's warranty data
 - 6. Irrigation specifications
 - 7. Accepted submittals
 - 8. As-constructed documents
 - 9. Two (2) copies (24" x 36") of the "as-constructed" documents fully labeled and referenced to the above. All valve locations shall be located from a minimum of three (3) fixed reference points.
 - 10. Provide reference and coordinate with RWRS opening and shut down procedures.
- E. Submit prior to approval, the operation and maintenance manual for review and acceptance, by the Owner's Representative. Approval of the O& M manual a condition required, prior to Owner's acceptance of the Work.
- F. Upon approval submit three (3) copies of the operations and maintenance manual to the Owner, as herein specified.

10.01 Guarantee

- A. The Contractor shall warranty the new materials and labor incorporated into the irrigation system for a period of one (1) year from the date of final acceptance by the Owner.
- B. Final acceptance requires acceptance of system operation, O&M manual acceptance, as-built drawings and Owners Representative instruction during programming services. Formal acceptance will be in written form delivered from the Owner, to the contractor and the date of said notice begins the one-year warranty period.

11.01 Products

- A. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system.
- B. All irrigation equipment shall be Hunter, Rainbird or Toro.
- C. All controllers shall be Toro Sentinel AC 2-wire Stainless Steel Pedestal Controller: SBA-PS1-U.
- D. All pipes and sleeving shall be PVC Schedule 40.

- E. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes allowed, but substitutions of larger size subject to approval. Remove all pipe damaged or rejected because of defects from the site at the time of said rejection.
- F. For warranty purposes, supply irrigation products from a local authorized distributor of the manufacturer's products and provide the name of the distributor in the O&M Manual.
- G. The Contractor shall supply all irrigation system materials unless otherwise noted.
 - 1. Copper pipe shall be used from the meter to after the backflow, to be installed by Contractor. Copper piping shall be soft, annealed, seam-less piping conforming to the requirements of Federal Specification WW-7-799, Type K.
 - 2. All fittings are to Schedule 40 solvent weld unless otherwise noted.
 - 3. Gate Valve: Isolation gate valves, zone isolation, shall be of a Brass Ball Valves, US Manufacturer with malleable iron handwheel. Gate Valves manufactured by Nibco, Model T-113, threaded or approved equal. Each zone will have a ball valve associated with the zone for isolation and maintenance. Locate ball valve in the same valve access box inches of the Isolation valve and electric valve shall be the same size. Drain valves shall use same gate valve, drain into gravel sump below level of zone control valve.
 - 4. Electric valves for rotor zones and spray zones (set at 30 psig) shall be Rain Bird – PEB Series Valves only. Use Rain Bird valve-identifying tags model VID1P24 for each valve and wire, or approved equal. Tag and identify all zone wires, at junction boxes as to the zone number and controller used.
 - 5. Encase all control valve assemblies in plastic valve box. All bodies shall be black in color; covers shall be colored as indicated herein. Valve boxes for quick coupler valves (tan lid) shall be 10 inch round valve boxes as manufactured by Rain Bird, or approved equal. Valve boxes for zone control valves (tan lid) shall be standard 12-inch rectangle in shape, as manufactured by CARSON. Provide valve box extensions as required insuring proper grade and depth.
 - 6. Coupler valves and couplers shall be a two-piece valve of red brass and stainless steel, with a non-potable purple rubber cover. The coupler shall be Rain Bird Model # 33DNP, double track key lug, rubber cover, 2 piece body, 3/4 inch. Provide two (2), # 33DK (3/4") coupler keys and two (2) # SH-0, hose swivel, by Rain Bird. Install quick couplers on PVC prefabricated swing joints, with minimum of three (3) elbows and two (2) nipples. Swing joint length twelve (12) inch minimum. Include anti-rotation wing, manufactured by Leemco Model LS-100, or approved equal. The couplers shall be housed in valve access box, as herein specified, for ease of use and locating.
 - 7. Rotor sprinklers shall be Hunter MPR40-CV with MP Rotator nozzles radius as noted on the drawings at 40 psig; install with flex pipe for swing points. Spray sprinklers shall be Rain Bird 1812-PRS-SAM sprinklers, nozzles as noted on the drawing at 30 psig; install with flex pipe for swing joints.

8. All wire connections shall be waterproofed with 3M DBY-6 splice kits or equal per 3M recommendations for the wire voltage and size being used. Make all wire spliced in valve boxes unless otherwise noted in these specifications.
9. All grounding wire connections shall be made using 3M Type DBY-6, DBR-6 or 3M 3570 direct burial connectors.
10. Flow sensors to be Toro TFS Series, wired with P7162D Communication Cable.
11. Single Station Decoders, per valve, to be Toro SB-DAC-1; Line Surge Decoder to be SB-BLA grounded to rod every 600’.
12. Master Valve to be Toro P 220 series.
13. Wireless Rain/Freeze Sensor to be Toro TWRFS

12.01 General Construction

- A. Examine all Project Documents noting any discrepancies and bringing them to the attention of the Owner and the Owner Representative for a timely resolution.
- B. All materials to be incorporated in this system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the system. All material coverages at the completion of the installation are the property of the Contractor and remove from site. Pipe sizes shall conform to those shown on the drawings. No substitutions of smaller pipe sizes allowed but substitutions of larger size subject to approved. Remove all pipe damages or rejected because of defects from the site at the time of rejection.
- C. All excavation and backfill operations shall conform to the details shown on the Drawings and the applicable provisions specified.
- D. Pipe shall be laid in trenches to the proper lines and grades established only where accepted by the Project Landscape Architect. Prior to placing the pipe, the trench shall be graded and prepared to provide a firm and uniform bearing throughout the entire length of the pipe barrel. During backfill operations the pipe shall be rigidly supported so that no movement of or damage to the pipe or joints will occur.
- E. Caution tape shall be used in the pipe trench, laid above the pipe line to minimize damage in the event of latter digging or excavation in the area.
- F. Prevent foreign material from entering the irrigation system during installation. Immediately prior to assembling, clean all pipes, valves and fittings. Plug or cap all unattached ends of pipe, fittings and valves pending attachment of additional pipe or fittings, overnight or during breaks in work. Do not lay pipe or wire out above ground, prior to installation, to prevent interference with other Work. Should water enter the trench during or after the installation of the piping, install no additional piping or backfilled until all water is removed from the trench. Do not install pipe when temperature is at 35 degrees F or below, (follow manufacturer’s recommendations). Snake pipes in the trench to accommodate expansion and contraction due to temperature change according to manufacturer’s recommendations and guidelines.

G. Install all valves as detailed where shown on the Drawings

H. Excavation/Installation of piping and fittings

1. Make all pipe connections in strict accordance with manufacturer's recommendation. Maximum deflection per joint shall not exceed manufacturer's recommendations. Provide for expansion and contraction as recommended.
2. In installing irrigation pipe the contractor shall route the pipe as necessary to prevent damage to tree and plant roots. When digging must occur near trees or within drip lines, refer to previous section of the specifications regarding notification to Project Landscape Architect of pipe route and potential tree damage.
3. Throughout the guarantee periods, it will be the responsibility of the Contractor to refill any trenches that have settled due to incomplete compacting. It shall not be the Contractor's responsibility to refill and compact trenches that have eroded by natural rainfall and runoff after acceptance of the system.
4. Contractor shall be responsible for repairing existing paths and road crossings as herein specified where irrigation work results in damage.
5. Pipe shall be cut straight and true. After cutting, the ends shall be reamed out to the full inside diameter of the pipe and all burrs removed prior to the solvent weld (gluing) of the schedule 40 fittings. Solvent welds are to be executed as per manufacturer's recommendations.
6. Before any portion of the pipeline is backfilled to completion, (providing said backfill does not cover any fittings and/or joints), water shall be turned into that portion of the line and maintained at full pressure for a period of not less than one hour after all air has been expelled from the line. The Contractor shall repair leaks that develop in the installed system at no additional cost to the Owner. The pipe shall be plugged or capped where sprinklers are to be installed while making this test. The tests shall continue until approved by the Owner's Representative.

I. Wiring

1. Wherever splices are made, they shall be placed in a valve box, as herein specified. All main line branch connections must be placed in a valve box. Sufficient slack must be left at each connection and splice to allow connectors to be lifted a minimum of one foot above finish ground level. All wires in a valve box shall be permanently identified as to their routing direction or units they feed using permanent marking pens.
2. Underground splices shall be made in accordance with National Electrical Code Articles
3. (Underground Installations) and (Electrical Connections) using 3MDBY-6 or DBR-6 connectors, which are UL, listed under "UL486D-Direct Burial", for wet or damp locations, 600 volts.
4. All wire connections shall be waterproofed with 3-M DBY-6 splice kits of the appropriate size.

J. Valves

1. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with the convenient of operating the hand wheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortions and strain or appurtenances during handling and installation. All material shall be carefully inspected for defects in workmanship and materials, all debris and foreign material

cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning and all nuts and bolts checked for tightness. Valves that do not operate easily or are otherwise defective shall be replaced or repaired at the Contractor's expense.

2. Valves shall not be installed with stems below the vertical.
3. Valves shall be set plumb and supported adequately in conformity with instructions of the manufacturer.
4. Control valves in pipelines shall be installed in valve boxes extending from grade to valve body. Each valve box shall be located and labeled on Record Drawings.
5. All zones shall have the ability to be individually isolated.
6. Install isolation valves on mainline where indicated on the drawings. Install all isolation valves on a level crushed stone base so that they can easily be opened and closed by hand or with the appropriate valve wrench.

K. Valve Box Installation

1. Furnish and install a valve access box for each isolation gate valve, wire splices, electric valves, and quick coupler valves as herein otherwise specified.
2. Valve access boxes shall be installed as detailed.
3. Provide valve box extensions as required on all valve boxes to insure valve box cover shall be at grade.

L. Piping

1. Drawings are generally diagrammatic and indicative of work to be installed. Run and arrangement of piping shall be approximately as indicated, subject to modifications as required to suit conditions, to avoid interference with Work of other trades, or for proper, convenient and accessible location of all parts of piping systems as determined by the Owner's Representative and the Project Landscape Architect. Refer to and carefully check all Drawings and Details noting conflicts with Work of other trades and arrange Work accordingly; furnishing all offsets, fittings, valves, drains and other parts required accommodating such conditions.

M. Sprinklers

1. A. Sprinklers shall be installed as indicated on the Drawings and as herein specified.
2. B. Properly flush all piping before installation of sprinklers.

N. Irrigation Controller

1. A. Irrigation Controller shall be Toro and must have a flow meter installed to Toro specifications.

O. Construction and Inspections

1. Adjust sprinkler heads and valve boxes to grade.
2. Height adjustment to the equipment shall be performed as required by settlement, etc., throughout the guarantee period.

3. Each new control zone shall be operated for a minimum of five (5) minutes and all sprinklers checked for consistency of water application. The contractor shall check each sprinkler for proper nozzle and adjust to minimize overspray.
 4. All damage heads shall be flagged and replaced immediately.
 5. Entire system shall be adjusted to assure compliance with manufacturer's recommendations and the intent of the Project Documents.
 6. The location of controls, valves, piping, sprinklers, etc., shall be staked by the Contractor and reviewed by the Owner's Representative.
 7. The system shall have a minimum of three inspections. The system shall be inspected by the Owner's Representative, Irrigation Designer/Consultant and Landscape Architect prior to burial of pipe and wire. A second inspection by the same after the controller is installed and a final inspection.
 8. Contractor shall work closely with the various manufacturers to coordinate all phases of construction and installation. The Contractor shall secure the services of manufacturer's representatives to work with them, on site, in the installation and programming of the irrigation control system, as required.
 9. Upon completion of the improvements and prior to final acceptance by the Owner, the Contractor in conjunction with the supplier shall furnish, in addition to the Record Drawings and Maintenance and Operating Instruction Manuals, copies of all available specification sheets, catalogue sheets, and parts lists to the Owner.
 10. Upon completion of the improvements and acceptance by the Owner, the Contractor in conjunction with the supplier shall train appropriate personnel designated by the Owner, in the system operating procedures, distribution adjustments, zone pressure adjustments, and programming of irrigation control systems.
 11. Upon completion of the improvements and before acceptance by the Owner, the Contractor shall turn over all required spare parts and release of lien forms to the Owner.
 12. Contractor shall guarantee all parts and labor for a minimum period of one (1), year from date of final acceptance by the Owner. The Contractor, at no additional cost to the Owner, shall service the irrigation request as follows:
 - a. Major failure, response within 24 hours
 - b. Major failure is defined as failures that cause the system to be inoperable, i.e., mainline break, controller failure, wiring failure, loss of ability to water.
 - c. Minor failure, response within 72 hours
 - d. Minor failure is defined as failures that only incapacitate a small part of the system, i.e., sprinkler heads, valve, and lateral line.
- P. Contractor shall make all changes within a one year period that are required to put the system proper condition and operation, without additional cost.

- Q. Within the one year warranty period if settlement due to improper compaction and backfilling occurs and adjustments in pipe, valves and sprinkler heads or other equipment is necessary to bring the system to proper level of permanent grades, the Contractor shall make all adjustments without additional cost to the Owner, unless the Owner specifically agrees to the contrary in writing.
- R. Final Acceptance will occur one year after Substantial Completion. At the end of this one year warranty period, the Contractor shall leave the entire installation in complete working order, free from any and all defects in materials, workmanship or finish regardless of any discrepancies and/or omissions in Drawings or Specifications.
- S. If under the warranty period, sprinklers become stuck on or clogged due to improper flushing of the piping system during installation, the Contractor shall clean, repair and replace these sprinklers as needed without additional cost to the Owner.
- T. Contractor shall be responsible for the first shut down in the autumn, including blow-out, as well as the start-up in the following spring, including any adjustment in the sprinkler heights and zone pressure adjustments. Contractor shall work closely with the various manufacturers to coordinate all phases of construction and installation.
- U. Contractor shall be aware that other work in adjacent areas by other contractors under other contracts may be under construction at the same time as their Work. Contractor shall make every effort to coordinate irrigation work with the ongoing adjacent work by others. When and where conflict exists the Contractor shall notify the Owner's Representative and the Project Landscape Architect of said conflict and shall cooperate with all parties to resolve said conflict.
- V. In the event that earthwork, planting or work in adjacent areas by others is dependent upon the timely completion of the irrigation system, the Contractor shall schedule irrigation work in a manner compatible with the ongoing work by others. Coordinate all scheduling with the Owner's Representative. The scope of work requires that the irrigation contractor shall be on-site during various phases of construction. Install sleeves as site condition progress through primary grade; lateral piping, as field installation is ongoing or completed.
- G. Construction Documents
 - 1. A. Contractor shall provide to the Owner, all As-Built Documents as required and herein specified.
 - 2. B. Contractor shall provide three (3) copies of the Maintenance Manuals and "As-Built" Documents as herein specified to the Owner.

END OF SECTION- IRRIGATION

329113 - Soils

1.01 Application

- A. Typical campus soils are sandy clays, classified as Urban and are compacted, lack structure and organic material. The proper preparation of soils is crucial to the survival of proposed plantings. Plant life is greatly dependent on volume, physical properties, and chemical properties of soil.

2.01 Design Guidelines

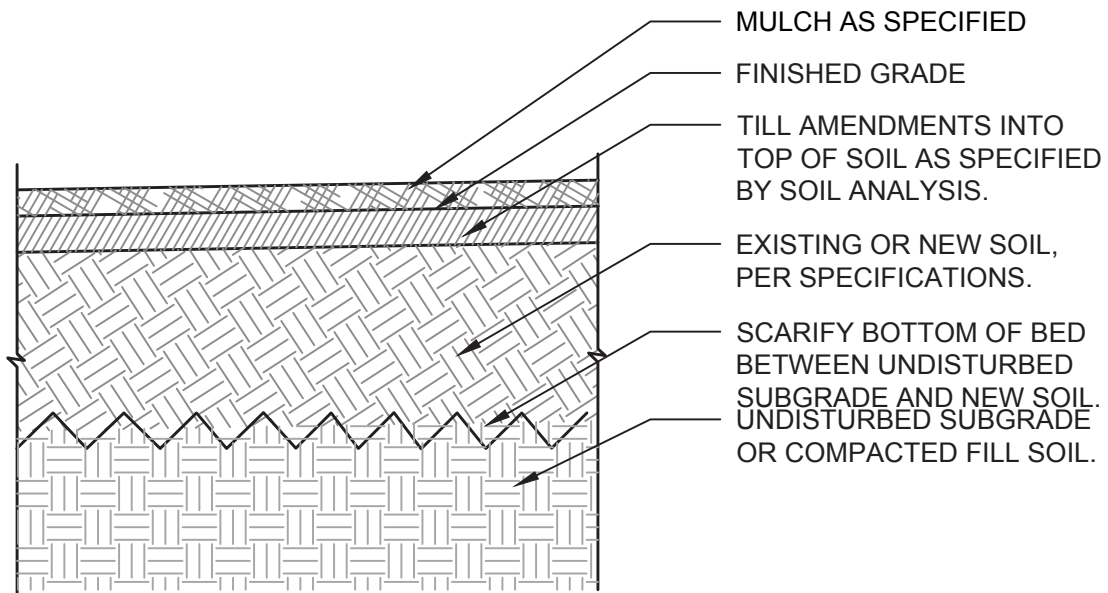
- A. Enhance the capacity of existing soils to infiltrate precipitation runoff, retain moisture, and sustain robust vegetation.
- B. Eliminate hauling in soil from off campus to replace campus soils for landscape development.
- C. Utilize on-campus waste to improve soils, including inorganic material, such as gypsum, and composted organic material.

3.01 Campus Standard

- A. Prepare a Soil Protection and Improvement Plan based on site-specific soil tests, to be certified by a Certified Professional Soil Scientist by the Soil Science Society of America.
- B. A Soil Protection and Improvement Plan should specify actions to protect good site soil characteristics, and improve those that are not – including structure, infiltration, permeability, and fertility.
- C. Rehabilitate existing disturbed soils onsite or from elsewhere on campus. Do not import soil. Where possible, redevelop soils to a depth of 48” using sub-soiler or other approved equipment. Where compacted soils cannot be redeveloped to a 48” depth, drill 12” diameter vertical cores 6’ deep on a 3 meter grid.
- D. Where possible, renovate compacted soils in undisturbed site areas.
- E. Soil preparation is to be provided for all proposed planting areas in addition to actual plant locations outside of existing tree driplines.
- F. Use structural soils for heavily used lawn areas.
- G. Include CSI Master Format Specification Section 32-91-12 Soil Rehabilitation and Section 32-91-13 Soil Preparation in construction documents.

- H. Mulch to be pine straw in planting beds and wood chips for trees. New woodland plantings to receive mulch that is a mixture of wood, leaves and needles. Mulch samples shall be submitted for approval by Design Professional and Georgia Tech Facilities Management.
- I. Treatment of disturbed soils shall meet the following soil structure performance requirements:

Soil Layer	Infiltration	Permeability Rate
Surface to Depth of 12"	B Hydrologic Soil Group	2.0" – 6.0" /hour
Surface to Depth of 36"		0.6" – 2.0" /hour
Depth of 36" to 72"		0.6" – 2.0" /hour



○ TYPICAL SOIL PREPARATION FOR PLANT BED AREAS
SECTION - NTS

4.01 Quality Assurance

- A. An independent laboratory, recognized by the State of Georgia, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.

5.01 Testing, Submittal and Mock-Ups

- A. Certificates: Provide certificates required by authorities having jurisdiction, especially for any composted materials. Contractor shall submit certification that all soil blend components and all soil blends meet all environmental standards of the State of Georgia and Georgia Inst. of Technology.
- B. Testing for Planting Bed and Turf Soil: Testing is required at the following intervals:
- C. Existing Soils should be tested, tests should contain soil analysis, including pH, organic matter, sand, silt and clay percentages, and recommendations for amendments. Testing of individual components for all soil and subsoil mixes. Tests are as described in this Section.
- D. Contractor to submit samples from various parts of the site, as agreed and approved by GT Facilities - Project Manager to the lab via County Extension Office.
- E. After test results for components have been accepted, create sample mixes of each planting soil and subsoil mix and perform tests described in c. & d below.
- F. Amended soil should be re-tested for compliance to recommendations. Soil re-test results should be submitted to GT Facilities - Project Manager for review and approval.
- G. After the test results for planting soil and subsoil mixes have been accepted, and during the placement of planting soils and subsoil, test every 200 cubic yards of soil mix delivered to the job site. Testing applies to all soil layers of the planting profile.
 - 1. Test Reports: Submit certified reports for tests as described in this Section.
 - 2. Mechanical gradation (sieve analysis) shall be performed and compared to the USDA Soil Classification System. Percent clay (0.002 mm) shall be reported separately in addition to silt (ASTM D-422-63, hydrometer method).
 - 3. The silt and clay content shall be determined by a Hydrometer Test of soil passing the #270 sieve.

4. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.
5. Tests shall be conducted in accordance with 'Reference Soil Test Methods for the Southern Region of the United States' Southern Cooperative Series Bulletin 289; Tests include the following:
6. Test for soil Organic Matter by loss of weight on ignition,
7. Test for soil CEC by exchangeable acidity method
8. Test for soil Soluble Salts shall be by the 1:2 (v:v) soil: water Extract Method
9. Test for Buffer pH by the SMP method
10. Certified reports on analyses from producers of composted organic materials are required, particularly when sources are changed. Analyses will include all tests for criteria specified in 2.01F.
11. Density Tests: ASTM D1556 Density of Soil and Rock In Place Using Sand Cone Method. ASTM D698 Test Method For Laboratory Compaction Characteristics Of Soil Using Standard Effort.
12. In-place density tests shall be carried out at a rate of one test per 2,000 square feet for each type of material placed.
13. Testing Agencies: The following firms are acceptable testing agencies for the various components.
 - a. Soil: UGA - Agricultural and Environmental Services Laboratories (AESL)
 - b. Leaf Yard Waste Compost: Georgia State Government: Soil Testing Laboratory COOP Extension Service, 2400 College Station Road, Athens, GA 30602, tel. 706.543.5350.
 - c. Mechanical Gradation and Chemical Analysis, All Components and Soil Mixes: Georgia State Government: Soil Testing Laboratory COOP Extension Service, 2400 College Station Road, Athens, GA 30602, tel. 706.543.5350.
14. Samples: Prior to ordering the below listed materials, submit representative samples to the Owner's Representative and Soil Scientist (appointed by Owner), for selection and approval. Do not order materials until Owner's Representative's or Soil Scientist's (appointed by Owner) approval has been obtained. Delivered materials shall closely match the approved samples.

- a. Organic amendment: duplicate samples of 1 gallon.
 - b. Base Loam: duplicate samples of 1 gallon.
 - c. Coarse Sand: duplicate samples of 1 gallon.
 - d. Planting Bed and Turf Soil, High after approval of individual components: duplicate samples of 1 gallon.
 - e. Sod Farm Soil: duplicate samples of 1 gallon.
 - f. ¾-inch Crushed Stone: duplicate samples of 1 gallon.
 - g. Under-drainage Pipe with Filter Fabric: duplicate samples of 1 foot.
15. Sources for Soil Components and Soil Mixes: Submit information identifying sources (see below) for all soil components and the firm responsible for mixing of soil mixes.
 16. Owner’s Representative shall have the right to reject any soil supplier.
 17. Submit certification that accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project.

6.01 Inspections

- A. The Contractor shall not place Planting Bed and Turf Soil on subsoil prior to inspection and approval of Owner Representative for compliance with depth, grading and compaction specifications. The Contractor shall request inspection before proceeding.

7.01 Delivery, Storage and Handling

- A. In addition, the following provision is established: Material shall not be handled or hauled, placed or compacted when it is wet as after a heavy rainfall or is frozen. Soil shall be handled only when the moisture content is less than at field capacity. The Soil Scientist (appointed by Owner) and the Owner Representative shall be consulted to determine if the soil is too wet to handle.
- B. Sequence deliveries to avoid delay. On-site storage space is permissible only with written notice from Construction Manager and the Owner Representative. Deliver materials only after preparations for placement of planting soil have been completed.
- C. Prohibit vehicular and pedestrian traffic on or around stockpiled planting soil.

- D. Soil that is to be stockpiled longer than two weeks, whether on or off site, shall not be placed in mounds greater than six feet high. If soil stockpiles greater than six feet high are present longer than two weeks then the contractor shall break down and disperse soil so that mounds do not exceed the six foot height restriction for longer than two weeks.
- E. Vehicular access to the site is restricted. Before construction, the Contractor shall submit for approval a plan showing proposed routing for deliveries and site access.

8.01 Products

A. Soil Materials

1. All planting soil material shall fulfill the requirements as specified and be tested to confirm the specified characteristics.
2. Samples of individual components of soil mixes in addition to blended soil mixes including mulch materials shall be submitted by the Contractor for testing and analysis to the approved testing laboratory. Comply with specific materials requirements specified.
3. No base component material or soil components for soil mixes shall be used until certified test reports by an approved agricultural chemist have been received and approved by the Owner's Representative and Soil Scientist (appointed by Owner).
4. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.
5. The Owner's Representative and Soil Scientist (appointed by Owner) may request additional testing by Contractor for confirmation of mix quality and/or soil mix amendments at any time until completion.
6. Base Loam
7. Base Loam as required for blending with other components shall be a naturally occurring soil formed from geologic soil forming processes without admixtures of sand or organic matter sources (composts).
8. Base Loam as required for the work shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris.
9. Base Loam shall also be free of grass, weed, invasive plant, quack-grass rhizomes, Agropyron Repens, and the nut-like tubers of nutgrass, Cyperus Esculentus, and all other primary noxious weeds.

10. Base Loam shall not be delivered or used for planting while in a frozen or muddy condition. Base Loam for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
10	---	100
18	85	100
35	70	95
60	50	85
140	36	53
270	32	42
0.002mm	3	6

U.S. Sieve Size Number	Minimum	Maximum
10	100	--
18	60	80
35	25	45
60	8	20
140	0	8
270	0	3
0.002mm	0	0.5

11. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 8 or less ($D80/D30 < 8$). Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. The organic content shall be between 4.0 and 8.0 percent by weight.
12. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.

B. Uniformly Graded Coarse Sand

1. Sand for Planting Bed and Turf Soil, High Use Turf Soil, Sand-Based Structural Soil, and Horticultural Subsoil and for Drainage Layers shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, mica, surface coatings and deleterious materials with the following gradation.
2. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing. (D20) shall be 3.5 or less. (D70/D20 <3.5) Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition. pH shall be less than 7.5.

C. Crushed Stone

1. Crushed stone (3/4 inch) shall consist of one or the other of the following materials:
2. Durable crushed rock consisting of the angular fragments obtained by breaking and crushing solid or shattered rock and free from a detrimental quantity of thin, flat or elongated or other objectionable pieces.
3. Durable crushed gravel stone obtained by artificial crushing of gravel boulders or fieldstone with a minimum diameter before crushing of 200 mm.
4. Crushed stone shall be reasonably free from clay, loam or deleterious material and shall conform to the following gradation:

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
1 inch	100	---
3/4 inch	90	100
1/2 inch	10	50
3/8 inch	0	20
#4 Sieve	0	5

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
10	100	--
18	85	95
35	60	85
60	42	95
140	21	44
270	18	24
0.002 mm	2	4

D. Organic Amendment

5. Organic Matter for amending planting soils shall be a stable, humus-like material produced from the aerobic decomposition and curing of Leaf Yard Waste Compost, composted for a minimum of one year (12 months). The leaf yard waste compost shall be free of debris such as plastics, metal, concrete or other debris. The leaf yard waste compost shall be free of stones larger than 1/2", larger branches and roots. Wood chips over 1" in length or diameter shall be removed by screening. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests.
6. The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1.
7. Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale. Stability tests shall be conducted by an independent laboratory, recognized by the State of Georgia.
8. Organic Content shall be at least 20 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number

9. 50-cc sub-sample of the screened and mixed compost is ground to pass the number 60 sieve. Two to three grams (+ 0.001g) of ground sample, dried to a constant weight at 105 degrees C is placed into a muffle furnace. The temperature is slowly raised (5C/minute) to 450C and maintained for three hours. The sample is removed to an oven to equilibrate at 105C and the weight is taken. Organic matter is calculated as loss on ignition.
10. pH: The pH shall be between 6.5 to 7.2 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis, Part 2, 1986.
11. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.0 mmhos/cm (dS/m).
12. The compost shall be screened to 3/8 inch maximum particle size and shall contain not more than 3 percent material finer than 0.002mm as determined by hydrometer test on ashed material.
13. Nutrient content shall be determined by a Testing Laboratory or equivalent laboratory as approved by Owner's Representative and Soil Scientist (appointed by Owner) and utilized to evaluate soil required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), and buffer pH.

E. Under-drainage Pipe with Filter Fabric

1. Planting under-drain pipe shall be ADS Single Wall Corrugated Polyethylene Pipe, manufactured by ADS Company, Columbus, OH 43221, or approved equal. Pipe shall be manufacturer's standard perforated configuration. Jointing shall be made using manufacturer's standard snap coupling type fittings.
2. Filter Fabric Covering for Corrugated Piping: Piping shall be factory-fitted with a filter fabric covering around piping. Filter fabric shall be Drain Guard Cerex Part No. 0414HA filter fabric manufactured by ADS Company, Columbus, OH 43221, or approved equal.

9.01 Planting Soil Mixes

- A. Uniformly mix ingredients by windrowing/tilling on an approved hard surface area. Organic Amendment shall be maintained moist, not wet, during mixing. Amendments shall not be added unless approved to extent and quantity by the owner and addi-

tional tests have been conducted to verify type and quantity of amendment is acceptable. Percentages of components, unless otherwise noted, will be established upon completion of individual test results for components of the various mixes.

- B. After component percentages are determined by the Soil Scientist (appointed by Owner), each planting soil mix shall be tested for physical and chemical analysis.
- C. Planting Bed and Turf Soil shall consist of a combination of approximately equal parts Coarse Sand, Base Loam and Organic Amendment.
- D. The following gradation for material passing a Number 10 Sieve shall be achieved in the final mix.

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
10	100	--
18	85	95
35	60	85
60	42	65
140	21	44
270	18	24
0.002 mm	2	4

U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	85	100
35	60	85
80	25	40
140	6	26
270	4	18
0.002mm	2	5

1. Maximum size shall be one half-inch largest dimension. The maximum retained on the #4 sieve shall be 10% by weight of the total sample. The ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6 or less. (D80/D30 <6) The final mix shall have an organic content between 5 and 7 percent by weight. The final mix shall have a hydraulic conductivity of not less than 1.5 inches per according to test procedure ASTM D5856-95 (2000) hour when compacted to a minimum of 86 percent Standard Proctor ASTM D 698. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
2. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium Magnesium, Aluminum, Iron, Manganese, Lead, Cation Exchange Capacity, Soluble Salts, acidity (pH) and buffer pH.

E. Sod Farm Soil

1. Soil at the off-site Sod Farm in which proposed sod was grown shall be USDA classified as sand and shall conform to the following grain size distribution for material passing the #10 sieve:

U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	85	100
35	60	85
80	25	40
140	6	26
270	4	18
0.002mm	2	5

10.1 Execution

A. PRE-INSTALLATION EXAMINATION AND PREPARATION

1. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement.

2. Pre-Installation Examination Required: The Contractor shall examine previous work, related work, and conditions under which this work is to be performed and shall notify Owner's Representative in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Contractor accepts substrates, previous work, and conditions. The Contractor shall not place any planting soil until all work in adjacent areas is complete and approved by the Owner's Representative and Soil Scientist (appointed by Owner).
3. Examination of Sub-grade: The sub-grade shall be examined by the Contractor prior to the start of soil placement and planting. Any deficiencies shall be noted and related to the Owner's Representative in writing prior to acceptance of the sub-grade by the Landscape Contractor. Deficiencies include, but shall not be limited to the following:
 - a. Construction debris present within the planting areas.
 - b. The sub-grade is at incorrect depths for installing the designed soil profile and drainage layer.
 - c. Incomplete irrigation and/or subsurface drainage installation.
 - d. Sub-grade compaction.
 - e. Sub-grade must infiltrate water at the rate of at least one inch per hour.
4. Planting Soil Preparation: Examine soil and remove foreign materials, stones and organic debris over 1/2" in size. Mix-in fertilizers and amendments as required by tests and as approved by the Owner's Representative. All preparation and mixing shall be accomplished when the soil moisture content is less than field capacity and at a moisture content approved by the Owner's Representative and Soil Scientist (appointed by Owner). If lime is to be added, it shall be mixed with dry soil before fertilizer is added and mixed.
5. Soil mixtures shall be produced with equipment that blends together each component in a thorough and uniform manner.

B. Backfilling of Planting Soil

1. Soil Placement Preparation:
 - a. Verify that the plumbing for the irrigation system has been installed and accepted.
 - b. Verify that the under-drainage system has been installed and accepted.
 - c. Notify the Owner's Representative of soil placement operations at least seven calendar days prior to the beginning of work.

- d. The plant stock shall be placed simultaneously with the planting soil. The Landscape Contractor will stake trees and shrubs during placement of the planting soil.
 - e. Verify that the sub-grade passes the minimum water infiltration requirement.
2. Placement of Planting Soil and Subsoil:
3. Placement of Planting Bed and Turf Soil and plant stock shall be carried out simultaneously to prevent excessive traffic over soil lifts and the final grade so as to prevent the creation of undesirable soil compaction. Care should be taken not to create layering of soil. New soil and existing soil shall be adequately mixed with rototill to create a uniform blend. The contractor shall install plants simultaneously with the installation of the soil. The soil on top shall not be installed before all plants are installed and before the acceptance by the Owner's Representative.
- a. Planting Bed and Turf Soil shall be placed in lifts not to exceed 8 inches in thickness and compacted to meet minimum and maximum requirements as specified below:
 - b. Planting Bed, turf soil, and high use turf soil shall be compacted to between 84 and 86 percent Standard Proctor, except soils beneath the root-balls shall be compacted to between 88 and 92% Standard Proctor to create a firm pedestal and prevent settlement of the root-balls.
 - c. In all cases, the soil being placed shall be in a dry to damp condition. No wet soils shall be placed. All testing of in-place density for Plant materials shall be made according to ASTM D1556.
 - d. Prevention of compacted soils can be accomplished by beginning the work in corner, against walls, or the center of isolated beds, and progressing outwards towards the borders.
 - e. Planting soils and Subsoil shall never be moved or worked when wet or frozen.
 - f. The Contractor shall place barricades as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.

H. Protection

- 1. Protect newly graded areas from traffic, freezing and erosion. Keep free of trash, debris or construction materials from other work.

2. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or compaction due to subsequent construction operations or weather conditions. Scarify or remove and replace material to a depth as directed by the Owner Representative; reshape and re-compact at optimum moisture content to the required density.
3. Where settling occurs, before final acceptance or during the warranty period, remove finish surfacing, backfill with additional approved material, compact to specified rates, and restore any disturbed areas to a condition acceptable to the Owner.

END OF SECTION – SOILS

329200 - Turf and Grasses



1.01 Application

- A. Turf serves as a unifying landscape element in the campus fabric and provides open, safe, flexible space for students, staff and visitors to enjoy. Grasses can be used to stabilize sloped banks and reduce erosion.

2.01 Design Guidelines

- A. Use structural soil for actively-used turf areas.
- B. Where possible turf areas should be built on porous material to store and manage stormwater.

3.01 Campus Standard Turf

- A. Warm Season: Bermuda; TifWay 419 sod only; Zoysia Meyer sod only
- B. Cool Season: Tall Fescue The Rebels (type) sod only
- C. Annual Rye: For overseeding only
- D. Streetscape: Liriope spicata in defined planting areas only
Liriope muscari

4.01 Campus Standard Temporary Reforestation Turf

- A. Andropogon sp.
- B. Fescue Kentucky 31
- C. Panicum virgatum
- D. Carex cherokeeensis

5.01 Campus Standard Reinforced Turf Product

- E. Material: GrassPave2 by Invisible Structures, Inc.
- F. Base: Per engineer’s specifications
- G. Color: Black

- H. Edge Restraint: Use with manufacturer specified anchors when reinforcing areas for fire truck access. Exposed concrete curbing shall not be used.

Ornamental Plantings



Photo by Wouter Hagens



Photo by Andre Karwath

1.01 General

- A. Plantings help to shape and define spaces and connections on the Georgia Tech campus. Ornamental planting is one of two special purpose plant communities permissible at the institute and should be limited to areas associated with a garden or entrance.

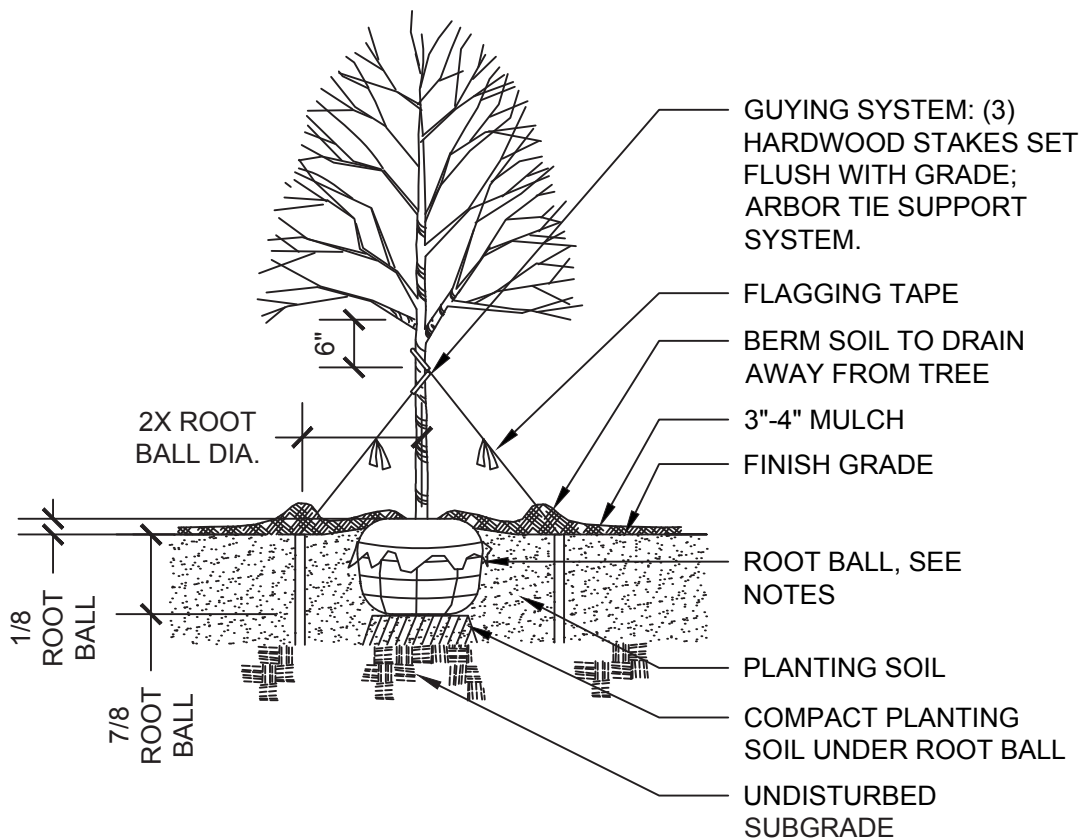
2.01 Design Guidelines

- A. Primarily use flowering woody plants and vigorous perennials and ornamental grasses. Concentrate floral displays in key locations, such as building entries or campus gateways.
- B.
- C. Use plants identified in Chart 6.6 of the Landscape Master Plan: [Acceptable Plants for the Georgia Tech Campus](#)
- D. Discretionary choices within the Landscape Master Plan: [Acceptable Plants for the Georgia Tech Campus](#) list should be governed by the following Georgia Tech preferences:
 - 1. Plants native to the Atlanta region.
 - 2. Plants having physio-gnomic similarities to native species.
 - 3. Plants adapted to specific site conditions.
 - 4. Plants that do not require much material and maintenance subsidy, including pruning, long term irrigation, fertilization, and pest control.
 - 5. Proven performers are preferred over newly developed cultivars, especially for trees.
 - 6. If a plant's flowers are one of the main reasons for its selection, those that bloom between September and June.

3.01 Campus Standard

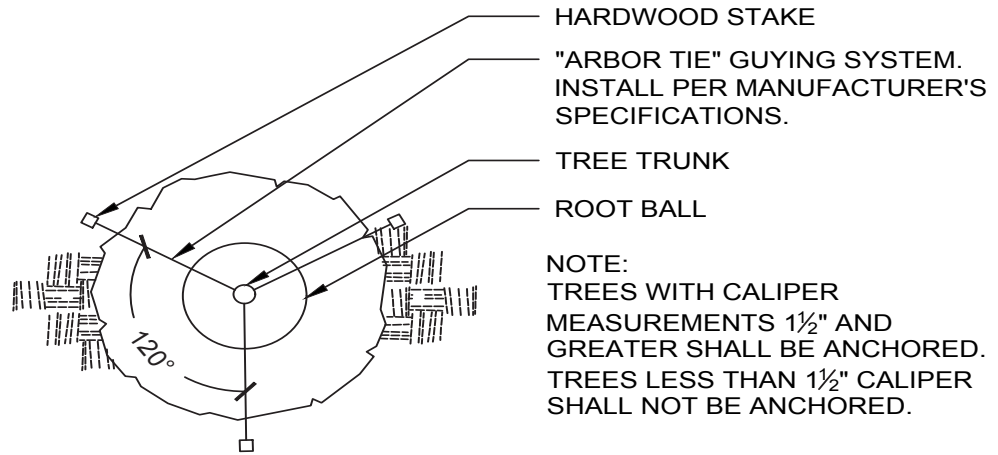
- G. All plant material shall comply with the American Standard for Nursery Stock, ANSI Z60.1
- H. All plants must be container grown unless approved by Georgia Tech.
- I. Plant material must have been propagated and grown in the Piedmont or Coastal Plain physiographic provinces within 250 miles of Georgia Tech.
- J. Contractor to submit order list to Design Professional for review.
- K. Contractor to submit delivery receipt to Georgia Tech for reference.
- L. Maximum size for a tree shall be 4 inch caliper. Unless Approved by Landscape Committee.
- M. Minimum container size for a tree shall be #3.
- N. Minimum container size for shrubs shall be #3.
- O. Height of deciduous shrubs in #3 containers shall be 12-18 inches for Type 1 Small shrubs, 18-24 inches for Type 2 Intermediate shrubs, 2-3 feet for Type 3 Large Shrubs.
- P. Height of broadleaf evergreen shrubs in #3 containers shall be 12-18 inches for Type 1 to Type 3 broadleaf evergreens, and 15-30 inches for Type 4 to Type 6 broadleaf evergreens.
- Q. Minimum container size for perennials shall be #1. Specifying perennial plant height in plant schedule is required.
- R. Minimum spacing for perennials shall be 24 inches.
- S. Minimum container size for groundcover shall be #SP4.
- T. Minimum spacing for groundcover shall be 12 inches.
- U. The plant schedule for a project shall specify Georgia Tech plant community groups, plant type (e.g., large tree, medium tree, shrub, etc.), latin name, common name, phenology of leaves, phenology of flowers, height, canopy diameter, caliper size and container size.

- V. Design Professional and GT Facilities Management representative shall tag trees prior to construction. Tree harvesting to occur early during the construction planning process.
- W. Planting shall not occur during summer months, from June to August.
- X. All planting and associated materials within the city right of way shall comply with City of Atlanta requirements

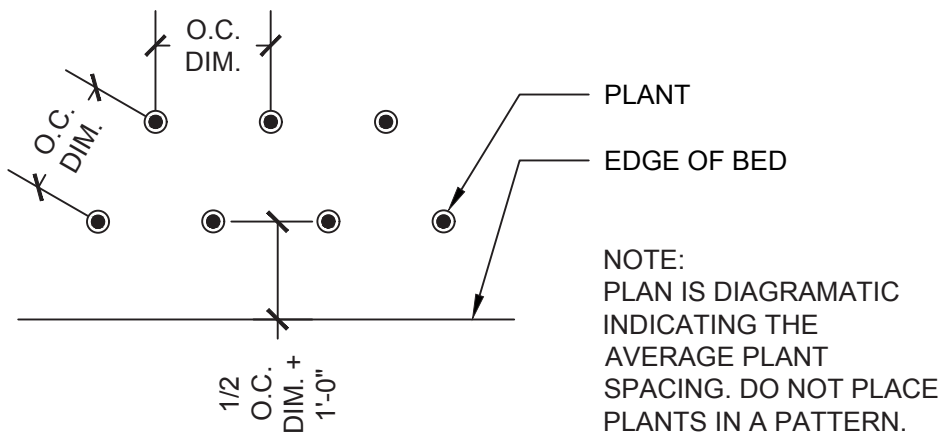


NOTE
 REMOVE TOP $\frac{2}{3}$ OF BURLAP FROM ROOT BALL. FOR WIRE BASKET, REMOVE TOP $\frac{2}{3}$ OF BASKET AND BURLAP. REMOVE EXCESS SOIL FROM TOP OF BARE ROOT BALL.

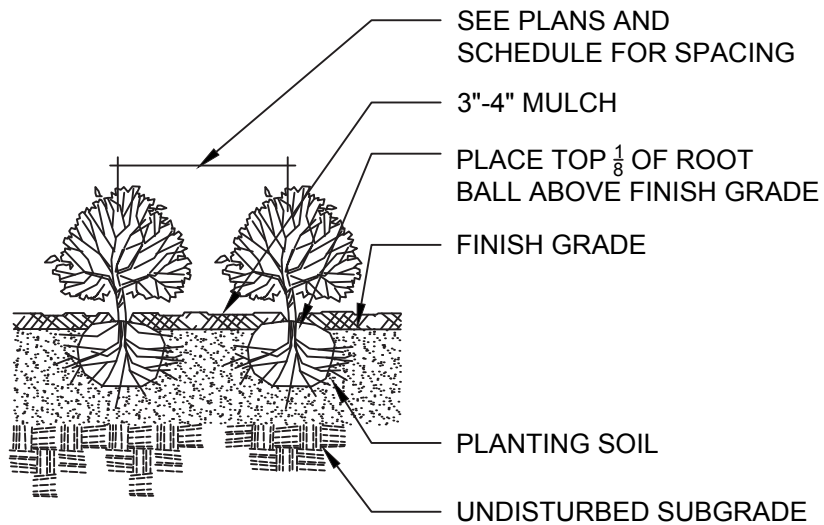
 TREE PLANTING
 SECTION - NTS



○ TREE PLANTING PLAN - NTS



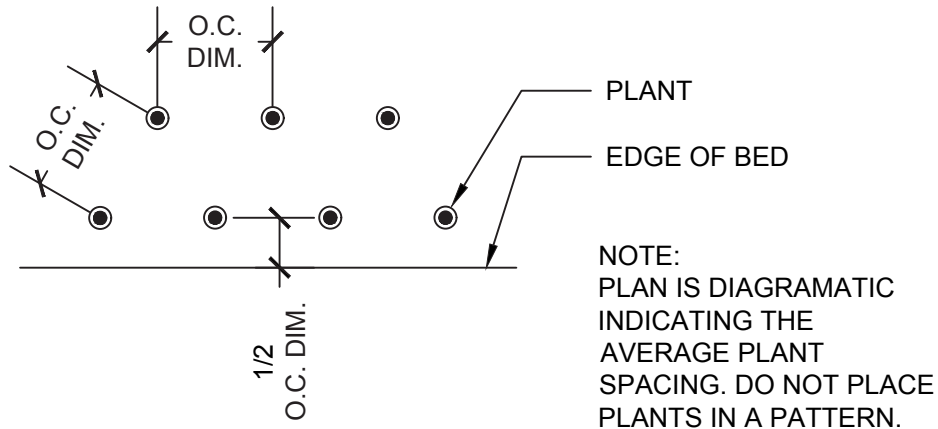
○ SHRUB TRIANGULAR SPACING PLAN - NTS



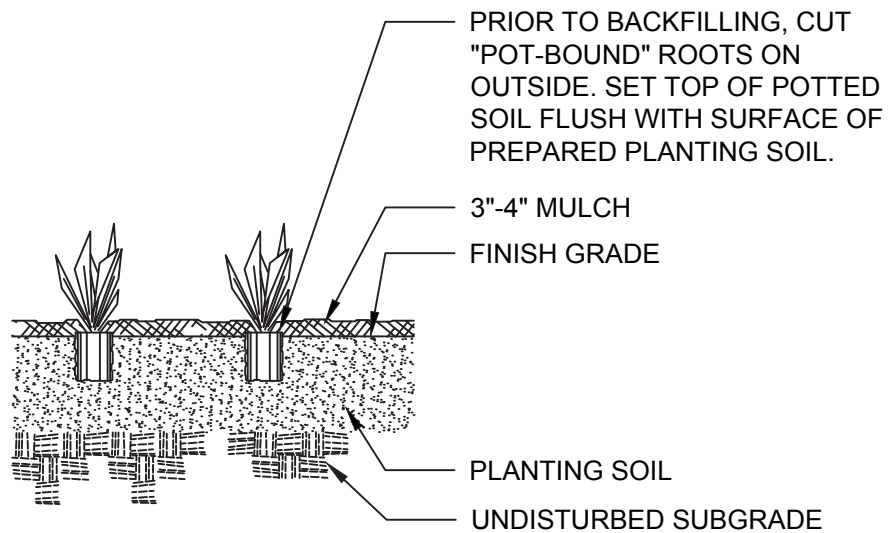
NOTES:

1. FOR CONTAINER STOCK, PULL POTTING MIX AND ROOT MASS APART TO DIRECT THE OUTER ROOTS INTO ADJACENT SOIL. DO NOT LEAVE CIRCLING ROOTS AGAINST ROOT BALL.
2. TAMP AND WATER WHEN BACKFILLING AROUND PLANT.

○ SHRUB PLANTING
SECTION - NTS



PERENNIAL TRIANGULAR SPACING
PLAN - NTS



NOTES:

1. FOR CONTAINER STOCK, PULL POTTING MIX AND ROOT MASS APART TO DIRECT THE OUTER ROOTS INTO ADJACENT SOIL. DO NOT LEAVE CIRCLING ROOTS AGAINST ROOT BALL.
2. TAMP AND WATER WHEN BACKFILLING AROUND PLANT.

PERENNIAL PLANTING
SECTION - NTS

329301 - Landscape Maintenance & Warranty

1.01 Application

- A. Warranty and extended maintenance of new or renovated sites provides peace of mind for Georgia Tech and assists in establishing a healthy landscape. The post-construction maintenance contract serves as a staff expansion on new campus buildings as it can sometimes be difficult to get maintenance staff in place for newly opened sites.

2.01 Campus Standard

- A. Provide maintenance by skilled employees of landscape Installer that includes:
- B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use practices to minimize the use of pesticides and reduce hazards.
- E. Apply pesticides and other chemical products and biological control agents in accordance with design professional and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- F. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- G. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period.
- H. Maintenance Period for Trees and Shrubs: Maintain trees and shrubs from time of initial installation until Project Completion and Final Acceptance by Georgia Tech Facilities Management. Separate maintenance contract shall be for 1 year after Final Acceptance.

- I. Georgia Tech Facilities Management. Separate maintenance contract shall be for 1 year after Final Acceptance.
- J. One year maintenance contract shall include a maintenance matrix for review and approval by Georgia Tech Facilities Management & Landscape Services and shall include monthly meetings with Georgia Tech Landscape Services to ensure that maintenance tasks are being completed as contracted.

3.01 Warranty

- A. Installer agrees, in writing, to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period. Failures include, but are not limited to, the following: Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control. Structural failures including plantings falling or blowing over
- B. Warranty Periods from Date of Material Completion:
- C. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months
- D. Ground Covers, Biennials, Perennials, and Other Plants: 12 months
- E. Annuals: Three months

4.01 Plant Replacement

- A. During installation, prior to material completion, any dead or dying plants shall be replaced.
- B. During and at the end of the warranty period, installer shall replace, without cost to the Owner, and within 30 days of notification by the Project Manager, all installer furnished plant materials which are dead or are not in a vigorous, thriving condition.
- C. Replacements shall closely match adjacent specimens of the same species and cultivar, and shall be subject selection in the field by the Design Professional prior to digging.
- D. Replacements shall be subject to all specification requirements.
- E. All necessary repairs to grades, lawn, plantings and paving as required because of plant replacements shall be done at no extra cost to Georgia Tech.

5.01 Landscape Maintenance Schedule Matrix

A. Maintenance Schedule Link