

# NC State University Design and Construction Guidelines

## Division 32 Exterior Improvements

### 1.0 Purpose

- A. This section addresses site development issues including roads, streets, walks, parking, and other site amenities.

### 2.0 General Requirements

#### A. Roads and Streets

1. Campus roads should be designed for 25 mph design speed.
2. Bus stops and transfer areas shall be designed as reinforced concrete pavement areas for 40-foot long urban-transit buses.
3. Pull offs dedicated for buses shall be reinforced concrete.
4. When cutting and patching existing concrete paving or curb and gutter, remove concrete to existing control or expansion joints and replace the entire section.

#### B. Accessible Curb Ramps

1. A concrete and brick curb ramp is the campus standard.
2. In public rights of way, other standards may be applicable.

#### C. Walks

1. Brick pavers are the campus standard for all new construction on North and Central precincts, Centennial Biomedical Campus, and for the Oval and Main Campus Drive on Centennial Campus precinct.
2. Concrete is the campus standard for all other areas of campus.
3. When cutting and patching existing concrete walks, remove concrete to existing control or expansion joints and replace the entire section.

#### D. Fences

1. Fences visible from walks and streets shall be ornamental.
2. Fences not visible from walks and streets shall be vinyl coated chain link.

### 3.0 Materials & Standards

#### A. Curb and gutter

1. Use 6-inch standard curb and 24-inch gutter sections for campus streets and parking lots.
2. Use rolled curb for medians and roundabouts.

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- B. Pavement marking
  - 1. All pavement marking in streets and parking areas shall be thermoplastic.
  - 2. Concrete pedestrian tables must be sealed with a commercial-grade concrete sealant prior to applying thermoplastic paint.
  - 3. Use reflective paint for structured parking decks where markings are not exposed to weather.
  
- C. Fire Lanes
  - 1. Fire lane markings shall read, “No Parking – Fire Lane,” in a template of white lettering on a field of red thermoplastic paint.
  - 2. The template field is 8 inches high with 6-inch high letters in all capitals.
  - 3. In areas where parking is not located adjacent to the fire lane, offset template three feet from the face of curb. In areas where parking is adjacent to the fire lane, offset the template 8’ from the face of curb.
  - 4. Repeat the template for the length of the fire lane so that templates are spaced approximately 10’ apart.
  
- D. Traffic Calming
  - 1. Parabolic speed humps shall be a minimum of 12’ long and 4” high, and extend the full width of the drive lane. Speed humps shall end at the drive lane so that bicyclists may use the gutter to drive around the speed hump.
  - 2. Pedestrian tables shall have a table-top surface a minimum of 10’ long that extends the full width of the street from face of curb to face of curb. Pedestrian tables shall be a maximum of 6 inches high, with transition ramps at a 1:12 slope. They shall be reinforced concrete.
  
- E. Parking Lots
  - 1. The university complies with City of Raleigh Zoning requirements and standards.
  - 2. Parking space dimensions shall be arranged and sized in accordance with the “Regular Space Parking Area Design” table of Figure 12, “Parking Area Design” of the City of Raleigh “Streets, Sidewalks, and Driveway Access Handbook, May 2002 Edition” with the exception that Curb Width (C) for parallel spaces (Parking Angle=0) may be reduced to 20.0’.
  - 3. All new parking lots shall be designed for a large passenger vehicle turning radius (24’) with a 24’ wide drive aisle for two-way circulation.
  - 4. Accessible parking spaces shall be 8’-6” wide.
  - 5. Sidewalks – At locations where the sidewalk is adjacent to head in parking, the walk shall be a minimum of 6’ wide.

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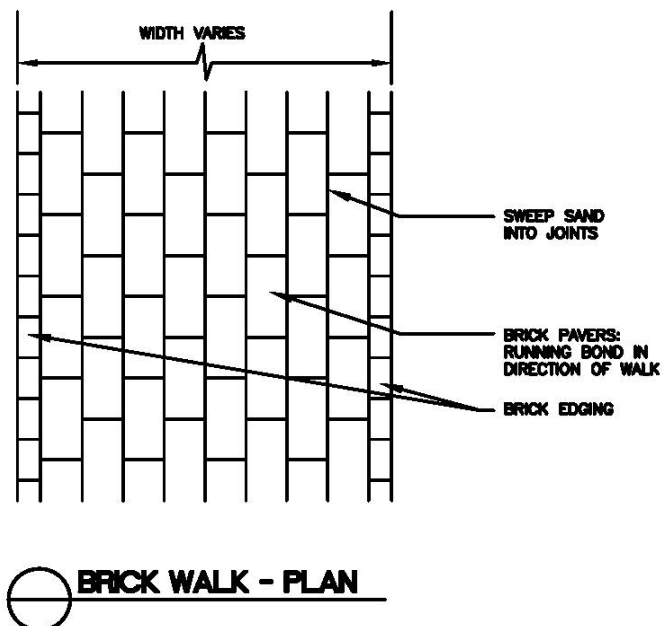
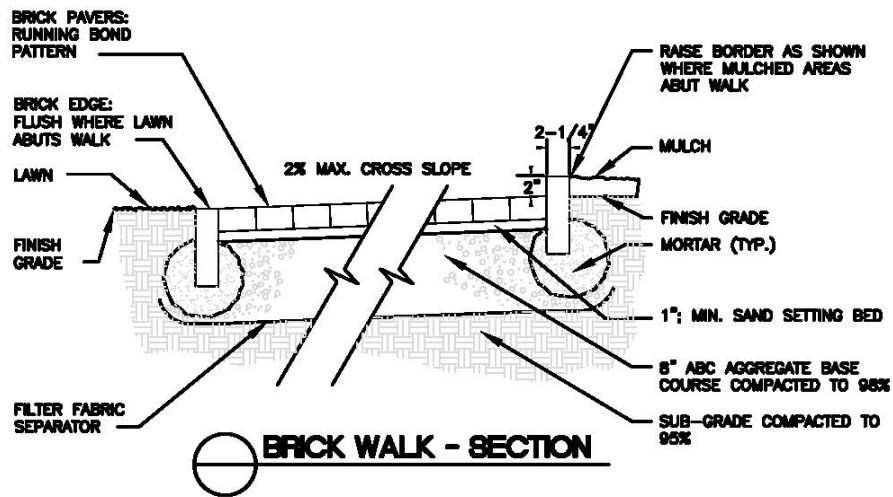
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### F. Crosswalks

1. All crosswalks shall be high-visibility block style; 2' wide by a minimum of 6' long and spaced 2 feet apart.
2. Orient crosswalks perpendicular to the street.

### G. Walks

1. The campus standard paving pattern is running bond in the direction of the walk.
2. Edge restraints consist of either a brick on end sailor course flush with the walk where lawn abuts the walk, or a brick on end sailor course set 2" higher than the walk finish grade where mulch abuts the walk. Brick edge restraints shall be set in a slush mortar bed.



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3. Slopes on brick walks less than 2% require subsurface drainage.
4. Special patterns and unit pavers other than brick may be integrated into the brick walks at building entrances, outdoor gathering places, and on All Campus Paths.
5. Materials for brick walks.
  - a) For pedestrian walks: solid, hard-burned, red-flash, ASTM C 902, SX, Pedestrian and Light Traffic Paving Brick. Do not use pavers with chips, cracks, voids, discolorations, or other defects which might be visible in finished work. See preferred manufacturers list for brick paver requirements.
  - b) For heavy vehicular traffic: solid, hard-burned, red-flash, ASTM C1272, Type F, Heavy Vehicular Paving Brick. Do not use pavers with chips, cracks, voids, discolorations, or other defects which might be visible in finished work. See preferred manufacturers list for brick paver requirements.
  - c) For small repair jobs: salvage and re-use existing brick pavers. If additional pavers are required to complete the repair, they shall match in color and size, and be added to the old brick in a random distribution. If brick cannot be salvaged, new brick shall match existing in size and color. Any reuse of brick pavers shall be approved by NC State.
6. Setting Bed sand – Use ASTM C 33. Dry sand-cement mixes and crushed screenings from quarry operations are not acceptable.
7. Jointing sand – Use ASTM C 33. Sand shall be screened, with a maximum particle size of 1/16". Sand shall be dry when used. Use white sand.
8. Filter fabric – Use non-woven drainage geo-textile, minimum 4-mil thickness. Use Propex 4546 manufactured by Ikex Company or equal.
9. ABC Aggregate – The aggregate base course shall comply with Section 520 of the NCDOT specifications. Aggregate shall be a maximum diameter of 1-1/2" and conform to the gradation requirements of ASTM D-2940. Contractor shall submit:
  - a) Proof that the aggregate for base is from a NC DOT certified quarry.
  - b) A test certificate from the quarry indicating 100% maximum dry density.
  - c) A batch ticket from the quarry certifying that the aggregate is ABC.

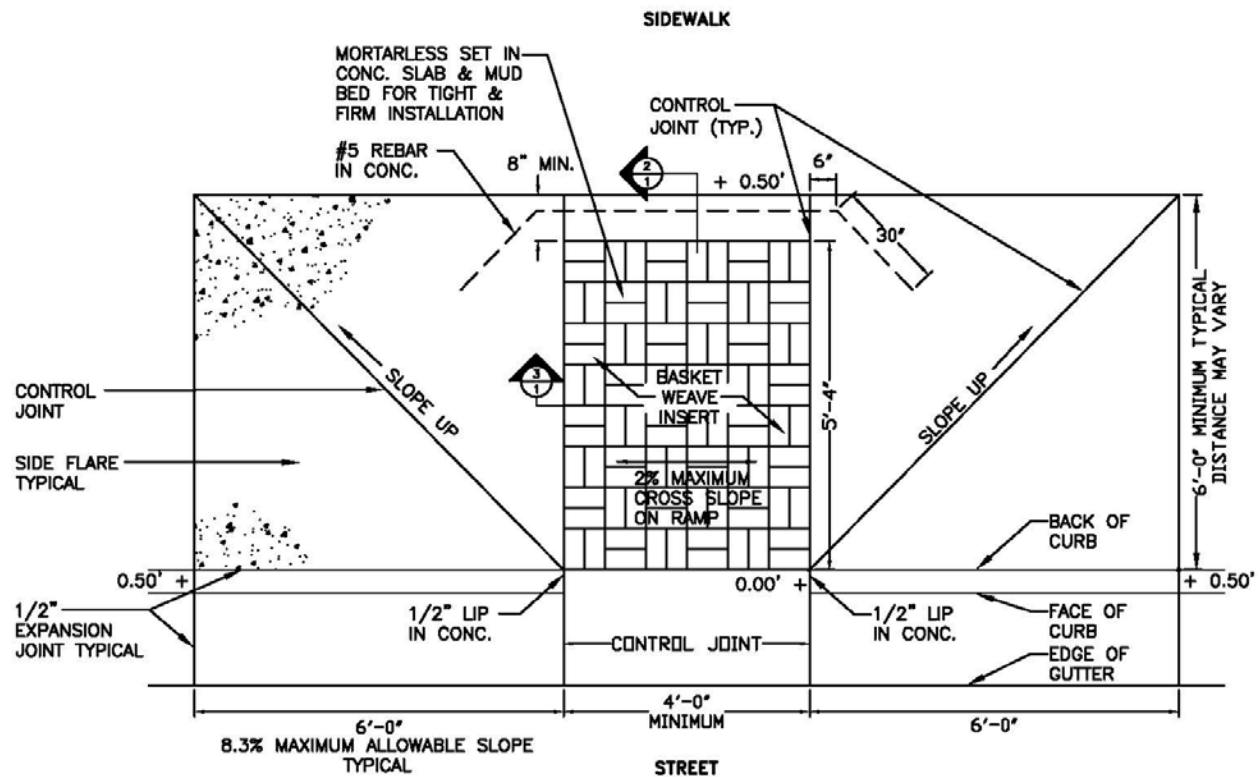
### H. Accessible Curb Ramps

1. Concrete ramps shall have a broom finish.
2. Create a true and square opening in the concrete ramp to receive the brick pavers.

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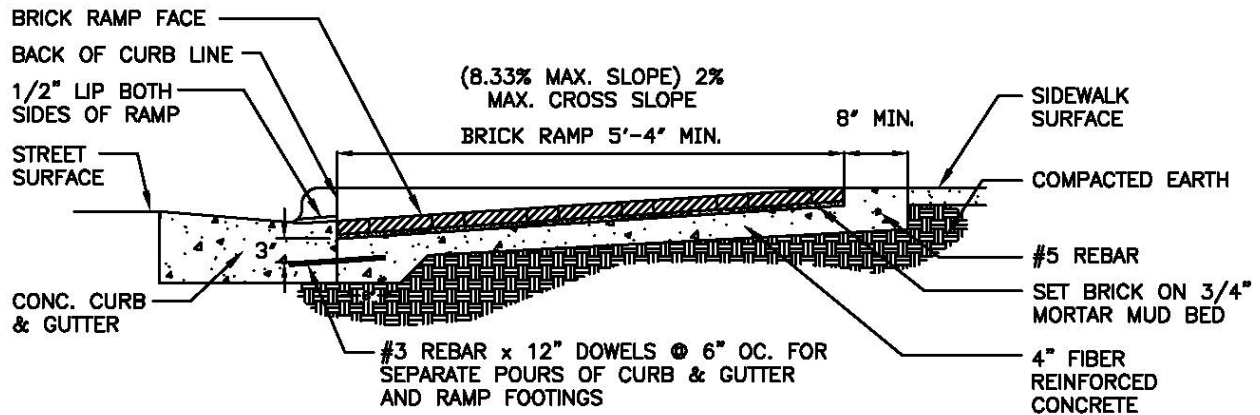
3. See preferred manufacturers list for brick paver requirements.
4. Lay bricks in a basket weave pattern.
5. Increase the size of concrete area at the top of the ramp as needed to avoid half or partial-brick rows across the top of the ramp.
6. Use a dry mortar and sand mixture between the brick joints.
7. Concrete expansion joints shall be 1/2" asphalt-impregnated fiberboard expansion joint material.



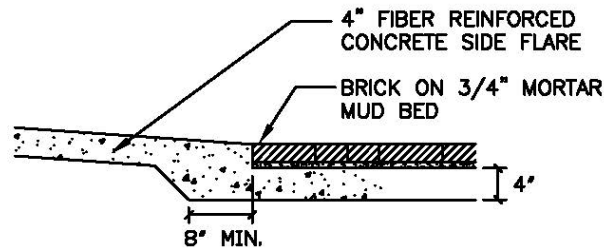
**1 PLAN-NC STATE ACCESSIBLE CURB RAMP**  
 1 Not to Scale

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**2 SECTION - ACCESSIBLE CURB RAMP**  
1 Not to Scale



**3 CONCRETE FOOTING SECTION - CURB RAMP**  
1 Not to Scale

### I. Fences and Gates

1. Campus standard for fences and gates that are visible from campus streets and walks is ornamental aluminum. Color, black. Finish, powder coat. Model, Industrial Grade Belmont by Alumi-Guard of Hudson, FL, or approved equal.
2. Chain link fences shall be vinyl coated. Color, black.
3. Fences and gates for screening shall be of metal or wood.

## 4.0 Brick Paver Installation

### A. Brick Pavers

1. Brick pavers shall be set 1/8" to 1/4" above finish grade.
2. Pavers shall be laid with a maximum 1/8" joint between pavers.

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3. Cut pavers shall have accurate, clean, straight cuts. Broken edges such as those caused by masonry hammers will not be accepted. Do not use less than ½ brick in any pavement area.
  4. The edges of adjacent pavers shall be flush.
  5. Pavers adjacent to drainage inlets and channels shall not be lower than the top of drain and not more than ¼” above it.
  6. Sinks in brick paved areas holding more than 1” of water for more than 3 hours, or those holding less than 1” water for more than 6 hours will not be accepted.
  7. Where walks abut curb and gutter, no edge restraint is required.
  8. Edge restraints shall not restrict the flow of water off the walk.
  9. Edge restraints shall be installed before pavers are installed.
  10. Irregular lines inconsistent with specified pattern will not be permitted.
  11. Where existing brick pavers are to be reused, the bricks are to be carefully removed, stored on pallets, and reinstalled as needed. Bricks that are chipped, cracked, broken or otherwise marred are not to be reused.
- B. Sub-grade
1. 95% compaction (of Modified Proctor Density) is required
  2. Contractor will notify NC State when sub-grade is complete. NC State will approve the sub-grade preparation before the aggregate base course is applied.
- C. Filter Fabric
1. Filter fabric is always located between the aggregate base and sub-grade.
  2. Filter fabric shall overlap 12” at its ends. The fabric shall be laid out smooth, and cut to match the paving area. It shall cover the base and extend up the sides of the excavation to the top of the setting bed material.
- D. Aggregate Base Course
1. Minimum standard depth is 8”. Sub-base testing to determine bearing strength is required to alter the minimum standard depth.
  2. Install in 2 (two) 4” maximum lifts. Wet and roll each lift.
- E. Sand Setting Bed
1. Sand setting bed shall be no more than 1” deep.
  2. Do not prepare more than one day’s worth of sand setting bed. If any screeded bed is not paved by the end of the day, it shall be removed and re-screeded the following day.

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3. The sand shall be screeded approximately 1/8" to 1/4" above the desired bed elevation to allow for compaction and settlement after the bricks are installed.
4. Contractor will notify NC State when sand setting bed is screeded, leveled, and ready for inspection, and will not apply brick pavers until directed by the NC State.

### F. Sand Joints

1. Sweep sand over surface of pavers to fill all joints, and then work into place with a plate vibrator, continuing until joints are full.
2. Tamp brick surface smooth. Refill joints with sand after tamping, and tamp again. Repeat process until joints are filled.
3. The contractor is required to sweep jointing sand over the new paving at the end of 30 days and 60 days from the acceptance date.