2.4 - CURB & GUTTER, DRIVEWAYS & SIDEWALKS

(Last Revised 02/2017)

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

PART 1 – GENERAL

2.4.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.

B. Section 2.2 – EARTHWORK

C. Section 2.8 – SEEDING, SODDING, AND GROUNDCOVER

2.4.2 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.

2.4.3 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 Fairfax, Virginia 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 Fairfax or the Virginia 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 Public Works Director 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

2.4.4 SUBMITTALS

A. Submit product data and shop drawings 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

2.4.5 QUALITY ASSURANCE

Materials and operations shall comply with the latest revision of all applicable Codes and Standards.

2.4.6 STANDARD ABBREVIATIONS

AASHTO	American Association of State Highway Transportation Officials.
ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
VDOT	Virginia Department of Transportation

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

2.4.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. **Concrete Handling/Transportation**

1) Hydraulic cement concrete plant operations shall comply with the latest revision of VDOT *Road and Bridge Specifications*.

2) Time limitations and intervals between deliveries shall be in accordance with Section 217.09 of the VDOT *Road and Bridge Specifications*, latest revision.

3) Forms required to be accompanied with delivery shall be in accordance with Section 217.09 of VDOT *Road and Bridge Specifications*.

4) 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 A775. Visible damage to the coating shall be patched or repaired with materials compatible to the existing coating in accordance with AASHTO A775.

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 Public Works Director.

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 deliver to site, epoxy coated steel shall be covered with an opaque covering. Coverings shall be placed to provide air circulation and prevent condensation.

2.4.8 PROJECT CONDITIONS

2.4.8.1 PROTECTION OF STREAMS

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

2.4.8.2 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 Public Works Director.

2.4.8.3 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.

2.4.9 COORDINATION

Coordinate placement of sidewalk and driveway connections to municipal streets and roadways with the Public Works Director.

PART 2 – PRODUCTS

2.4.10 MISCELLANEOUS

2.4.10.1 HYDRAULIC CEMENT CONCRETE

Ready mixed concrete shall comply with ASTM C94, *Standard Specification for Ready-Mixed Concrete.* Cement concrete shall meet the requirements of Section 217, VDOT Road and Bridge Specifications or latest revision. Concrete strength shall be as specified on standard details and drawings. Unless otherwise specified, all concrete shall be Class A3, minimum.

All exposed concrete shall be air entrained with an air content conforming to the requirements of Table II-17, Section 217 of the VDOT *Road and Bridge Specifications.* Air entrained admixtures for use in Portland cement concrete shall meet the requirements of AASHTO M154. Only those admixtures shall be used which have been approved by the Public Works Director.

Calcium chloride may be used as an admixture if approved by the Public Works Director. Calcium chloride shall conform to AASHTO M144, type 2. Do not use calcium chloride in reinforced concrete construction.

Concrete admixtures, when specified, shall conform to Section 215 of VDOT *Road and Bridge Specifications.*

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

Class A4.5	General	4,500-psi
Class A4	General	4,000-psi
Class A3	General	3,000-psi
Class B2	Massive or Lightly Reinforced	2,200-psi

2.4.10.2 HANDRAILS

Handrails shall conform to requirements of the VDOT *Road and Bridge Specifications*.

2.4.10.3 JOINT FILLER

A. ASPHALT EXPANSION JOINT FILLER

Asphalt expansion joint filler: Material shall be in accordance with Section 212.02(c) of the VDOT *Road and Bridge Specifications*. 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. Material shall be approximately ½ inch in thickness and a width and depth equal to those of the incidental structure. Unless otherwise directed by the Public Works Director, install expansion joint filler 1/2-inch below the concrete surface and seal with W. R. Meadows #164, "HI-SPEC, cold-applied "SOF-SEAL," or an approved equal for maximum protection from water infiltration, weathering and to assure proper performance.

2.4.10.4 CURING MATERIALS

Liquid membrane curing compound, PE film, or water for curing shall meet the requirements of Section 220 of the VDOT *Road and Bridge Specifications*.

2.4.10.5 INSULATION BLANKET

In cold weather operations, insulated blankets must retain or supply moisture and maintain the temperature at the outermost surfaces of concrete above 50º F for at least 72 hours and above 32º F for at least an additional 48 hours.

2.4.10.6 POROUS BACKFILL AND WEEP HOLES

Porous backfill material and drain pipes for weep holes for retaining walls shall conform to requirements of Section 506 of the VDOT *Road and Bridge Specifications*.

2.4.10.7 PORTLAND CEMENT

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

2.4.10.8 REINFORCEMENT

A. REINFORCING BARS

Reinforcing bars shall conform to the requirements Section 223, Grade 40 or 60 of the VDOT *Road and Bridge Specifications*.

B. WELDED WIRE FABRIC

Wire mesh reinforcement shall be as shown on the plans but no less than 6 x 6, 10 Ga. and shall conform to the requirements of Section 223 of VDOT Road and Bridge Specifications.

2.4.10.9 AGGREGATE BASE MATERIAL

Aggregate base materials for foundation support shall be VDOT 21A, compacted, and in compliance with Section 208 of the VDOT *Road and Bridge Specifications*.

2.4.10.10 CONCRETE ADMIXTURES

Admixtures, when specified by the Public Works Director, shall be in conformance with Section 215, *Hydraulic Cement Concrete Admixtures*, of the VDOT *Road and Bridge Specifications*.

PART 3 – EXECUTION

2.4.11 CONSTRUCTION – ALL CONCRETE ITEMS

2.4.11.1 CONSTRUCTION OF SUBGRADE

A. **SUBGRADE PREPARATION**: Excavation and subgrade preparation shall be in strict compliance with Section 2.2 – *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 2.4.11.1 A, above and shall conform to the grade and cross-section shown on the plans.

2) Herbicides shall conform to the applicable sections of Section 244, *Roadside Development Materials* of the VDOT *Road and Bridge Specifications* and 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 Inspector ahead of pouring operations. Subgrade fine grading shall be the responsibility of the Contractor to insure that the subgrade conforms to the Standard Details.

2.4.11.2 FORMS

A. **GENERAL**: Forms for this work shall be of wood, 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.

2.4.11.3 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. No concrete is to be poured when the outside temperature is 40 degrees and falling.

2.4.11.4 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 217.09 of the VDOT *Road and Bridge Specifications* for time limitations and intervals between deliveries.

2.4.11.5 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 coarse 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.

2.4.11.6 CURING

A. **CURING – YEAR ROUND**

Curing shall be accomplished by preventing loss of moisture, rapid temperature change, and mechanical injury from rain or flowing water for a period of 7 days when normal Portland cement has been used or 3 days when high early strength Portland cement has been used. Curing shall be started as soon as placing, finishing, and free water has disappeared from the surface of the concrete. 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 surface of the pavement 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.

   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 witch 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**: Concrete shall be covered with PE film. Color of film shall be white. However, from November 1 to April 1, clear or opaque PE film will be permitted. Film shall be installed immediately after liquid membrane compound has obtained a sufficient set so that it is not damaged. Apply film so that marks from application are not produced.

B. **COLD WEATHER CURING**

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

1) Concrete Temperature: Conform to the requirements of the *Placement Limitation* section of the VDOT *Road and Bridge Specifications* 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 50º F for at least 72 hours and above 32º 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 Public Works Director, provided the concrete is not reinforced.

C. **HOT WEATHER CURING**

Hot weather curing shall be applied when the outside temperature is 75 degrees 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 2.4.13 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 Public Works Director, 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.

2.4.11.7 PROTECTION OF CONCRETE

A. **Sidewalks**: Protect new concrete sidewalks and appurtenances from pedestrian traffic for a minimum of 24 hours and driveway surfaces and curb and gutter from vehicular traffic for minimum of 7 days, unless otherwise approved by the Public Works Director. Erect and maintain warning signs, lights, and watchmen to protect pedestrian and to direct traffic as needed.

Driveways and Curb and Gutter: 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 Public Works Director. 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 if sustaining loads to be imposed by the equipment.

D. Protect concrete from graffiti.

2.4.11.8 TESTING

Testing shall be in accordance with the requirements of the *Acceptance* section of the VDOT *Road and Bridge Specifications*.

2.4.11.9 DEFECTIVE WORK

The City will require the removal and replacement of any concrete items where they have been broken, cracked, 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 Public Works Director 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.

The Engineer may drill cores from the completed slab 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.

2.4.11.10 CONCRETE CLASS

Concrete class for combined curb and gutter, curbs, sidewalks, driveways, flumes, ditches, steps, headwalls, and islands shall be a minimum of A3, 3000 psi or as designated in the specifications or drawings.

2.4.11.11 PLACEMENT LIMITATIONS

Conform to the requirements of the VDOT *Road and Bridge Specifications* for concrete temperature.

2.4.12 STANDARD CONCRETE CURB AND COMBINED CURB AND GUTTER

2.4.12.1 GENERAL REQUIREMENTS – COMBINED CURB & GUTTER

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 Public Works Director. See VDOT *Road and Bridge Standards* **Volume I & II** for standard concrete curb, combined curb and gutter, and valley gutter sections.

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:

i) At approximately 10 foot intervals;

ii) At the gutter where the curb and gutter tie to the gutter apron of drop inlets;

iii) When time elapsing between consecutive concrete placements exceeds 45 minutes, and

iv) 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:

i) Removable 1/8 inch thick templates.

ii) Scoring or sawing for a depth of not less than 3/4 inch when using curb machine.

iii) 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.

iv) Place a joint sealant in cracks after removal of templates.

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, at all radii points at concrete entrances and curb returns, at locations no less than 6 feet and no more then 10 feet from drop inlets, at the end of days work, and or all cold joints.

2.4.12.2 FORMS – COMBINED 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 Engineer will be required. The contractor's proposed equipment must receive the approval of the Public Works Director.

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.

Equipment used for slipforming shall conform to the general requirements of Section 108.07 of the VDOT *Road and Bridge Specifications*.

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 the VDOT *Road & Bridge Standards* **Volume I and II** 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 inspector before any "trimming" or pouring occurs. However, approval of these controls by the inspector 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 insure 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 2.2 – *Earthwork*. Before pouring operations begin, the subgrade shall be checked by a City representative.

5) **Pouring Operations**: Before the machine starts a pour, the inspector will check the slump of the concrete. This slump must be between 0 and 2 inches. In the event that the slump exceeds 2 inches, the concrete will be rejected.

If in the event the inspector feels 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.

2.4.13 STANDARD PORTLAND CEMENT CONCRETE SIDEWALK AND DRIVEWAY ENTRANCES

2.4.13.1 GENERAL REQUIREMENTS

This work shall consist of the construction of Portland cement concrete sidewalk 4 inches thick and in accordance with these specifications. Sidewalks crossing driveways entrances shall be constructed 7 inches thick. See **Standard Details 404.01 and 404.02** for sidewalk and **Standard Details 404.03, 404.04, 404.05 and 404.06** for driveway entrance openings.

Unless otherwise shown on the plans and approved by the Public Works Director, all sidewalks shall maintain a ¼ inch per foot transverse slope.

Curb cuts for driveways shall be constructed as shown on the Standard Details for the type driveway or ramp specified on the plans or as directed by the Public Works Director.

Handicap 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 VDOT *Road and Bridge Standards* **Volume I and II** for the type shown on the plans or as directed by the Public Works Director.

Wire mesh or reinforcing steel will be used if recommended by the Public Works Director or shown on plans. For installation of mesh or steel, see the applicable section of the VDOT *Road and Bridge Specifications*.

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.

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 30 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. For 5-foot wide sidewalk, the slab between expansion joints shall be divided into sections approximately 5 feet in length

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 and shall be approximately 1/8 inch in width. Where slabs are more than 7 feet in width, 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.

Construction joints shall be formed around appurtenances extending into and through the sidewalk. Preformed joint filler 1/4-inch thick shall be installed in these joints except that joint filler shall not be used adjacent to drop inlets. Preformed joint filler shall be securely fastened. An expansion joint shall be formed and filled with 1/4 inch preformed joint filler no less than 6 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.

B. **PLACING CONCRETE**

See paragraph 2.4.11.3, *Placing*, above.

C. **FINISHING**
See paragraph 2.4.11.5, *Finishing*, above.

D. **CURING**

See paragraph 2.4.11.6 *Curing* for requirements for curing concrete.

2.4.13.2 FORMS

A. **FIXED FORMS**

See paragraph 2.4.12.2 A *FIXED FORMS*, above.

B. **SLIP FORMS**

Slip form pouring shall be allowed with approval of the Public Works Director. All portions of paragraph 2.4.12.2 B, *SLIP FORMS*, above, concerning pouring operations with slip forms shall apply.

2.4.14 FACEDOWN PORTLAND CEMENT CONCRETE SIDEWALK

2.4.14.1 GENERAL REQUIREMENTS:

This type of sidewalk construction shall consist of standard sidewalk as specified in above paragraph *2.4.13 - Standard Portland Cement Concrete Sidewalk and Driveway Entrances*, of these specifications, poured monolithically with a 12 inch curb as shown on **Standard Detail 404.02**. See also **Standard Details 404.03, 404.04, 404.05 and 404.06** for driveway entrance openings.

The methods of construction for facedown sidewalk shall be the same specified in section 2.4.13 - *Standard Portland Cement Concrete Sidewalk and Driveway Entrances* of these specifications with the following additions:

A. A joint shall be cut with an approved edging tool 6 inches from the face of the curb and parallel thereto.

B. All expansion joints in the sidewalk shall extend across the top and face of the curb.

C. The final finish for the top of the curb shall be made with a brush dampened with water, to match the finish of the adjoining structure.

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

A. 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 Public Works Director.

B. REINFORCING STEEL

Reinforcement steel shall be placed in accordance with Section 406 of the VDOT *Road and Bridge Specifications,* the drawings, and 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. See also *paragraph 2.4.10.8, Reinforcement* of this specification.

C. HANDRAILS

Handrails shall be placed in accordance with Section 504 of the VDOT *Road and Bridge Specifications*.

D. FLUMES AND DITCHES

Concrete flumes and ditches shall be constructed in accordance with Sections 406 and 502 of the VDOT *Road and Bridge Specifications*.

E. MEDIAN BARRIERS, MEDIAN STRIPS AND ISLANDS

Concrete median barriers, median strips, and islands shall be constructed in accordance with Sections 406 and 502 of the VDOT *Road and Bridge Specifications*.

F. PIERS FOR STREAM CROSSINGS, STEPS, HEADWALLS AND RETAINING WALLS

Concrete retaining walls shall be constructed in accordance with Sections 406 and 506 of the VDOT *Road and Bridge Specifications*.

END OF SECTION 2.4

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