

SECTION 5.0 CONCRETE AND ASPHALT CONSTRUCTION FOR CURB AND GUTTER, DRIVEWAYS AND SIDEWALKS

5.01 Description

These specifications shall include concrete and asphalt curb and gutter, driveway and sidewalk work to be performed on various City streets. Work shall consist of the following items, complete in place:

- (1) Concrete combination curb and gutter
- (2) Concrete valley
- (3) Plain concrete paving for sidewalks
- (4) Concrete paving for driveways
- (5) Asphalt paving for driveways
- (6) Asphalt paving for sidewalks
- (7) Adjustments of structures

All concrete and asphalt construction shall be laid on a prepared subgrade in one course with line and grade as specified by the plans or by the City Engineer.

5.02 Clearing and Grubbing

The contractor shall clear the entire area inside the construction limits as shown on the plans or as specified by the City Engineer. Clearing shall consist of the removal of fences, trees, logs, stumps, brush, vegetation, rubbish and other perishable or objectionable matter. Stumps and roots within the right-of-way lines shall be removed to a depth of six inches (6") below subgrade.

See Section 8.01, 9.01 and 10.01 for additional requirements.

Objectionable or spoiled material shall be removed from the project and disposed of by the contractor.

### 5.03 Earthwork

#### (1) Excavation

The contractor shall perform all excavations to the elevations and cross sections as shown on the plans and standards. Any excavation below grades shown on plans shall be scarified then backfilled with approved material and shall be thoroughly tamped in (compacted) layers of not more than six inches (6") for reciprocating tamps, or twelve inches (12") for robotic vibratory wheeled tamps. Backfill material shall be compacted to limits and conditions as specified in Section 6.07.

The contractor shall control grading in the vicinity of construction to prevent surface water from running into the excavation.

#### (2) Fill or Backfill

All fill or backfill material shall be free of logs, roots, rubbish, other organic material, and stones larger than four inches (4") in diameter. Fill or backfill material shall be placed in compacted layers six inches (6") for reciprocating tamps, or twelve inches (12") for robotic vibratory wheeled tamps or sheeps-foot rollers and each layer shall be compacted as specified in Section 5.05(3).

Where fill is inaccessible to rollers, compaction will be done by mechanical tampers with a rating of at least 300 ft.-lbs. of energy per blow.

### 5.04 Preparation of Subgrade

Subgrade shall be fine graded to the grades and elevations as shown on the plans or as specified by the City Engineer. The subgrade shall be free of water and mud and shall have passed all compaction tests as specified in Section 5.05. Before any asphalt or concrete is placed on fill section, the City Engineer shall have inspected and approved the subgrade.

5.05 Testing

When required by the City, the contractor shall take samples of the materials delivered to the City and shall, at his expense, have an approved engineering testing laboratory perform such test as may be required by the City. The contractor shall then present the test results to the City Engineer for his review. All such tests shall be certified by a registered professional engineer. The City also reserves the right to perform any and all tests deemed necessary by the City Engineer. Materials which fail to meet the minimum requirements of tests as set forth in this section may be rejected by the City Engineer and any such material shall be removed and replaced at the expense of the contractor.

- (1) Concrete for curb and gutter, driveways, or sidewalks shall have a 28 day crushing strength of 3000 psi when tested in accordance with ASTM Test designation C39-49 or latest amendment.
- (2) Asphalt for driveways and Greenways shall meet the test requirements as set forth in Section 609 and 610 of the NCDOT specifications for Type S(F)9.5(A, B or C).
- (3) Backfill and subgrade for curb and gutter, driveways and sidewalks shall be tested in accordance with the following testing procedures:
  - (a) AASHTO T 147-54 "Field Determination of Density of Soil in Place"
  - (b) AASHTO T 100-60 "Specific Gravity of Soils"
  - (c) AASHTO T 99-57 (ASTM 698) "The Moisture-Density Relations of Soils using a 5.5 lb. Rammer and a 12 inch drop" ( Standard Proctor ).

The following minimum density shall be obtained when tested according to AASHTO T 99 Test procedures:

- |     |  |              |
|-----|--|--------------|
| (a) | Under cut backfill                                   | 100% density |
| (b) | Backfill for curb and gutter, driveway and sidewalks | 95% density  |
| (c) | Subgrades  | 95% density  |
| (d) | Backfill for ditches outside street section          | 95% density  |

5.06 Fine Grading

The contractor shall be responsible for fine grading and bringing all grades and forms to the grades and elevations as shown on the plans or as directed by the City Engineer. Fine grading shall conform to Section 500 of the NCDOT "Standard Specifications for Roads and Structures" latest revision. Finished surfaces shall be smooth and even and shall not vary more than 3/8 inch in 10 feet from the true profile and cross-section.

Fine grading shall additionally conform to Section 500 of the NCDOT "Standard Specifications for Roads and Structures" latest revision.

5.07 Miscellaneous Concrete Removal

The contractor shall remove all existing concrete curb and gutter, concrete sidewalk, concrete driveway, or other items as designated by the plans or as authorized by the City Engineer. The contractor shall remove all such material from the project to a place provided by the contractor or, if required by the City Engineer, shall deposit such material in areas provided by the City. The contractor shall restore all disturbed area to the proper cross-section so as to provide a neat and orderly appearance.

5.08 Concrete Materials

The contractor shall only place concrete in the presence of a City Construction Inspector. Concrete for curb and gutter, driveways, and sidewalk shall be a Class "A" (3000 psi) mix as specified in Sections **825**, 846, 848, 1000, and 1024 of the NCDOT "Standard Specifications for Roads and Structures" latest revision,.

Aggregate for concrete shall conform to Section 1014 (1-2) of the NCDOT "Standard Specifications".

### **Joints (Flatwork)**

Joints are to be installed in all concrete work, according to Section 825-10 of the NCDOT “Standard Specifications”. Large areas should be divided by joints into sections no greater than 24 thicknesses by 36 thicknesses. Sidewalks should be divided by joints into square sections based on the width of the sidewalk. Care should be taken to ensure that the sidewalk joints coincide with joints in the curb and gutter. Joints shall either be tooled or saw cut to a depth of 1/3 the total thickness of the concrete. Tools for jointing shall use 1/8” radii.

#### 5.09 North Carolina Department of Transportation Specifications

References to sections of the NCDOT specifications are intended to be supplementary to the City's specifications. In any conflict between NCDOT specifications and City specifications, the City's specifications shall govern.

#### 5.10 Combination Curb and Gutter

All forms **shall comply with NCDOT specification section 846-3(B)** and shall be of metal, straight, free from warp, and of sufficient strength when staked to resist the pressure of the concrete without springing. Metal forms shall be of approved section and shall have a flat surface on top.

Special radius forms at street intersections will be made by fabricating 1/2" wood, or metal to obtain the proper horizontal curvature and 1-inch batter, thoroughly braced and staked to proper alignment and grade and so maintained while pouring the concrete. Wood forms may only be used upon special approval by the Engineer.

Forms for the concrete gutter or shoulder shall be of a depth equal to the depth of the gutter.

Outside forms for the combination concrete gutter and curbing shall be of a depth equal to the combined depth of the curbing and gutter and the inside forms shall be of the depth of the curbing and gutter respectively and shall be so designed as to permit of secure fastening to the outside form and held with suitable clamps, numerous enough to prevent bulging of the forms.

All forms shall be cleaned thoroughly and oiled before concrete is placed against them. Forms which have become worn, bent, or broken shall not be used.

Concrete shall be placed in forms in conformance with Section 825-4 of the NCDOT “Standard Specifications”. Concrete shall be held with face forms or muled to the cross-section indicated on the plans. Finished concrete shall not deviate from true cross-section by more than one-eighth inch (1/8”).

#### 5.11 Dummy (Control) Joints

Dummy joints shall be constructed as per Section 846-3(C) of the NCDOT “Standard Specifications”. Joints that cannot be tooled to a depth of two inches (2”) shall be “chased” by saw cutting to a depth of two inches (2”) per Section 825-10(E).

#### 5.12 Expansion Joints

Expansion joint material shall be placed approximately ninety (90) feet apart, the material to extend **entirely** through the structure and held securely in place. The material will extend through the joint at all points, after the forms are removed, and projecting edges of the material will be cut off. Expansion joint material will be placed at each point of curvature and point of tangency, and the space intervening between points will be divided in sections approximately ninety (90) feet as above described. The length of sections may be reduced when necessary for closures but no section less than eight (8) feet will be permitted. Expansion joint material shall be composed of either Cork Filler or Bituminous Filler and shall conform to the requirements as outlined in NCDOT Specifications.

#### 5.13 Driveway and Sidewalk Forms

The depth of forms shall be the depth of the concrete. All forms shall be approved sections, free from all bends and warps at all times, and shall be cleaned thoroughly each time they are used before concrete is placed against them. All forms shall be of sufficient material integrity to maintain line and grade during the initial curing period. All stakes or pins shall be placed on the **outside** of the forms. The forms shall be set so that they have firm and even bearing throughout their entire length on the thoroughly completed subgrade. They shall be joined neatly and tightly; the forms shall be accurately set to line and grade and braced sufficiently to resist the pressure of the concrete and the impact of the screed.

#### 5.14 Finishing

The top surface of the concrete shall be finished to line and grade in a smooth, neat and even manner by means of wooden floats, or by an approved finishing machine. A slick trowel finish is not wanted. Upon removal of the forms where necessary to secure a smooth, even finish, the permanently exposed surfaces will be rubbed in an approved manner. All rejected work shall be removed and replaced. All joints shall be open for the full depth and length of the joint, the edges adjacent to the joints being sharp and clean-cut. The curb must show no variation horizontally **and/or vertically** exceeding one-eighth inch (1/8") under a **ten (10')** foot straight edge.

#### 5.15 Curing

As soon as the concrete has set sufficiently, it shall be sprinkled and kept Moist until covered. As soon as the concrete has set sufficiently to not be damaged or scratched, it shall be covered with damp burlap or two inches of earth or sand which shall be kept wet by watering for an additional period of not less than three (3) days, or longer, if necessary, in the opinion of the City Engineer.

In lieu of the above, the contractor may elect to use membrane curing in accordance with Section 700-9(B) of the NCDOT Standard Specifications. Particularly that the curing compound shall be applied at a rate of at least 0.01 gallon per square foot (1 gal / 100 sf); and that the newly placed concrete shall be covered by curing compound within thirty minutes of placement. Curing compound shall be re-applied to any concrete surfaces that receive heavy rainfall (<0.1 in/ 10 minutes) within three hours of initial application. Where forms are removed before the expiration of the required curing period, curing compound shall be applied immediately after removing the forms. The curing period is as defined in Section 825-9 of the NCDOT Standard Specifications.

In case the concrete is placed and the temperature is expected to fall below thirty-two (32) degrees Fahrenheit, a sufficient supply of polyethylene film, straw, hay, grass or other suitable material must be placed to cover the concrete to protect it against freezing, but care shall be taken not to mar the surface of the concrete.

The contractor shall protect the concrete from damage by rain, pedestrians, and animals with suitable covers.

At no time shall more concrete be laid than can be immediately and properly finished and properly covered during daylight, unless an adequate lighting system satisfactory to the City Engineer. No annoyance to the Public shall be allowed during the night hours.

**It is the duty of the contractor to prevent the marring of any surface, and he will be held responsible and required to replace any damaged areas.**

#### 5.16 Expansion Joints Abutting Curbing

Whenever a sidewalk is constructed abutting a curb and gutter section or when required by the City Engineer, an expansion joint shall be formed adjacent to the curbing or other permanent structure by the use of expansion joint material. An expansion joint shall be placed between the sidewalk and the radius curbing of the street intersection to allow the longitudinal expansion of the sidewalk. The expansion joint material shall be 1/2" thick, unless otherwise shown on the plans or requested by the City Engineer, and shall be securely fastened in position against the curb so it will not be displaced when concrete is deposited against it. Expansion joint material shall extend to the full depth of the joint and the top shall be 1/4" below the finished surface of the sidewalk.

#### 5.17 Concrete Curb and Gutter Machine

Curb and Gutter machines shall produce a combination curb and gutter section of the same cross-sectional area and dimensions as required by the plans and/or standard drawings as required by the City Engineer.

Concrete used in conjunction with an extrusion type machine shall be 3000 psi concrete with a slump of not more than one and one-half inches (1-1/2"). Water shall not be added to the mix at any time after the initial batch mix.

Expansion joints shall be placed at approximately ninety feet (90' ) apart. Expansion joints shall also be placed between the extruded curb and gutter section and any fixed structure.

Dummy joints shall be sawed at fifteen feet (15') intervals and shall be perpendicular to the face of the curb. All such joints shall be sawed to a width of 3/8-inch plus or minus 1/16-inch and to a depth of two inches (2") plus or minus 1/16-inch. All joints shall be sawed out within 72 hours or earlier if necessary to prevent uncontrolled cracking. Sawing of joints shall not be done until the concrete has hardened sufficiently to avoid spalling and raveling.

Any portion or portions of the curb and gutter installed by an extrusion type machine that does not meet the approval of the City Engineer and is not in conformance with these specifications shall be removed and replaced by the contractor at his expense. Any sections found not to be acceptable by the City shall be removed by sawing a joint on both sides of the section to be removed and the section shall then be removed in such a manner so as not to disturb any other portions which does meet the requirements of these specifications. In no case shall remaining portions be less than eight feet (8') from the nearest construction joint, fixed structure, or previously sawed dummy joint.



Concrete curb and gutter machines may not be used to construct any curb and gutter sections within ten feet (10') of a catch basin or other permanent structure, except where approved by the City Engineer.

#### 5.18 Typical Sections

(a) 24" Concrete Combination Curb and Gutter

All twenty-four inch (24") concrete combination curb and gutter shall conform to the cross-sectional area and dimensions as shown on City Standard Drawing No. 71D-9 or latest addendum. All forms for such curb and gutter shall conform to the requirements as set forth in Sections 5.09 thru 5.12 of these specifications.

(b) 30" Concrete Combination Curb and Gutter

All thirty inch (30") concrete combination curb and gutter shall conform to the cross-sectional area and dimensions as shown on City Standard Drawing No. 71D-10 or latest addendum. All forms for curb and gutter shall conform to the requirements as set forth in Sections 5.09 thru 5.12 of these specifications.

(c) 18" Mountable Concrete Curb and Gutter

All 18" mountable concrete curb and gutter shall conform to the cross-sectional area and dimensions as shown on City Standard Drawing No. 71D-13 (Type "A") or latest addendum. All forms for such curbing to Sections 5.09 thru 5.12 of these specifications.

(d) 24" Valley Curbing

All 24" valley curbing shall conform to the cross-sectional area and dimensions as shown on City Standard Drawing No. 71 D-11 or latest addendum. All forms for such curb and gutter shall conform to the requirements as set forth in Sections 5.09 thru 5.12 of these specifications.

(e) Concrete or Asphalt Sidewalk Paving

All concrete or asphalt sidewalk paving shall conform to the typical section as shown on City Standard Drawing No. 71D-14 or as required by the City Engineer. In most cases, sidewalk paving shall be four feet (4') in width and four inches (4") in depth. All forms used for such paving shall meet the requirements of Section 5.13 of these specifications.

5.19 Wheelchair Ramps

All street curbs in North Carolina being constructed or reconstructed for maintenance procedures, traffic operations, repairs, correction of utilities or altered for any reason shall provide wheelchair ramps at all intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow. The City Engineer shall make the final determination of the locations of wheelchair ramps.

(a) Curb and Gutter Removal

The concrete curb and gutter shall be removed for the full width of the wheelchair ramp. The curb and gutter may be sawed or taken out to the nearest joint as directed by the City Engineer. The contractor may be required under certain circumstances, to remove only the curb portion of the concrete curb and gutter, leaving the gutter apron in place.

(b) Installation

Wheelchair ramps shall be constructed in accordance with the NCDOT Standard Detail 848.05 & 848.06.

5.20 Restoration of Disturbed Areas

The contractor shall restore all surfaces disturbed by construction. This shall include but is not limited to surfaces where: (1) The contractor exceeded the construction limits indicated on the plans, or (2) Work was necessary to adequately tie the cut or fill slopes between the new construction and the existing surface.

Where existing driveways are encountered, the contractor shall restore the area disturbed in accordance to the following schedule:

<b>Original Driveway Surface</b>	<b>Replacement Surface</b>
Asphalt	1.5" 1-2 asphalt, 4" ABC Stone Base

Pen. Mac.	1.5" I-2 asphalt, 4" ABC Stone Base
Concrete	4" concrete
Stone or Gravel	4" ABC Stone Base
Dirt	3" ABC Stone Base

Note: All replacement depths are compacted depths. All driveway grades shall conform to City Standard Drawing No. 7ID-21 **latest revision**, unless otherwise specified in plans or directed by the City Engineer.

#### 5.21 Erosion Control

The Contractor shall supply all material, equipment, and labor necessary to protect the construction area and the property adjacent thereto from siltation and/or erosion damage caused by his construction. As minimum requirements, the Contractor shall install the erosion controls called for on the Project Plans and the erosion control permit issued pursuant to the "Sedimentation Pollution Control Act of 1973" as amended.

All items supplied/installed under this heading, shall comply with the recommendations as set forth in the NCDEQ "Erosion and Sediment Control Planning and Design Manual".

Any items, in the City Engineer's opinion, that fails to function properly due to faulty material or faulty installation techniques used by the Contractor, shall be replaced by the Contractor at the Contractor's expense. See Plans for additional Erosion Control measures.