

## **02400 - CURB & GUTTER, DRIVEWAYS & SIDEWALKS**

(Last Revised 5/2/16) R4

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## **PART 1 – GENERAL**

### **1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.
- B. [Section 00825 – Product Substitutions](#)
- C. [Section 00950 – Measurement and Payment](#)
- D. [Section 02200 – Earthwork](#)
- E. [Section 02275 – Trenching, Backfilling, and Compaction of Utilities](#)
- F. [Section 02920 – Seeding, Sodding, and Groundcover](#)
- G. [City of Wilson List of Approved Manufacturers and Products](#)

### **1.2 SUMMARY**

This section includes concrete curbs, combination curb and gutters, ramps, sidewalks, driveways, flumes, valley gutters, median strips, islands, retaining walls, steps, and headwalls on municipal roadways and its appurtenances.

### **1.3 DEFINITIONS**

#### **A. General:**

For the purposes of this specification, the following definitions refer to the streets and roadway system that comes under the authority of the City of Wilson, North Carolina as specified within this section and other sections of this manual.

- 1) **Aggregate Base Course:** A layer of graded aggregate materials of a specified thickness placed between the subgrade and the concrete structure or appurtenance.
  - 2) **Public Road System:** Roadway, streets, and their appurtenances required for the conveyance of the motoring public that are maintained by either the City of Wilson or the North Carolina Department of Transportation.
  - 3) **Subgrade:** The top surface of a sidewalk, curb and gutter or driveway shaped to conform to the typical section on which the concrete structure or appurtenance is constructed.
  - 4) **Suitable Subgrade:** A subgrade that consists of a material type and density that is approved by the City Engineer for placement of a subsequent concrete structure or appurtenance.
- B. The following are industry abbreviations for various materials and items:
- 1) **C&G:** Concrete Curb and Gutter
  - 2) **D/W** Driveway
  - 3) **S/W** Sidewalk
  - 4) **WWF:** Welded Wire Fabric

#### 1.4 SUBMITTALS

- A. Submit product data, reports, and/or shop drawings, as applicable, for the following:
- 1) Air Entrainment
  - 2) Concrete cylinder break tests
  - 3) Concrete admixtures
  - 4) Joint Sealants and expansion joint material
  - 5) Job mix formula
  - 6) Other embedded items

#### 1.5 QUALITY ASSURANCE

- A. **Geotechnical Testing Agency Qualifications:** An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing as documented according to ASTM D3740 and ASTM E548.
- B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.
- C. The Contractor shall comply with North Carolina Department of Environment and Natural Resources, "Erosion and Sedimentation Control Handbook," latest revision.
- D. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

**American Society for Testing and Materials**

<b>ASTM A82</b>	Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
<b>ASTM A185</b>	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
<b>ASTM A497</b>	Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
<b>ASTM A615</b>	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
<b>ASTM C33</b>	Standard Specification for Concrete Aggregates
<b>ASTM C94</b>	Standard Specification for Ready-Mixed Concrete
<b>ASTM C136</b>	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
<b>ASTM C150</b>	Standard Specification for Portland Cement
<b>ASTM C171</b>	Standard Specification for Sheet Materials for Curing Concrete
<b>ASTM C260</b>	Standard Specification for Air-Entraining Admixtures for Concrete
<b>ASTM C309</b>	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
<b>ASTM C494</b>	Standard Specification for Chemical Admixtures for Concrete
<b>ASTM C1116</b>	Standard Specification for Fiber-Reinforced Concrete and Shotcrete
<b>ASTM C1315</b>	Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
<b>ASTM D422</b>	Standard Test Method for Particle-Size Analysis of Soils (for classification purposes only)
<b>ASTM D448</b>	Standard Classification for Sizes of Aggregate for Road and Bridge Construction

<b>ASTM D1751</b>	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
<b>ASTM D1752</b>	Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
<b>ASTM D3740</b>	Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
<b>ASTM D4397</b>	Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications
<b>ASTM E329</b>	Standard Specification for Agencies Engaged in Construction Inspection and/or Testing
<b>ASTM E548</b>	Standard Guide for General Criteria Used for Evaluating Laboratory Competence
<b>ASTM E1745</b>	Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

#### **American Association of State Highway & Transportation Officials**

<b>AASHTO M145</b>	The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
<b>AASHTO T99</b>	The Moisture-Density Relations of Soils using a 5.5-pound Rammer and a 12-inch drop
<b>AASHTO T180</b>	The Moisture Density Relations of Soils using a 10-pound Rammer and an 18-inch drop.
<b>AASHTO T191</b>	Density of Soil In-Place by the Sand-Cone Method
<b>AASHTO T204</b>	Density of Soil In-Place by the Drive Cylinder Method
<b>AASHTO T205</b>	Density of Soil In-Place by the Rubber-Balloon Method

#### **1.6 STANDARD ABBREVIATIONS**

<b>ACI</b>	American Concrete Institute
<b>ADA</b>	Americans with Disabilities Act
<b>ANSI</b>	American National Standards Institute

<b>ASCE</b>	American Society of Civil Engineers
<b>AASHTO</b>	American Association of State Highway Transportation Officials.
<b>ASTM</b>	American Society for Testing and Materials
<b>CRSI</b>	Concrete Reinforcing Steel Institute
<b>FS</b>	Federal Specifications
<b>MSDS</b>	Material Safety Data Sheets
<b>NCDOT</b>	North Carolina Department of Transportation

Note: Designations such as ASTM, AASHTO, NCDOT, etc. referenced throughout this specification imply the latest revision.

## 1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

### A. Concrete Handling/Transportation

- 1) Cement concrete plant operations shall comply with the applicable sections of NCDOT *Standard Specifications for Roads and Structures*, Section 1000, *Portland Cement Concrete Production and Delivery*.
- 2) Time limitations and intervals between deliveries shall be in accordance with Section 1000-4E, *Elapsed Time for Placing Concrete* of the NCDOT *Standard Specifications for Roads and Structures*.
- 3) See Part 3 - EXECUTION of these specifications for handling of materials during placement of hydraulic cement concrete.

### B. Steel Handling/Examination:

- 1) **Steel Reinforcing Inspection:**
  - a. **Plain Steel Reinforcing:** Inspect materials thoroughly upon arrival. Examine materials for damage or excessive rust. Remove damaged or rejected materials from site. A light coat of rust is permitted to develop on steel bars and fabric; however, rust scaling and flaking is not permitted
  - b. **Coated Steel Reinforcing:** Handling and storage of coated bars shall conform to the requirements of AASHTO M284. Visible damage to the coating shall be patched or repaired with materials compatible to the existing coating in accordance with AASHTO M284.
- 2) **Pre-Installation Inspection:** Prior to being installed, inspect each bar of steel reinforcing for the presence of dirt, paint, oil, rust scaling, flaking or other foreign matter. Remove such matter with appropriate methods and to the satisfaction of the City Engineer.

- C. Observe manufacturer's directions for delivery and storage of materials and accessories.
- D. Reinforcing steel shall be stored on platforms, skids, or other supports that will keep the steel above ground, well drained, and protected against deformation. Upon delivery to site, epoxy coated steel shall be covered with an opaque covering. Coverings shall be placed to provide air circulation and prevent condensation.

## **1.8 PROJECT CONDITIONS**

### **1.8.1 PROTECTION OF STREAMS**

Do not discharge excess concrete into a drainage pipe, catchbasin, ditch, stream, river, pond, or lake.

### **1.8.2 PROTECTION OF ROADWAYS**

Do not discharge or allow concrete to spill onto any roadway or appurtenances either during placement or while in transit. Remove spills immediately or otherwise repair street as directed by the City Engineer.

### **1.8.3 PROTECTION FROM GRAFFITI:**

Newly poured concrete roads, streets, curbs, or sidewalks shall be protected AND guarded from graffiti from passersby until the concrete has sufficiently cured to resist such molestation. Failure to prevent graffiti, or other such vandalism, shall result in the new concrete having to be removed and replaced. This requirement shall mandate the Contractor to take the necessary steps in preventing such incidents including, but not limited, to guarding the project after normal working hours.

### **1.8.4 WASHOUT HANDLING**

A concrete washout shall be identified and preapproved for use. The area shall be maintained and restored prior to acceptance of the project.

## **1.9 COORDINATION**

Coordinate placement of sidewalk and driveway connections to municipal streets and roadways with the City of Wilson City Engineer.

## **PART 2 – PRODUCTS**

### **2.1 MISCELLANEOUS**

#### **2.1.1 PORTLAND CEMENT CONCRETE**

Ready mixed concrete shall comply with ASTM C94, *Standard Specification for Ready-Mixed Concrete*. Cement concrete shall meet the requirements of Section 1000, *Portland Cement Concrete Production and Delivery* and Section 1024, *Materials for Portland Cement Concrete* of the NCDOT Standard

Specifications for Roads and Structures. Concrete strength shall be as specified on Standard Details and drawings. Unless otherwise specified, all concrete shall be Class A (3000 psi), minimum.

All exposed concrete shall be air entrained with an air content conforming to the requirements of Section 1000-4B, *Air Entrainment* of the NCDOT *Standard Specifications for Roads and Structures*. Air entrained admixtures for use in Portland cement concrete shall meet the requirements of AASHTO designation M-154, *Air-Entraining Admixtures for Concrete*. Only those admixtures shall be used which have been approved by the City Engineer.

If approved by the City Engineer, calcium chloride may be used as an admixture subject to the requirements of Section 1000-4H, *Use of Calcium Chloride* of the NCDOT *Standard Specifications for Roads and Structures*. Calcium chloride shall conform to AASHTO M144, Calcium Chloride, type 2. Do not use calcium chloride in reinforced concrete construction.

Concrete admixtures, when specified, shall conform to Section 1024-3, *Admixtures* of NCDOT *Standard Specifications for Roads and Structures*.

Concrete Classes (NCDOT) to Design Compressive Strength at 28 days (f'c):

Class	Minimum Compressive Strength at 28 days (psi)
Class AA	4,500
Class A	3,000
Class B	2,500

## 2.1.2 HANDRAILS

Handrails shall conform to the applicable sections and requirements of Section 460, *Bridge Railing* of the NCDOT *Standard Specifications for Roads and Structures*, latest revision. Handrails for trail projects shall comply with the applicable subsections of Section 1074, *Miscellaneous Metals and Hardware* of the NCDOT *Standard Specifications for Roads and Structures*.

## 2.1.3 JOINT FILLER

### A. ASPHALT EXPANSION JOINT FILLER

Material shall be approximately ½ inch in thickness and a width and depth equal to those of the incidental structure. However, unless otherwise directed by the City Engineer, install expansion joint filler 1/2-inch below the concrete surface and seal for maximum protection from water infiltration, weathering and to assure proper performance. See [paragraph 2.1.11 for concrete joint sealer](#) requirements.

Asphalt expansion joint filler material shall be in accordance with the applicable sections of Section 1028 of the NCDOT *Standard Specifications for Roads and Structures*. Fiber expansion joint filler shall meet AASHTO M213, *Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction*

(*Nonextruding and Resilient Bituminous Types*); ASTM D1751, *Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)*, ; Fed Spec item HH-F-341 F, Type I; FAA Spec Item P-610-2.7.

#### **2.1.4 CURING MATERIALS**

Liquid membrane curing compound, PE film, burlap, or water for curing shall meet the requirements of Section 1026, *Curing Agents* of the NCDOT *Standard Specifications for Roads and Structures*.

#### **2.1.5 INSULATION BLANKET**

In cold weather operations, insulated blankets must retain or supply moisture and maintain the temperature at the outermost surfaces of concrete above 50° F for at least 72 hours and above 32° F for at least an additional 48 hours. For other measures pertaining to placing concrete in cold weather, see Section 420-7, *Placing Concrete in Cold Weather* of the NCDOT *Standard Specifications for Roads and Structures*.

#### **2.1.6 POROUS BACKFILL AND WEEP HOLES**

Porous backfill material and drainpipes for weep holes for retaining walls shall conform to requirements of Section 420-11, *Drains in Walls and Culverts* of the NCDOT *Standard Specifications for Roads and Structures*.

#### **2.1.7 PORTLAND CEMENT**

Type I, CSA normal, ASTM C150 *Standard Specification for Portland Cement*.

#### **2.1.8 REINFORCEMENT**

##### **A. REINFORCING BARS**

Steel reinforcing bars shall be minimum grade 60 and shall conform to the requirements of AASHTO M31, *Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcing* and ASTM A615. Reinforcing bars shall also conform to the applicable requirements of Section 1070, *Reinforcing Steel*, of the NCDOT *Standard Specifications for Roads and Structures*.

##### **B. WELDED WIRE FABRIC**

Welded wire mesh shall be of the size specified by the City Engineer but shall be minimum 6 x 6, W2.9 x W2.9 and shall conform to the requirements of AASHTO M32, *Cold-Drawn Steel Wire for Concrete Reinforcement* and the applicable sections of Section 1070, *Reinforcing Steel* of NCDOT *Standard Specifications for Roads and Structures*.

#### **2.1.9 AGGREGATE BASE MATERIAL**



Aggregate base materials for foundation support shall be #57, compacted, and in compliance with Table 1005-1, *Aggregate Gradation, Coarse Aggregate* of the NCDOT *Standard Specifications for Roads and Structures*.

### 2.1.10 CONCRETE ADMIXTURES

Concrete admixtures, when specified by the City Engineer, shall conform to Section 1024-3, *Admixtures* of NCDOT *Standard Specifications for Roads and Structures*.

### 2.1.11 CONCRETE JOINT SEALER

Hot applied joint sealer shall be a rubberized/asphalt project meeting ASTM D6690, *Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements*. Hot applied Joint sealer is not to be used in areas of a heavy pedestrian traffic. For pedestrian traffic areas, use low modulus silicone sealant meeting ASTM D5893, *Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements*.

## **PART 3 – EXECUTION**

### **3.1 CONSTRUCTION – ALL CONCRETE ITEMS**

#### **3.1.1 CONSTRUCTION OF SUBGRADE**

- A. **SUBGRADE PREPARATION:** Excavation and subgrade preparation shall be in strict compliance with [Section 02200, Earthwork](#). The subgrade upon which this work is to be placed shall be shaped and compacted to a firm, even surface conforming to the elevation and cross-sections shown on the plans, the standard drawings, or as directed by the Engineer. All soft, frozen, and unsuitable material shall be removed and replaced with approved material. The subgrade shall be moist when the concrete is placed.
- B. **BICYCLE/GREENWAY SUBGRADE:**
  - 1) Pavement subgrade should be prepared in accordance with paragraph 3.1.1 A, above and shall conform to the grade and cross-section shown on the plans.
  - 2) Herbicides shall conform to Section 1060-13, *Herbicides* of the NCDOT Specifications for Roads and Structures, latest revision shall be applied to the aggregate base course and/or subgrade immediately prior to paving. The rate of application shall be as recommended by the herbicide manufacturer. **Herbicides shall not be left uncovered for longer than 15 minutes.** Herbicides shall not be used where they may contaminate water used for irrigation or drinking purposes.
- C. **SUBGRADE FINE GRADING (Trimming):** When forms have been set to exact grade and secured, fine grading to exact sub-grade elevation shall be completed by hand. Before pouring operations begin, the Contractor shall have forms set and grade tested and approved by the Contractor ahead of pouring operations.

Subgrade fine grading shall be the responsibility of the Contractor to ensure that the subgrade conforms to the Standard Details.

### 3.1.2 FORMS

- A. **GENERAL:** Forms for this work shall be of wood (except curb and gutter), metal, or other approved material, shall extend to the full depth of the concrete and shall be straight, free from warps and of sufficient strength to withstand the pressure of the concrete without springing. Bracing and staking of the forms shall be such that the forms will remain in both horizontal and vertical alignment until their removal. Forms shall be cleaned of foreign matter and oiled before concrete is placed. No concrete shall be poured into forms which have not been checked and approved.

### 3.1.3 PLACING— ALL CONCRETE ITEMS

The concrete shall be placed in the forms in such a manner as to prevent the segregation of the mortar and the aggregate. The concrete shall be spaded, tamped, or vibrated sufficiently to bring the mortar to the surface. Concrete shall not be dropped a distance of more than 5 feet.

Prior to and during pouring operations, the Contractor's foreman or formsetter shall carefully watch all alignment and grades to detect any errors in grade or misalignment. In the event any of the work is damaged from any cause or prove defective in any way, or is out of alignment or grade, the Contractor shall remove such work and replace at his own expense. The detection of poor subgrade shall also be his responsibility.

When sufficient concrete has been placed in the forms, it shall be well spaded along all areas in contact with the forms in order to eliminate all honeycombing. Mix shall be rodded or vibrated to eliminate voids. Concrete shall be floated to the proper grade and alignment, free from depressions or other irregularities, after which the exposed surfaces shall then be screeded with a straight edge and finished with a steel or wooden trowel. The concrete shall be troweled smooth and, before the concrete obtains full set, very lightly brushed with a brush moistened with clear water. No mortar shall be used in the finishing. Immediately following finishing operations, the finished concrete shall be cured and protected in accordance with these specifications.

### 3.1.4 COORDINATION OF POURS

It will be the responsibility of the Contractor to coordinate the times of pours with the Inspector. Sufficient notice shall be given to the Inspector so that he/she can check all aspects of the work before the pouring operations begin. Under no circumstances shall the Contractor pour concrete until the Inspector has had sufficient time to make checks of the work. An inspection shall be requested at least 4 hours prior to any pouring operation.

The maximum interval between the placing of batches at the work site shall not exceed 20 minutes. See also Section 1000-4E, *Elapsed Time for Placing Concrete* and Table 1000-2 of the NCDOT *Standard Specifications for Roads and Structures*.

### 3.1.5 FINISHING

Concrete for curb, curb and gutter, sidewalks and driveways shall have a broomed finish. This finish shall be accomplished as follows: the surface shall be screeded and tamped to force the course aggregate away from the surface, floated to bring the surface to the required finish level, steel-troweled to an even smooth surface and broomed with a fiber-bristle brush. The surface shall be uniform in texture.

### 3.1.6 CURING

#### A. CURING – YEAR AROUND

Curing shall be accomplished by preventing loss of moisture, rapid temperature change, and mechanical injury from rain or flowing water for a period of 3 days when normal Portland cement has been used or 7 days when pozzolan mix designs are used. Curing shall be started as soon as placing, finishing, and free water has disappeared from the surface of the concrete. One of the following methods of curing are required year round:

- 1) **Liquid membrane compound:** Apply membrane-curing compound for curing, sealing, and moisture retention. The entire exposed surface of the structure shall be sprayed uniformly with a white pigmented membrane-forming compound immediately following the texturing operation. The curing compound shall be applied in 2 coats by hand.

Do not expose newly placed concrete for more than 30 minutes before being covered with curing compound. Failure to cover the surfaces of the concrete shall be cause for immediate suspension of the paving operations.

Perform application in accordance with manufacturer's directions but at a minimum rate of 100 to 150 square feet per gallon and not more than 350 square feet per gallon (total for both coats). Application shall be by a sprayer or long-nap roller and shall be an even, continuous membrane produced on the concrete surface. The second coat shall be applied in a direction approximately at right angles to the direction of the first coat. No puddling shall be produced. At the time of use, the compound shall be in a thoroughly mixed condition, with pigment uniformly dispersed through the vehicle. The compound shall form a uniform, continuous, coherent film that will not check, crack or peel and shall be free from pinholes or other imperfections.

The membrane shall harden 30 minutes after application. Personnel and equipment shall be kept off the freshly applied material to prevent damage to the seal. Concrete surfaces to which membrane-curing compounds have been applied shall be adequately protected for 7 days from pedestrian and vehicular traffic and from any other action which might disrupt the continuity of the membrane. If the membrane becomes damaged within the initial 72 hours, damaged portions shall be repaired immediately with additional compound.

If removal of forms is required, exposed sections shall be protected immediately to provide a curing treatment equal to that provided for the surface.

- 2) **PE Film:** Spread the section of the film in a manner that will not damage the finished pavement surface. Securely tape or provide lap joints for the sections that are at least 12 inches wide and take suitable precautions to prevent the circulation of air beneath the film. Use black or dark plastic sheets when the daily high ambient temperature is between 40°F - 60°F. Use white opaque reflective plastic sheet when the daily ambient temperature is above 60°F. Plastic sheets shall meet the requirements of ASTM C171, *Standard Specification for Sheet Materials for Curing Concrete*.

Check the film for damage when it is spread and during the curing period. Repair or replace any damaged section immediately.

#### **B. COLD WEATHER CURING**

No concrete is to be poured when the outside ambient temperature is 40° F and falling. Cold weather curing shall be applied when the outside temperature is 50° F and falling. When the temperature falls to or below 35° F, no concrete work of any kind is to be performed.

- 1) Concrete Temperature: Conform to the requirements of paragraph 420-7, Placing Concrete in Cold Weather of the NCDOT Standard Specifications for Roads and Structures, for the required temperatures of concrete.
- 2) Cold subgrade: No concrete is to be placed on a frozen subgrade.
- 3) In addition to year round curing, install insulated blankets that will retain or supply moisture and maintain the temperature of concrete at the outermost surfaces above 50° F for at least 72 hours and above 32° F for at least an additional 48 hours. Blankets shall be left in place for a minimum of 7 days.
- 4) In cold weather applications, calcium chloride may be used as an admixture, if approved by the City Engineer, provided the concrete is not reinforced.

#### **C. HOT WEATHER CURING**

Hot weather curing shall be applied when the outside temperature is 75°F and rising. Care shall be taken in hot, dry, or windy weather to protect the concrete from shrinkage cracking by applying at a minimum liquid membrane compound and PE film as described in [Section 3.1.6 A](#), above.

Routine hot weather measures shall include cooling forms and wetting subgrade in addition to any of the other measures.

Other measures for curing may be required by the City Engineer, such as: fog spraying, sprinkling, ponding, windbreaks, shading, or wet covering with an approved light colored material. Such curing may be required to remain in place for a minimum of 7 days. No extra compensation will be made for curing of concrete.

#### **D. DAMAGED CONCRETE**

Any work damaged due to improper curing, freezing, or rain, shall be replaced at the Contractor's expense.

### 3.1.7 PROTECTION OF CONCRETE

- A. Protect new concrete sidewalks and appurtenances from pedestrian traffic for a minimum of 24 hours and do not open to pedestrian traffic for the first 5 days. Vehicular traffic shall be excluded for the first 14 days or until the minimum design compressive strength is attained, whichever is the lesser time.

Protect new concrete driveway surfaces and curb and gutter from vehicular traffic for minimum of 7 days or until the minimum design compressive strength is attained, whichever is the lesser time, unless otherwise approved by the City Engineer. Erect and maintain warning signs, lights, and watchmen to protect pedestrian and to direct traffic as needed.

- B. Protect concrete against public traffic, construction equipment and traffic caused by employees and agents. Repair or replace parts of concrete damaged from such prior to final acceptance.
- C. No equipment shall be driven or moved across newly concreted surfaces unless such equipment is rubber-tired and only if paved surface is designed for and capable of sustaining loads to be imposed by the equipment.
- D. Protect concrete from graffiti.

### 3.1.8 TESTING

- A. **Testing:**

On a case-by-case basis, at the discretion of the City Engineer, the Contractor may be required to perform concrete testing in accordance with the following provisions.

- 1) **Initial Test:** The initial test (from first ready mix truck) is to be taken after the second yard is dispatched from the mixer and is to consist of the following:
  - a. One slump test
  - b. Pull, prepare and store 3 cylinders on-site for 24 hours
  - c. Temperature
- 2) **Second Test:** After the above tests are pulled from the initial truck, every 5th truck thereafter is to be tested in the same manner as noted above.
- 3) **Subsequent Test:** Slump tests may be required at any time during the pour if for any reason the City Representative or Contractor feels the conditions of the concrete have changed. If the slump test fails, test cylinders of that section shall be taken by the Contractor.
- 4) The City Engineer shall require any concrete that fails to meet the required compressive strength to be removed from any portion of a sidewalk, curb & gutter or driveway and that it be replaced at the Contractor's expense.
- 5) **Testing Costs:** The cost of Quality Control (QC) tests, tests to assure the Contractor that he/she is meeting and complying with the requirements of

these specifications, is the Contractor's responsibility. The cost of Quality Assurance (QA) tests, tests performed independently by the City of Wilson to confirm that the Contractor is generally performing his/her work in compliance with these specifications, is the responsibility of the City of Wilson.

### **3.1.9 DEFECTIVE WORK**

The City will require the removal and replacement of any concrete items where they have structural cracks, have been broken, chipped, have become misaligned, grades are incorrect, does not meet dimensions as shown in the Standard Details, improperly cured, or of a substandard or non-approved product. Such areas designated by the City Engineer shall be repaired at no cost to the City. Items replaced shall conform to the requirements for new work as to strength and construction. During removal of defective work, an amount equal to the required lengths of construction joints must be removed and replaced.

Public jobs shall have cracked or defective curb replaced prior to paving.

The Engineer may drill cores from completed slabs of concrete to make depth measurements. Sections showing a deficiency of more than 3/8 inch shall be removed and replaced to the specified depth at the Contractor's expense.

### **3.1.10 CONCRETE CLASS**

Concrete class for combined curb and gutter, curbs, sidewalks, driveways, flumes, ditches, steps, headwalls, and islands shall be a minimum of A, 3000 psi or as designated in the specifications or drawings. However, machined formed curb Class AA (4500 psi) is recommended

## **3.2 STANDARD CONCRETE CURB AND GUTTER**

### **3.2.1 GENERAL REQUIREMENTS**

This work shall consist of a single course of Portland cement concrete, constructed on a prepared subgrade in accordance with these specifications. It shall have the dimensions, cross-section, and location as shown on the plans or as directed by the City Engineer. See **Standard Detail 402.01** for standard vertical curb & gutter and roll curb.

Horizontal alignment of curbs and combined curb and gutter shall be in reasonably close conformity to the lines shown on the plans. Vertical alignment shall not exceed +/- 3/8 inch in 10 feet from plan grade.

Before concrete obtains full set, all exposed surfaces shall be finished with a brush moistened with clear water.

When constructing curb and gutter, the Contractor will be responsible for filling and compacting material in the space left behind the curb and gutter after the forms are removed. This shall take place within 3 to 7 days from pour and the material shall be compacted to the grade of the back of the curb. No extra compensation shall be made for this work.

Dowels shall be placed in the throat plate, to tie gutter to plate as required in the use of conventional forms.

**A. JOINTS FOR CURB AND GUTTER:**

1) Transverse joints:

- a. Transverse joints for crack control for fixed forms shall be provided at the following locations:
  1. At approximately 10 foot intervals;
  2. At the gutter where the curb and gutter ties to the gutter apron of drop inlets;
  3. When time elapsing between consecutive concrete placements exceeds 45 minutes, and
  4. Where no section shall be less than 6 feet in length.
- b. Transverse joints for crack control may be formed by using one of the following methods:
  1. Removable 1/8 inch thick templates.
  2. Scoring or sawing for a depth of not less than 3/4 inch when using curb machine.
  3. Approved "leave-in" type insert or may be formed or created using other approved methods which will successfully induce and control the location and shape of the transverse cracks.
  4. Place a joint sealant in cracks after removal of templates. Fill joints in gutter with joint sealer to the top surface of the gutter. Seal all joints except for joints in curb sections not having an integral gutter. Joints are to be sealed before backfilling or performing adjacent operations. See paragraph [2.1.11, Concrete Joint Sealer](#) for material spec.

If templates are used for transverse joints, templates shall be removed by stages, but not entirely until the concrete has become thoroughly hard. After removal of the templates, there must be a clear division throughout between these sections. Edging tools will be used to form an edge along the back and front form and at each template.

2) Expansion joints:

- a. See Section 2 – PRODUCTS of these specifications for approved expansion materials.

Expansion joints shall be formed at intervals of approximately 90 feet on centers, at all radii points at concrete entrances and curb returns, at locations no less than 3 feet and no more than 10 feet from drop inlets, at the end of days work, and or all cold joints.

### 3.2.2 FORMS –CURB & GUTTER

#### A. FIXED FORMS

Steel forms shall be used for the construction of curb and gutter. Fixed forms shall be straight, free from warp, and of such construction that there will be no interference with the inspection of grade and alignment. Metal templates, not more than 3/16 inch in thickness and manufactured in accordance with the curb and gutter section, shall be set in the places provided in the forms not more than 10 feet apart. Templates shall be adjusted to prevent short sections (less than 5 feet). Forms shall extend the entire depth of the item and shall be braced and secured so that no deflection from alignment or grade will occur during concrete placement. Radial forms shall be sufficiently flexible or otherwise designed to provide a smooth, uniform, curved surface of the required radius. When sufficient concrete has been placed in the forms, it shall be well spaded along all areas in contact with the forms in order to eliminate all honeycombing. Face forms shall be removed as soon as concrete has attained sufficient set for the curb to stand without slumping. The exposed surface shall then be smoothed by the use of a suitable finishing tool.

#### B. SLIP FORMS

In some places the Contractor may desire to use the slip form method to pour curb and gutter. In such cases approval from the City Engineer will be required. The Contractor's proposed equipment must receive the approval of the City Engineer.

- 1) **Equipment:** The slipform equipment shall be self-propelled and shall be equipped to consolidate, form, extrude, and finish the freshly placed concrete in such a manner that a minimum of hand finishing is required to produce a dense, consolidated, homogenous product. Slipform equipment shall be controlled to line and grade by automatic sensing, guidance, and control devices such that the machine automatically senses and follows taut guidelines or other stable reference, performing any necessary corrective action to ensure the correct grade and alignment is achieved.

The Contractor shall plan and stage the work to eliminate the need for the slipform machine to be stopped during placement operations.

- 2) **Attachments:** The forms on the equipment must meet the precise dimensions shown on **Standard Detail 402.01** for the different types of curb. A sufficient number of vibrators shall be provided on the machine and be in good working order.
- 3) **Line and Grade Controls:** It shall be the Contractor's responsibility to set the line and grade controls for his machine. These controls shall be checked by the City's Contractor before any "trimming" or pouring occurs. However, approval of these controls by the City's Contractor shall not relieve the Contractor of the responsibility of obtaining the planned grade or alignment according to the construction stakes.



- 4) **Subgrade Trimming:** It shall be the responsibility of the Contractor to ensure that the subgrade conforms to the Standard Details. No extra payment shall be made to the Contractor for "trimming" the subgrade if such "trimming" is less than the 6-inch limit allowed for unclassified excavation as defined in [Section 02200, Earthwork](#). Before pouring operations begin, the subgrade shall be checked by the City's Contractor.
- 5) **Pouring Operations:** Before the machine starts a pour, the slump of the concrete will be checked in the presence of the City's Contractor. This slump must be between 0 and 2 inches. In the event that the slump exceeds 2 inches, the concrete will be rejected.

If it is determined by the City's Contractor that the poured curb or gutter does not meet the exact dimensions of the "standard drawings" or for some other reason it does not conform to these specifications, (alignment, grade, materials, etc.) then the Contractor, at his own expense, shall remove the faulty work before concrete obtains full set. No compensation shall be made for unsatisfactory work.

The Contractor shall make sure that sufficient vibration of the concrete occurs. If vibrators fail to function, all operations shall cease until they are satisfactorily repaired.

Where storm inlets are designated, the Contractor shall either leave a sufficient blank space to be hand formed later or work concrete to the exact dimensions for the standard inlet specified.

- 6) **Defective Curb & Gutter:** Honeycombed concrete shall be filled with a sand/cement paste and allowed to cure prior to backfilling curb. If in the opinion of the City Engineer the honeycombing, blemish or damage by construction equipment is extensive to the point of rendering a weak, cracked or otherwise questionable section of curb, in strength or appearance, the City Engineer will require the curb section to be replaced at the Contractor's expense.

### 3.3 STANDARD PORTLAND CEMENT CONCRETE SIDEWALK AND DRIVEWAY ENTRANCES

#### 3.3.1 GENERAL REQUIREMENTS

This work shall consist of the construction of Portland cement concrete sidewalk 4 inches thick and in accordance with these specifications and to the widths shown in the applicable Standard Details. Sidewalks crossing driveway entrances shall be constructed 6 inches thick. See [Standard Detail 404.03](#) for sidewalk.

All driveways shall have a 6 inch thick concrete apron from street to right-of-way. The width of residential driveways, measured at the right-of-way, shall be 12 feet minimum to 24 feet maximum. See [Standard Detail 404.01](#). The width of commercial driveways shall be 20 feet minimum, measured face to face at the

throat of the opening, up to a maximum width approved by the City of Wilson. See [Standard Detail 404.02](#).

Unless otherwise shown on the plans and approved by the City Engineer, all sidewalks shall maintain a ¼ inch per foot (2%) transverse slope.

Curb cuts for driveways and curb ramps shall be constructed as shown on the City's Standard Details for the type driveway or ramp specified on the plans or as directed by the City Engineer.

Curb ramps shall be constructed at all street intersection corners and at other major points of pedestrian crossing. The ramps shall be constructed as shown on the City's standard drawings for the type shown on the plans or as directed by the City Engineer to meet ADA/ABA requirements.

Wire mesh or reinforcing steel will be used if recommended by the City Engineer or shown on plans. For installation of mesh or steel, see Section 425, *Fabricating and Placing Reinforcement* of the NCDOT *Standard Specifications for Roads and Structures*.

The foundation shall be thoroughly moistened immediately prior to concrete placement. Concrete shall be placed in forms by methods that will prevent segregation. Concrete shall be spread to the full depth and brought to grade by screeding and straightedging. Concrete shall be spaded adjacent to forms to prevent a honeycomb appearance, and the surface shall be floated with a wooden float to produce a surface free from irregularities. The final finish shall be obtained with an approved hand float that will produce a uniform surface texture. Light brooming may be used to hide trowel marks. Outside edges of the sidewalk slab and joints shall be edged with an edging tool having a radius of 1/4 inch.

When required as part of construction, reinforcing steel shall be properly spaced and thoroughly tied before concrete is placed.

All sidewalks (new or existing) fronting a new development shall be free of cracks, breaks, or other defects prior to receiving a Certificate of Occupancy.

See also [paragraph 3.1.7, Protection of Concrete](#).

**Tolerances:** Horizontal alignment of sidewalks shall be to the lines and grades as shown on the plans and details. Vertical alignment shall not exceed +/- 3/8 inch in 10 feet from the plan grade.

#### A. JOINTS FOR CONCRETE SIDEWALK AND DRIVEWAY ENTRANCES

Transverse expansion joints shall be constructed at intervals of approximately 32 feet. Slabs shall be separated by transverse preformed joint filler 1/2 inch in thickness that extends from the bottom of the slab to approximately 1/4 inch below the top surface.

The slab between expansion joints shall be divided into sections equal in width to the sidewalk by transverse score joints formed by a jointing tool, trowel, or other approved means. Transverse control joints shall also be provided when the time period between consecutive concrete placements is more than 45 minutes. Control joints shall extend into concrete for at least 1/4 of the depth (e.g. 1 inch for 4-inch concrete sidewalk) and shall be approximately 1/8 inch in width. Where slabs are more than 7 feet in width, the City Engineer may require that scored control joints shall be formed longitudinally to obtain secure uniform blocks that are approximately square. Transverse control joints shall also be installed where the corners of the drop inlets project into the sidewalk.

Expansion joints shall be formed around appurtenances extending into and through the sidewalk. An expansion joint shall be formed and filled with 1/2 inch preformed joint filler no less than 3 feet and no more than 10 feet from drop inlets. Preformed joint filler shall also be installed between concrete sidewalk and any adjacent fixed structure which is not tied to the sidewalk with steel dowels.

Place a joint sealant in cracks after removal of templates. Fill joints with joint sealer to the top surface of the sidewalk. See paragraph [2.1.11, Concrete Joint Sealer](#) for material spec.

#### **B. PLACING CONCRETE**

See [paragraph 3.1.3, Placing](#), above.

#### **C. FINISHING**

See [paragraph 3.1.5, Finishing](#), above.

#### **D. CURING**

See [paragraph 3.1.6 Curing](#) for requirements for curing concrete.

#### **E. FORMS**

1) **Fixed forms:** See [paragraph 3.2.2 A Fixed Forms](#), above.

2) **Slip forms:** Slip form pouring shall be allowed with approval of the City Engineer. All portions of paragraph [3.2.2 B, Slip Forms](#), above, concerning pouring operations with slip forms shall apply.

### **3.4 PORTLAND CEMENT CONCRETE RETAINING WALLS, HEADWALLS, STEPS, PIERS FOR STREAM CROSSINGS, FLUMES AND DITCHES, MEDIAN BARRIERS, MEDIAN STRIPS, ISLANDS, ETC.**

#### **3.4.1 GENERAL REQUIREMENTS**

This work shall consist of Portland cement concrete retaining walls, headwalls, steps, piers for stream crossings, flumes and ditches, median barriers, median strips, islands, etc. constructed in accordance with these specifications. These structures shall be constructed to the dimensions, cross-section, and located as shown on the plans, shown on the Standard Details, or as directed by the City Engineer.

#### A. REINFORCING STEEL

Reinforcement steel shall be placed in accordance with the drawings, the Concrete Reinforcing Steel Institute's *Placing Reinforcing Bars Recommended Practices*, the latest edition of ACI 318, *Building Code Requirements for Reinforced Concrete*, latest edition and Section 425, *Fabricating and Placing Reinforcement* of the NCDOT *Standard Specifications for Roads and Structures*. See also [paragraph 2.1.8, Reinforcing](#) of this specification.

#### B. HANDRAILS

Handrails shall be placed in accordance with Section 1074, *Miscellaneous Metals and Hardware* of the NCDOT *Standard Specifications for Roads and Structures*, latest revision.

#### C. FLUMES AND DITCHES

Concrete flumes and ditches shall be constructed in accordance with Section 850, *Concrete Paved Ditch* of the NCDOT *Standard Specifications for Roads and Structures*, latest revision.

#### D. MEDIAN BARRIERS, MEDIAN STRIPS AND ISLANDS

Concrete median barriers, median strips, and islands shall be constructed in accordance with Section 852, *Traffic Islands and Medians* of the NCDOT *Standard Specifications for Roads and Structures*, latest revision.

#### E. PIERS FOR STREAM CROSSINGS, STEPS, HEADWALLS AND RETAINING WALLS

Concrete retaining walls shall be constructed in accordance with Sections 420, *Concrete Structures* of the NCDOT *Standard Specifications for Roads and Structures*.

### 3.5 CONSTRUCTION METHODS FOR BRICK SIDEWALKS

See [paragraph 2.6.4](#) of the [Street Design Section](#) for allowable locations for brick sidewalks. When permitted, the construction shall comply with the following.

- A. **Subgrade Preparation:** The subgrade for sidewalks shall be shaped to the proper cross-section and thoroughly compacted by rolling or tamping. Tree roots shall be removed to a depth of 12-inches below subgrade for the full width of the walk. All soft and spongy material shall be removed and replaced with suitable and approved borrow material (on-site or off-site). Borrow material shall be compacted in lifts not exceeding 8 inches in thickness.
- B. **Base:** Base to be 4-inch thick 3,000 psi concrete with a minimum of 1-inch thick stone screenings or sand. Concrete shall be 6-inches thick when crossing driveways.
- C. **Sidewalk Width and Grade:** Except when repairing a non-conforming brick sidewalk, the width shall be as specified by the city engineer and shall be laid to

grade with a smooth uniform surface with a slope of ¼-inch per foot toward the street.

- D. **Material:** Brick shall conform to ASTM C902 *Standard Specification for Pedestrian and Light Traffic Paving Brick*.
- E. **Filling Voids:** The voids between the brick shall be filled with a mixture of sand and cement broomed into the voids. The sand-cement ratio shall be 1/3 cement and 2/3 sand well mixed before brooming into the voids. After the voids are well filled, the brick surface shall be cleaned of all excess sand and cement.
- F. See paragraph 3.6 below regarding maintenance of brick paved walks.

### 3.6 **DECORATIVE (STAMPED OR TINTED) CONCRETE OR BRICK PAVED WALKS, DRIVES, AND PAVEMENTS**

The City of Wilson does not maintain decorative concrete (stamped or tinted) or brick paved walks, drives, or roadway pavements other than to replace them with City standard hardscape elements. This includes maintenance or replacement due to damages arising from root heave or acts of God. Decorative concrete or brick walks and drives will be replaced with non-pigmented plain concrete with industry standard broomed or brushed finishes. In roadways, the hardscape will be replaced with asphalt. If the abutting homeowner, developer or homeowner association desires to retain the decorative finish, the abutting homeowner, developer or homeowners association may opt to replace the hardscape at their expense provide the hardscape is replaced within 30 days of written notification from the City.

**END OF SECTION 02400**

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