

## SECTION 340

### CONCRETE CURB, GUTTER, SIDEWALK, SIDEWALK RAMPS, DRIVEWAY AND ALLEY ENTRANCE

#### 340.1 DESCRIPTION:

The various types of concrete curb, gutter, sidewalk, sidewalk ramps, driveways, and alley entrances shall be constructed to the dimensions indicated on the plans and standard detail drawings.

#### 340.2 MATERIALS:

~~Concrete shall be as noted on the standard details.~~ Concrete shall conform to the requirements of Section 725. Concrete class shall be as noted on the standard details.

Expansion joint filler shall be ½-inch thick preformed bituminous material in compliance with Section 729, unless otherwise noted.

**340.2.1 Detectable Warnings:** Truncated dome dimensions and spacing for detectable warnings are defined by the Americans with Disabilities Act Accessibilities Guidelines (ADAAG) for optimal detect-ability and public safety. Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity to the ADAAG. Truncated domes shall have the following nominal dimensions: base diameter of 1.0 inches (0.9 inches minimum) top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and height of 0.2 inches. Dome center-to-center spacing of 2.35 inches, measured between the most adjacent domes on the square grid. Dome center-to-center spacing for radial installations shall be 1.6 inches minimum and 2.4 inches maximum with a base-to-base spacing of 0.65 inches minimum. Detectable warning edges shall be sized and installed so that dome spacing is maintained across adjoining edges. Each dome shall have a minimum static friction of coefficient of 0.8 as tested per ASTM C1028.

**340.2.1.1 Color and Contrast:** Detectable warnings shall contrast visually with adjoining surfaces, either light-on-dark or dark-on-light. Specific colors to be used shall be approved by the local jurisdictional agency prior to installation. Detectable warnings shall have integral color throughout.

**340.2.1.2 Materials:** Detectable warning materials shall be durable with a non-slip surface not subject to spalling, chipping, delamination, or separation. All detectable warnings shall be approved by the local jurisdictional agency prior to installation.

**340.2.1.3 Attachment System:** Detectable warnings shall be either placed in freshly poured concrete (wet-set) or recessed into pre-formed concrete. Detectable warnings using wet-set placement shall have an anchoring method that assures constant contact of the detectable warning bottom surface with the concrete as it cures, thus rendering the ramp a single monolithic structure. The thicker and heavier detectable warnings lowered into pre-formed recesses in the concrete substrate must demonstrate a firm fitting into metal reinforced frames without gaps along the edges that can channel water, sand, or debris. They must also be able to resist movement (i.e. sliding, rocking, or lifting) once in service. All attachment systems shall be approved by the local jurisdictional agency.

**340.3 CONSTRUCTION METHODS:**

Existing ~~pavements and~~ concrete shall have a clean vertical edge where it is to be that are joined by new construction ~~shall be cut in accordance with Section 336.2.2. Sawcutting is required when the existing matching edge is not a straight vertical edge.~~

**340.3.1 Subgrade Preparation:** The subgrade shall be constructed and compacted true to grades and lines shown on the plans and as specified in Section 301. All soft or unsuitable material shall be removed to a depth of not less than 6 inches below subgrade elevation and replaced with material satisfactory to the Engineer. Removal and replacement of soft or unsuitable materials will be paid for as extra work.

~~When the Engineer determines that the existing subgrade consists of soils with questionable swelling characteristics subgrade shall be tested in accordance with Table 340-1. Subgrade classified as marginally expansive or expansive as defined in Table 340-1 shall be treated as follows unless the construction documents require alternative measures for mitigation of expansive soils.~~ The upper 6 inches of marginally expansive soils shall be compacted per Section 301.3 at a moisture content between 0% to 3% above optimum moisture per ASTM D698. Expansive soils shall be considered unsuitable and shall be treated or removed and replaced in accordance with the preceding paragraph with material as directed by the Engineer. Alternate corrective measures contained in an existing geotechnical report or new site analysis may can be submitted to the Agency Engineer by the Contractor or Permittee for review approval. The submittal of alternative corrective measures must include be a recommendation affixed with the professional seal of an Arizona registered engineer and have the professional seal affixed.

Table 340-1			
Description	Percent Fines ( #200 sieve) <sup>(1)</sup>	Plasticity Index <sup>(2)</sup>	Liquid Limit <sup>(3)</sup>
Non-expansive	> 20%	≤ 15	≤ 25
Marginally expansive		> 15 and ≤ 30	> 25 and ≤ 50
Expansive		> 30	> 50

~~(1) Tested in accordance with ASTM C117~~

~~(2) Tested in accordance with AASHTO T90 (wet prep per AASHTO T146)~~

~~(3) Tested in accordance with AASHTO T89 (wet prep per AASHTO T146)~~

Table 340-1			
Description	Percent Fines (– #200 sieve) <sup>(1)</sup>	Plasticity Index <sup>(2)</sup>	Additional Testing
Non-expansive	> 20%	≤ 15	None
Potentially expansive		> 15	Perform Swell Test <sup>(3)</sup>
Description	% Swell <sup>(3)</sup>		
Non-expansive	< 1		
Marginally expansive	1 – 3		
Expansive	> 3		

~~(1) Tested in accordance with ASTM C117~~

~~(2) Tested in accordance with AASHTO T90 (wet prep per AASHTO T146)~~

~~(3) Swell Test: Samples for swell tests shall be re-molded in accordance with ARIZ 249 (ADOT Materials Testing Manual) to 95% of maximum dry density at optimum moisture as determined by ASTM D698 and tested for one-dimensional expansion in accordance with the applicable portions of ASTM D4546 applying a surcharge of 144 psf.~~

Material removed for construction shall not be placed on the base and/or surfacing material already in place on the roadway nor shall the excavated material be placed in such a manner as to interfere with access to property or traffic flow in the street.

**340.3.2 Formwork:** Concrete curbs, gutters and sidewalks shall be constructed by the conventional use of forms, or may be constructed by means of an appropriate machine when approved by the Engineer.

If machines designed specifically for such work and approved by the Engineer are used, the results must be equal to or better than that produced by the use of forms. If the results are not satisfactory to the Engineer, the use of the machine shall be discontinued and the Contractor shall make necessary repairs at his own expense. All applicable requirements of construction by use of forms shall apply to the use of machines.

Forms conforming to the dimensions of the curb, gutter, sidewalk, sidewalk ramps, driveway, and alley entrance shall be carefully set to line and grade, and securely staked in position. The forms and subgrade shall be watered immediately in advance of placing concrete.

Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.

**340.3.3 Concrete Placement:** The concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. The concrete may be compacted by mechanical vibrators approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate is below the concrete surface. The surface shall then be struck off and worked to grade and cross section with a float.

If machine placement is used, the machine shall place, consolidate and finish the concrete in one complete pass, requiring a minimum of hand finishing producing a dense and homogeneous section. A form shall trail behind the machine for such a distance that no appreciable concrete slumping will occur. Final finishing shall be as specified [in Section 340.3.7, Form Removal and Finishing hereinafter.](#)

**340.3.4 Joints:** Shall be constructed in a straight line, vertical plane and perpendicular to the longitudinal line of the sidewalk, curb and gutter, single curb, etc., except in cases of curved alignment, where they shall be constructed along the radial lines of the curve.

Curb and gutter joints shall match the location of concrete pavement joints when abutting concrete pavement.

The space between joints in curbs and gutters (space between contraction joints or between contraction and expansion joints) shall not exceed ten feet.

Sidewalk that abuts curb or gutter shall have joints that match the curb or gutter joints.

The space between sidewalk joints shall not exceed 125% of the sidewalk width (for example: maximum joint spacing for 5 foot wide sidewalk is 6.25 feet).

**340.3.4.1 Expansion Joints:** Expansion joints shall be constructed to the full depth and width of the concrete ~~and shall match joints in adjacent pavement, sidewalk, curb or gutter.~~ The expansion joint material shall extend fully through the concrete and one inch into the subgrade with the top of the expansion joint material one-quarter inch below the top surface. Expansion joint material shall be secured in place prior to placement of concrete.

~~Expansion joints shall be installed along all abutting structures to provide complete separation from the structure.~~

~~Sidewalk, curb, and gutter expansion joints shall be installed at all radius points, at both sides of each driveway, at both sides of each alley entrance, at every change of depth in the concrete and shall provide for complete separation of adjoining structures.~~ The maximum distance between expansion joints shall be 50 feet.

**340.3.4.2 Contraction Joints:** Unless otherwise specified, the large aggregate in contraction joints shall be separated to either side of the joint for a minimum depth equal to 25% of the concrete thickness; the finished depth shall be a minimum of  $\frac{3}{4}$  inch.

~~Contraction joints in curbs and gutters shall match contraction joints in adjacent attached sidewalks.~~

**340.3.5 Edges:** All exposed edges shall be shaped with a suitable tool ~~so to~~ form edges having the shape as indicated on the referenced detail.

**340.3.6 Detectable Warnings:** Detectable warnings shall be installed perpendicular to the direction of pedestrian/wheelchair travel and have a minimum width of 24 inches measured perpendicular to the edge of the roadway or rail crossing. The base surface of detectable warnings shall be installed flush with the adjacent walkway surface; the truncated domes shall extend above the walkway surface. The boundary between detectable warnings and the adjacent walkway shall provide a flush uniform surface that will not cause ponding of water nor present a tripping hazard. Partial domes at the edge of the detectable warning shall be made flush to match the base surface of the detectable warning. Detectable warnings installed on curb ramps shall extend the full width of the ramp depression.

Detectable warnings installed on sidewalk ramps shall modify the sidewalk concrete thickness at the detectable warning to provide a minimum concrete thickness of four-inches (4"). When detectable warnings are modules inset into the sidewalk ramp, the bottom surface of the sidewalk shall be lowered a distance equal to or greater than the module thickness to maintain the minimum sidewalk thickness. The sidewalk bottom surface shall have a minimum transition taper length of 12" between the thickened and normal depth sections of sidewalk. The detectable warning surface shall be located so that the edge nearest the curb line is 6 inches minimum and 8 inches maximum back from the face of curb.

Detectable warning surfaces for pedestrian at-grade rail crossings not located within a street or highway shall be installed on each side of the rail crossing, located as shown on plans. Detectable warnings shall extend the full width of the pedestrian walkway.

**340.3.7 Form Removal and Finishing:** The front face form shall not be removed before the concrete has taken initial set and has sufficient strength to carry its own weight. Gutter forms and rear forms shall not be

removed until concrete has hardened sufficiently to prevent damage to the edges. Any portion of concrete damaged while stripping forms shall be repaired or replaced at no additional cost to the Contracting Agency.

After the forms are removed, the joints shall be tooled and the surface finished with a float to remove all imperfections. As needed, retool joints after finishing to prevent groove bonding. In all cases, the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed. The concrete work shall have a true surface; shall be free from sags, twists, or warps; have a uniform appearance; and be true to the lines, grades, and configurations indicated on the drawings.

Surfaces shall be light broom finished; flow lines shall be troweled for a smooth finish.

If the evaporation rate on the concrete surface exceeds the rate of bleeding of the concrete due to weather conditions, materials used, or for any other reason, and there is any likelihood of the fresh concrete checking or cracking before the curing operation, measures shall be taken to prevent the rapid evaporation of water from the surface during finishing operations. When allowed by the Engineer, the addition of water to the surface may be permitted as an indirect fog spray with approved spray equipment immediately after screeding and/or between finishing operations. A commercial evaporation reducer that forms a monomolecular film may also be sprayed onto the concrete surface in accordance with the manufacturer's recommendations. At no time will free water/evaporation reducer be worked into the concrete surface. Approved measures shall continue until curing operations per Section 340.3.8, Curing, are started in the particular area affected.

The Contractor shall stamp the company name and year on each end of the sidewalk or sidewalk ramp constructed. The letters shall not be less than 3/4 inch in height and the depth of the stamped impression shall be between 1/8-inch and 1/4-inch.

**340.3.8 Curing:** As soon after the completion of the finishing operations as the condition of the concrete will permit, all exposed surfaces shall either be sprayed with a pigmented curing compound or sealed with a material conforming to Section 726. Curing compound shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely seal all exposed concrete surfaces with a uniform film. The membrane shall be applied in two applications for a total coverage of 150 square feet per gallon. Concrete surfaces shall be kept damp until the curing compound is applied. Should the curing compound seal be broken or damaged before the expiration of 10 days after the placing of the concrete, the break shall be immediately repaired by the application of additional curing compound over the damaged area.

~~If due to weather conditions, materials used, or for any other reason, there is any likelihood of the fresh concrete checking or cracking before the curing operations, it shall be kept damp (not wet) by indirect fine spray of water until such danger is past, or until curing operations are started in the particular area affected. The need for adequate continuous curing is greatest during the first few hours after placement of concrete.~~  
The need for adequate curing is greatest during the first few hours after placement of the concrete.

**340.3.9 Tolerances:** The face, top, back, and flow line of the curb and gutter shall not deviate in excess of 1/4-inch over 10 feet, as tested with a 10-foot straightedge or curve template, longitudinally along the surface.

The surface of concrete sidewalk or sidewalk ramp ~~in all directions~~ shall not deviate in excess of 1/8-inch over 5 feet as tested with a 5-foot straightedge except for the ¼-inch recess of the preformed material in expansion joints.

All finished concrete elevations shall not deviate from the elevations shown on the plans, or indicated by typical sections or standard details referenced within the construction documents, by more than 1/2 inch.

When required by the Engineer, gutters shall be water tested. The Contractor shall establish flow in the length of gutter to be tested by supplying and distributing water from a hydrant, tank truck or other source. After the supply of water is shut off and water has stopped flowing, the gutter shall be inspected for evidence of ponding or improper shape. The work shall be deemed deficient if water is found ponded in the gutter to a depth greater than ½ inch or ponding extends onto the adjacent asphalt pavement.

Areas between elevations shown on the plans shall be straight graded or smoothly transitioned through a vertical curve in a manner approved by the Engineer or as otherwise indicated on the construction documents.

**340.3.10 Deficiencies:** Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency. Replacement or reconstruction shall be from joint to joint.

Concrete work that ~~deviates in straightness as specified in~~ does not comply with tolerance requirements of Section 340.3.9, Tolerances, shall be removed and replaced. Remove and replace gutters that exceed the ponding tolerance ~~in Section 340.3~~. Grinding shall only be allowed if approved by the Engineer.

~~Remove and replace all work that exceeds the elevation tolerance in Section 340.3.~~

#### **340.4 BACKFILLING:**

Unless otherwise specified the Contractor shall backfill behind the curbs, sidewalk or sidewalk ramps with soil native to the area to the lines and grades shown on the plans.

#### **340.5 MEASUREMENT:**

Concrete curbs and gutters of the various types shown on the plans and in the proposal, will be measured along gutter flow line through inlets, catch basins, driveways, sidewalk ramps, etc., by the lineal foot to the nearest foot for each type, complete in place. Measurement for curb terminations and transitions shall be included with the linear measurement of the various types of curb or curb and gutter as shown on the plans and in the proposal.

Curb and gutter type shall be based on the configuration of the final exposed surfaces. The increased curb and gutter depth required at valley gutter aprons or driveways shall not be measured as a separate pay item; any additional Contractor cost shall be included in the unit cost associated with the valley gutter, driveway or other associated item.

Concrete sidewalks, driveways, alley intersections, valley gutters and aprons will be measured to the nearest square foot complete in place.

Detectable warnings shall not be measured for payment. Detectable warnings are considered integral to the walking surface that they form a part of and the cost is included in the related pay item.

Curb ramp installations shall be measured as complete installed units and shall include the ramp curb and the walking surfaces between the ramp curb and back of curb and gutter or single curb. Single curb or curb and gutter located at the edge of roadway shall be measured and paid for separately. The surface area of curb ramps shall not be included in the measured quantity for sidewalks.

#### **340.6 PAYMENT:**

Payment will be made in accordance with the unit prices or lump sums as set forth in the proposal. Such payment shall include full compensation for furnishing all labor, material, tools and equipment and accomplishing all work in conformance with the contract documents.

~~Payment for curb ramps shall include the ramp curb and the walking surfaces between the ramp curb and back of curb and gutter or single curb.~~

Over-excavation of soft, expansive or unsuitable materials and installation granular materials will be paid as a separate pay item, not included with the above measured pay items.

## SECTION 340

### CONCRETE CURB, GUTTER, SIDEWALK, SIDEWALK RAMPS, DRIVEWAY AND ALLEY ENTRANCE

#### 340.1 DESCRIPTION:

The various types of concrete curb, gutter, sidewalk, sidewalk ramps, driveways and alley entrances shall be constructed to the dimensions indicated on the plans and standard detail drawings.

#### 340.2 MATERIALS:

Concrete shall conform to the requirements of Section 725. Concrete class shall be as noted on the standard details.

Expansion joint filler shall be ½-inch thick preformed bituminous material in compliance with Section 729, unless otherwise noted.

**340.2.1 Detectable Warnings:** Truncated dome dimensions and spacing for detectable warnings are defined by the Americans with Disabilities Act Accessibilities Guidelines (ADAAG) for optimal detect-ability and public safety. Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity to the ADAAG. Truncated domes shall have the following nominal dimensions: base diameter of 1.0 inches (0.9 inches minimum) top diameter of 50 percent of the base diameter minimum to 65 percent of the base diameter maximum, and height of 0.2 inches. Dome center-to-center spacing of 2.35 inches, measured between the most adjacent domes on the square grid. Dome center-to-center spacing for radial installations shall be 1.6 inches minimum and 2.4 inches maximum with a base-to-base spacing of 0.65 inches minimum. Detectable warning edges shall be sized and installed so that dome spacing is maintained across adjoining edges. Each dome shall have a minimum static friction of coefficient of 0.8 as tested per ASTM C1028.

**340.2.1.1 Color and Contrast:** Detectable warnings shall contrast visually with adjoining surfaces, either light-on-dark or dark-on-light. Specific colors to be used shall be approved by the local jurisdictional agency prior to installation. Detectable warnings shall have integral color throughout.

**340.2.1.2 Materials:** Detectable warning materials shall be durable with a non-slip surface not subject to spalling, chipping, delamination, or separation. All detectable warnings shall be approved by the local jurisdictional agency prior to installation.

**340.2.1.3 Attachment System:** Detectable warnings shall be either placed in freshly poured concrete (wet-set) or recessed into pre-formed concrete. Detectable warnings using wet-set placement shall have an anchoring method that assures constant contact of the detectable warning bottom surface with the concrete as it cures, thus rendering the ramp a single monolithic structure. The thicker and heavier detectable warnings lowered into pre-formed recesses in the concrete substrate must demonstrate a firm fitting into metal reinforced frames without gaps along the edges that can channel water, sand, or debris. They must also be able to resist movement (i.e. sliding, rocking, or lifting) once in service. All attachment systems shall be approved by the local jurisdictional agency.

**340.3 CONSTRUCTION METHODS:**

Existing concrete shall have a clean vertical edge where it is to be joined by new construction. Sawcutting is required when the existing matching edge is not a straight vertical edge.

**340.3.1 Subgrade Preparation:** The subgrade shall be constructed and compacted true to grades and lines shown on the plans and as specified in Section 301. All soft or unsuitable material shall be removed to a depth of not less than 6 inches below subgrade elevation and replaced with material satisfactory to the Engineer. Removal and replacement of soft or unsuitable materials will be paid for as extra work.

Subgrade classified as marginally expansive or expansive as defined in Table 340-1 shall be treated as follows unless the construction documents require alternative measures for mitigation of expansive soils. The upper 6 inches of marginally expansive soils shall be compacted per Section 301.3 at a moisture content between 0% to 3% above optimum moisture per ASTM D698. Expansive soils shall be considered unsuitable and shall be treated or removed and replaced with material as directed by the Engineer. Alternate corrective measures contained in an existing geotechnical report or new site analysis can be submitted to the Engineer for approval. The submittal of alternative corrective measures must be a recommendation of an Arizona registered engineer and have the professional seal affixed.

Table 340-1			
Description	Percent Fines (– #200 sieve) <sup>(1)</sup>	Plasticity Index <sup>(2)</sup>	Additional Testing
Non-expansive	> 20%	≤ 15	None
Potentially expansive		> 15	Perform Swell Test <sup>(3)</sup>
Description	% Swell <sup>(3)</sup>		
Non-expansive	< 1		
Marginally expansive	1 – 3		
Expansive	> 3		

(1) Tested in accordance with ASTM C117

(2) Tested in accordance with AASHTO T90 (wet prep per AASHTO T146)

(3) Swell Test: Samples for swell tests shall be re-molded in accordance with ARIZ 249 (ADOT Materials Testing Manual) to 95% of maximum dry density at optimum moisture as determined by ASTM D698 and tested for one-dimensional expansion in accordance with the applicable portions of ASTM D4546 applying a surcharge of 144 psf.

Material removed for construction shall not be placed on the base and/or surfacing material already in place on the roadway nor shall the excavated material be placed in such a manner as to interfere with access to property or traffic flow in the street.

**340.3.2 Formwork:** Concrete curbs, gutters and sidewalks shall be constructed by the conventional use of forms, or may be constructed by means of an appropriate machine when approved by the Engineer.

If machines designed specifically for such work and approved by the Engineer are used, the results must be equal to or better than that produced by the use of forms. If the results are not satisfactory to the Engineer, the use of the machine shall be discontinued and the Contractor shall make necessary repairs at his own expense. All applicable requirements of construction by use of forms shall apply to the use of machines.

Forms conforming to the dimensions of the curb, gutter, sidewalk, sidewalk ramps, driveway, and alley entrance shall be carefully set to line and grade, and securely staked in position. The forms and subgrade shall be watered immediately in advance of placing concrete.

Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.

**340.3.3 Concrete Placement:** The concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. The concrete may be compacted by mechanical vibrators approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate is below the concrete surface. The surface shall then be struck off and worked to grade and cross section with a float.

If machine placement is used, the machine shall place, consolidate and finish the concrete in one complete pass, requiring a minimum of hand finishing producing a dense and homogeneous section. A form shall trail behind the machine for such a distance that no appreciable concrete slumping will occur. Final finishing shall be as specified in Section 340.3.7, Form Removal and Finishing.

**340.3.4 Joints:** Shall be constructed in a straight line, vertical plane and perpendicular to the longitudinal line of the sidewalk, curb and gutter, single curb, etc., except in cases of curved alignment, where they shall be constructed along the radial lines of the curve.

Curb and gutter joints shall match the location of concrete pavement joints when abutting concrete pavement.

The space between joints in curbs and gutters (space between contraction joints or between contraction and expansion joints) shall not exceed ten feet.

Sidewalk that abuts curb or gutter shall have joints that match the curb or gutter joints.

The space between sidewalk joints shall not exceed 125% of the sidewalk width (for example: maximum joint spacing for 5 foot wide sidewalk is 6.25 feet).

**340.3.4.1 Expansion Joints:** Expansion joints shall be constructed to the full depth and width of the concrete. The expansion joint material shall extend fully through the concrete and one inch into the subgrade with the top of the expansion joint material one-quarter inch below the top surface. Expansion joint material shall be secured in place prior to placement of concrete.

Expansion joints shall be installed along all abutting structures to provide complete separation from the structure.

Sidewalk, curb, and gutter expansion joints shall be installed at all radius points, at both sides of each driveway, at both sides of each alley entrance. The maximum distance between expansion joints shall be 50 feet.

**340.3.4.2 Contraction Joints:** Unless otherwise specified, the large aggregate in contraction joints shall be separated to either side of the joint for a minimum depth equal to 25% of the concrete thickness; the finished depth shall be a minimum of  $\frac{3}{4}$  inch.

**340.3.5 Edges:** All exposed edges shall be shaped with a suitable tool to form edges having the shape as indicated on the referenced detail.

**340.3.6 Detectable Warnings:** Detectable warnings shall be installed perpendicular to the direction of pedestrian/wheelchair travel and have a minimum width of 24 inches measured perpendicular to the edge of the roadway or rail crossing. The base surface of detectable warnings shall be installed flush with the adjacent walkway surface; the truncated domes shall extend above the walkway surface. The boundary between detectable warnings and the adjacent walkway shall provide a flush uniform surface that will not cause ponding of water nor present a tripping hazard. Partial domes at the edge of the detectable warning shall be made flush to match the base surface of the detectable warning. Detectable warnings installed on curb ramps shall extend the full width of the ramp depression.

Detectable warnings installed on sidewalk ramps shall modify the sidewalk concrete thickness at the detectable warning to provide a minimum concrete thickness of four-inches (4"). When detectable warnings are modules inset into the sidewalk ramp, the bottom surface of the sidewalk shall be lowered a distance equal to or greater than the module thickness to maintain the minimum sidewalk thickness. The sidewalk bottom surface shall have a minimum transition taper length of 12" between the thickened and normal depth sections of sidewalk. The detectable warning surface shall be located so that the edge nearest the curb line is 6 inches minimum and 8 inches maximum back from the face of curb.

Detectable warning surfaces for pedestrian at-grade rail crossings not located within a street or highway shall be installed on each side of the rail crossing, located as shown on plans. Detectable warnings shall extend the full width of the pedestrian walkway.

**340.3.7 Form Removal and Finishing:** The front face form shall not be removed before the concrete has taken initial set and has sufficient strength to carry its own weight. Gutter forms and rear forms shall not be removed until concrete has hardened sufficiently to prevent damage to the edges. Any portion of concrete damaged while stripping forms shall be repaired or replaced at no additional cost to the Contracting Agency.

After the forms are removed, the joints shall be tooled and the surface finished with a float to remove all imperfections. As needed, retool joints after finishing to prevent groove bonding. In all cases, the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form stakes removed. No plastering of the concrete will be allowed. The concrete work shall have a true surface; shall be free from sags, twists, or warps; have a uniform appearance; and be true to the lines, grades, and configurations indicated on the drawings.

Surfaces shall be light broom finished; flow lines shall be troweled for a smooth finish.

If the evaporation rate on the concrete surface exceeds the rate of bleeding of the concrete due to weather conditions, materials used, or for any other reason, and there is any likelihood of the fresh concrete checking or cracking before the curing operation, measures shall be taken to prevent the rapid evaporation of water from the surface during finishing operations. When allowed by the Engineer, the addition of water

to the surface may be permitted as an indirect fog spray with approved spray equipment immediately after screeding and/or between finishing operations. A commercial evaporation reducer that forms a monomolecular film may also be sprayed onto the concrete surface in accordance with the manufacturer's recommendations. At no time will free water/evaporation reducer be worked into the concrete surface. Approved measures shall continue until curing operations per Section 340.3.8, Curing, are started in the particular area affected.

The Contractor shall stamp the company name and year on each end of the sidewalk or sidewalk ramp constructed. The letters shall not be less than 3/4 inch in height and the depth of the stamped impression shall be between 1/8-inch and 1/4-inch.

**340.3.8 Curing:** As soon after the completion of the finishing operation as the condition of the concrete will permit, all exposed surfaces shall either be sprayed with a pigmented curing compound or sealed with a material conforming to Section 726. Curing compound shall be applied under pressure through a spray nozzle in such manner and quantity as to entirely seal all exposed concrete surfaces with a uniform film. The membrane shall be applied in two applications for a total coverage of 150 square feet per gallon. Concrete surfaces shall be kept damp until the curing compound is applied. Should the curing compound seal be broken or damaged before the expiration of 10 days after the placing of the concrete, the break shall be immediately repaired by the application of additional curing compound over the damaged area. The need for adequate curing is greatest during the first few hours after placement of the concrete.

**340.3.9 Tolerances:** The face, top, back, and flow line of the curb and gutter shall not deviate in excess of 1/4-inch over 10 feet, as tested with a 10-foot straightedge or curve template, longitudinally along the surface.

The surface of concrete sidewalk or sidewalk ramp shall not deviate in excess of 1/8-inch over 5 feet as tested with a 5-foot straightedge except for the 1/4-inch recess of the preformed material in expansion joints.

All finished concrete elevations shall not deviate from the elevations shown on the plans, or indicated by typical sections or standard details referenced within the construction documents, by more than 1/2 inch.

When required by the Engineer, gutters shall be water tested. The Contractor shall establish flow in the length of gutter to be tested by supplying and distributing water from a hydrant, tank truck or other source. After the supply of water is shut off and water has stopped flowing, the gutter shall be inspected for evidence of ponding or improper shape. The work shall be deemed deficient if water is found ponded in the gutter to a depth greater than 1/2 inch or ponding extends onto the adjacent asphalt pavement.

Areas between elevations shown on the plans shall be straight graded or smoothly transitioned through a vertical curve in a manner approved by the Engineer or as otherwise indicated on the construction documents.

**340.3.10 Deficiencies:** Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency. Replacement or reconstruction shall be from joint to joint.

Concrete work that does not comply with tolerance requirements of Section 340.3.9, Tolerances, shall be removed and replaced. Remove and replace gutters that exceed the ponding tolerance. Grinding shall only be allowed if approved by the Engineer.

**340.4 BACKFILLING:**

Unless otherwise specified the Contractor shall backfill behind the curbs, sidewalk or sidewalk ramps with soil native to the area to the lines and grades shown on the plans.

**340.5 MEASUREMENT:**

Concrete curbs and gutters of the various types shown on the plans and in the proposal will be measured along gutter flow line through inlets, catch basins, driveways, sidewalk ramps, etc., by the lineal foot to the nearest foot for each type, complete in place. Measurement for curb terminations and transitions shall be included with the linear measurement of the various types of curb or curb and gutter as shown on the plans and in the proposal.

Curb and gutter type shall be based on the configuration of the final exposed surfaces. The increased curb and gutter depth required at valley gutter aprons or driveways shall not be measured as a separate pay item; any additional Contractor cost shall be included in the unit cost associated with the valley gutter, driveway or other associated item.

Concrete sidewalk, driveways, alley intersections, valley gutters and aprons will be measured to the nearest square foot complete in place.

Detectable warnings shall not be measured for payment. Detectable warnings are considered integral to the walking surface that they form a part of and the cost is included in the related pay item.

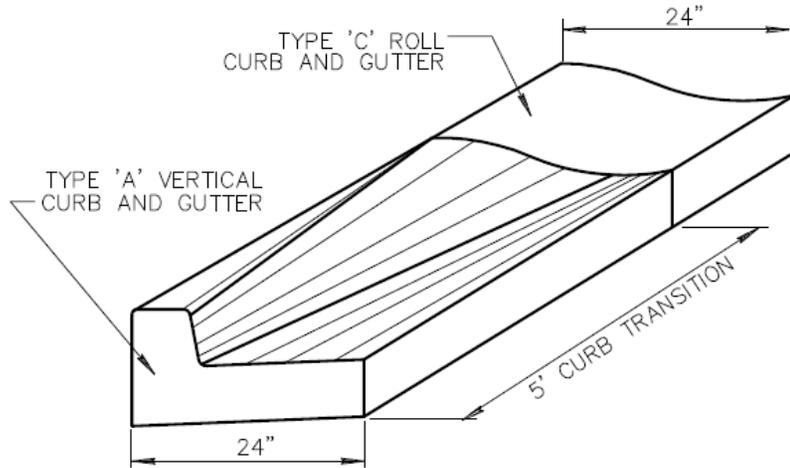
Curb ramp installations shall be measured as complete installed units and shall include the ramp curb and the walking surfaces between the ramp curb and back of curb and gutter or single curb. Single curb or curb and gutter located at the edge of roadway shall be measured and paid for separately. The surface area of curb ramps shall not be included in the measured quantity for sidewalk.

**340.6 PAYMENT:**

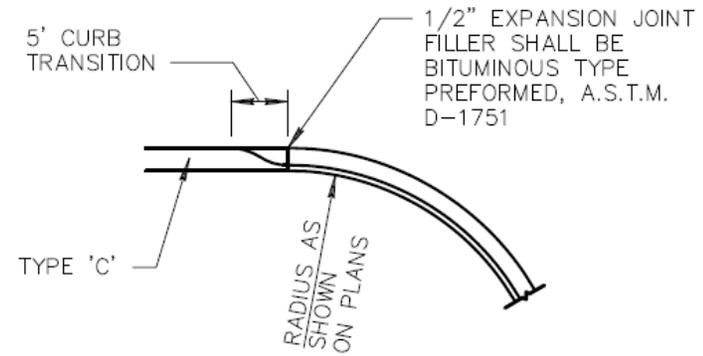
Payment will be made in accordance with the unit prices or lump sums as set forth in the proposal. Such payment shall include full compensation for furnishing all labor, material, tools and equipment and accomplishing all work in conformance with the contract documents.

Over-excavation of soft, expansive or unsuitable materials and installation granular materials will be paid as a separate pay item, not included with the above measured pay items.

**CURB TRANSITION TYPE 'A' TO TYPE 'C'**



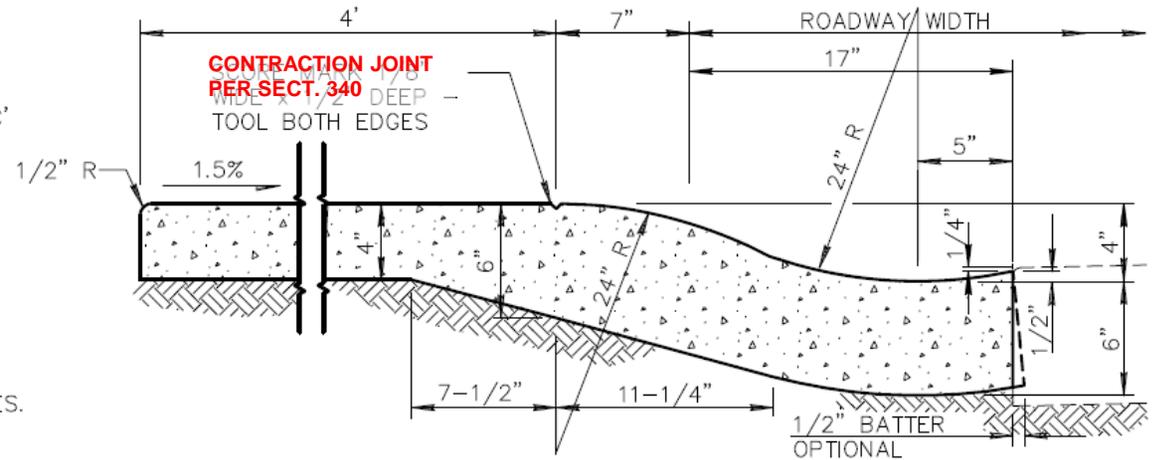
**CURB AND GUTTER TRANSITION**



**NOTES: (CURB AND GUTTER TRANSITIONS)**

1. TRANSITIONS WILL BE PAID FOR AS THE PREDOMINANT TYPE OF CURB AND GUTTER BEING TRANSITIONED. WHEN TYPE 'A' CURB AND GUTTER ARE USED AT CURB RETURNS AND TYPE 'C' CURB AND GUTTER IS PREDOMINANTLY USED ELSEWHERE, THE TYPE 'A' TO TYPE 'C' TRANSITIONS SHALL BE MEASURED AND PAID FOR AS TYPE 'C' CURB AND GUTTER.
2. WHERE PROPOSED CONSTRUCTION IS TO BE CONNECTED TO EXISTING CURB AND GUTTER, THE TRANSITION SHALL BE INDICATED ON PLANS.
3. CLASS 'B' CONCRETE PER SECT. 725.
4. TRANSITION BETWEEN TYPICAL SECTIONS SHALL BE ACCOMPLISHED BY THE USE OF DIRECT STRAIGHT LINE TRANSITIONS OF THE FLOW LINE AND OTHER SURFACE FEATURES.

**INTEGRAL ROLL CURB, GUTTER AND SIDEWALK**



**NOTES: (INTEGRAL ROLL CURB, GUTTER AND SIDEWALK)**

1. CONCRETE TO BE MONOLITHIC POUR. EXPOSED SURFACE FINISH AS PER SIDEWALK AND GUTTER DETAIL.
2. CONTRACTION JOINT SPACING 5' MAXIMUM.
3. EXPANSION JOINTS PER SECT. 340.
4. CLASS 'B' CONCRETE PER SECT. 725.

DETAIL NO.

221



STANDARD DETAIL  
ENGLISH

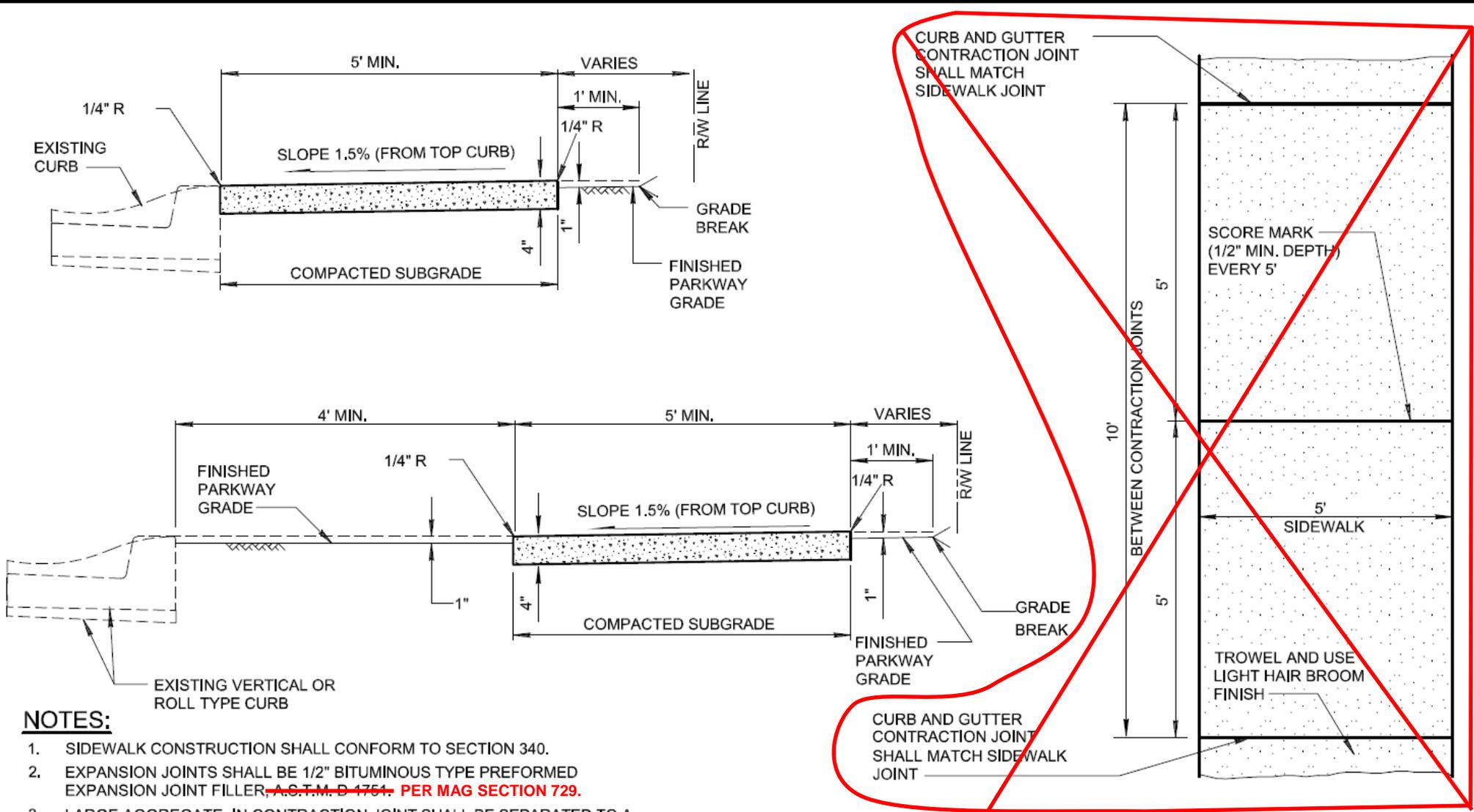
**CURB AND GUTTER TRANSITION TYPE A TO TYPE C  
INTEGRAL ROLL CURB, GUTTER AND SIDEWALK**

REVISED

01-01-2011

DETAIL NO.

221

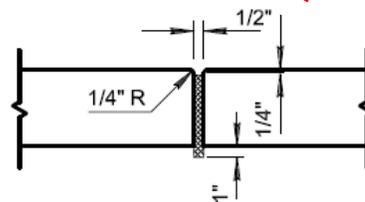


**NOTES:**

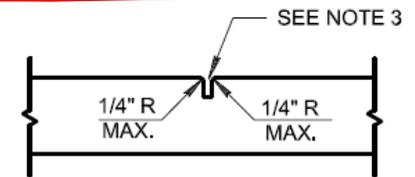
1. SIDEWALK CONSTRUCTION SHALL CONFORM TO SECTION 340.
2. EXPANSION JOINTS SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, ~~A.S.T.M. D 1754~~. **PER MAG SECTION 729.**
3. LARGE AGGREGATE, IN CONTRACTION JOINT SHALL BE SEPARATED TO A DEPTH OF 1", FINISH DEPTH SHALL BE A MINIMUM OF 3/4".
4. EXPANSION JOINTS SHALL CONFORM TO SECTION 340, BE INSTALLED PRIOR TO CONCRETE PLACEMENT, AND AT A MAXIMUM SPACING OF 50'. ~~THE EXPANSION JOINT MUST PROVIDE COMPLETE SEPERATION OF THE SIDEWALK FROM ADJOINING CONCRETE.~~
5. CONCRETE SHALL BE CLASS 'B' PER SECTION 725.
6. WHEN SIDEWALK AND ADJACENT CURB ARE INSTALLED MONOLITHICALLY, ~~THE MID-POINT SCORE LINE~~ SHALL EXTEND ACROSS THE CURB.

**CONSTRUCTED**

**ALL EXPANSION AND CONTRACTION JOINTS**



**EXPANSION JOINT**



**CONTRACTION JOINT**

DETAIL NO.

230



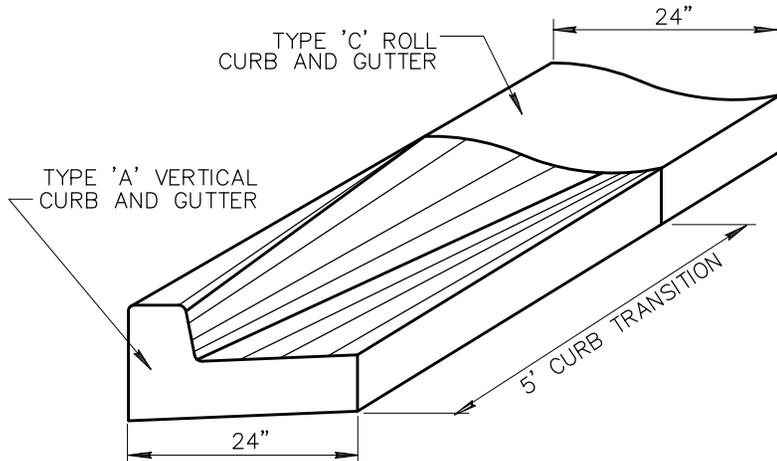
STANDARD DETAIL  
ENGLISH

SIDEWALKS

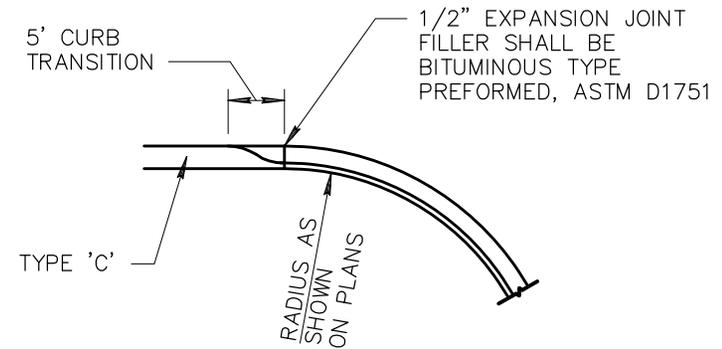
REVISED  
01-01-2011

DETAIL NO.  
230

## CURB TRANSITION TYPE 'A' TO TYPE 'C'



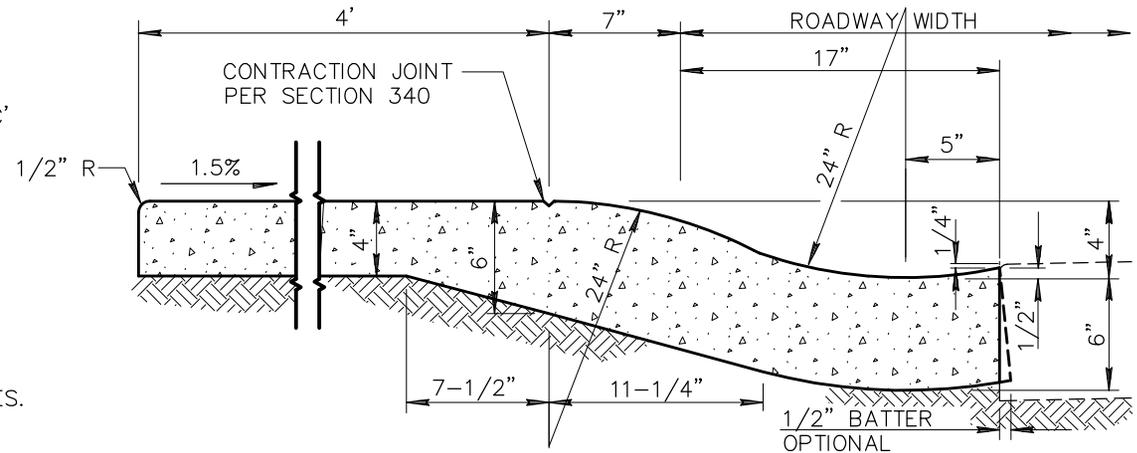
## CURB AND GUTTER TRANSITION



### NOTES: (CURB AND GUTTER TRANSITIONS)

1. TRANSITIONS WILL BE PAID FOR AS THE PREDOMINANT TYPE OF CURB AND GUTTER BEING TRANSITIONED. WHEN TYPE 'A' CURB AND GUTTER ARE USED AT CURB RETURNS AND TYPE 'C' CURB AND GUTTER IS PREDOMINANTLY USED ELSEWHERE, THE TYPE 'A' TO TYPE 'C' TRANSITIONS SHALL BE MEASURED AND PAID FOR AS TYPE 'C' CURB AND GUTTER.
2. WHERE PROPOSED CONSTRUCTION IS TO BE CONNECTED TO EXISTING CURB AND GUTTER, THE TRANSITION SHALL BE INDICATED ON PLANS.
3. CLASS 'B' CONCRETE PER SECTION 725.
4. TRANSITION BETWEEN TYPICAL SECTIONS SHALL BE ACCOMPLISHED BY THE USE OF DIRECT STRAIGHT LINE TRANSITIONS OF THE FLOW LINE AND OTHER SURFACE FEATURES.

## INTEGRAL ROLL CURB, GUTTER AND SIDEWALK



### NOTES: (INTEGRAL ROLL CURB, GUTTER AND SIDEWALK)

1. CONCRETE TO BE MONOLITHIC POUR. EXPOSED SURFACE FINISH AS PER SIDEWALK AND GUTTER DETAIL.
2. CONTRACTION JOINT SPACING 5' MAXIMUM.
3. EXPANSION JOINTS PER SECTION 340.
4. CLASS 'B' CONCRETE PER SECTION 725.

DETAIL NO.

221



STANDARD DETAIL  
ENGLISH

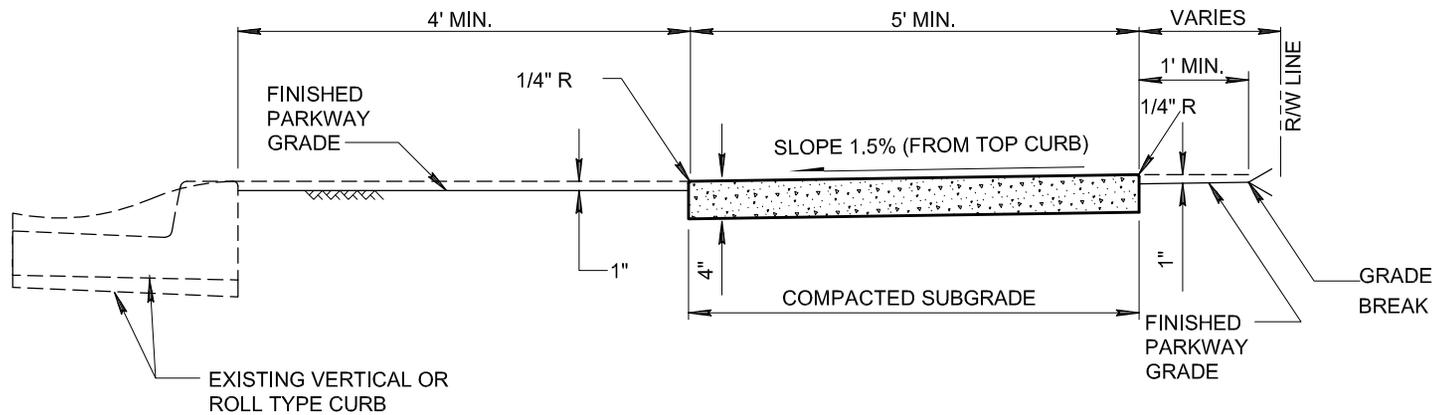
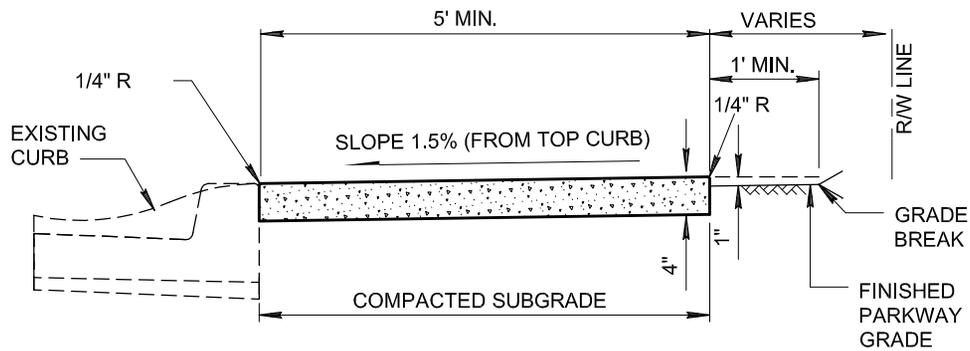
CURB AND GUTTER TRANSITION TYPE A TO TYPE C  
INTEGRAL ROLL CURB, GUTTER AND SIDEWALK

REVISED

01-01-2014

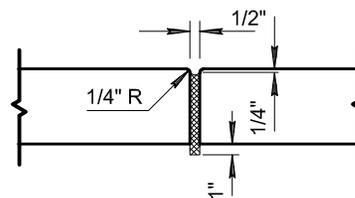
DETAIL NO.

221

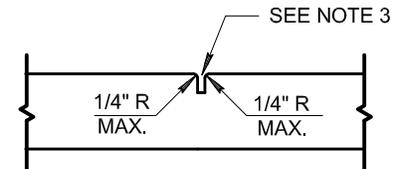


**NOTES:**

1. SIDEWALK CONSTRUCTION SHALL CONFORM TO SECTION 340.
2. EXPANSION JOINTS SHALL BE 1/2" BITUMINOUS TYPE PREFORMED EXPANSION JOINT FILLER, PER SECTION 729.
3. LARGE AGGREGATE, IN CONTRACTION JOINT SHALL BE SEPARATED TO A DEPTH OF 1", FINISH DEPTH SHALL BE A MINIMUM OF 3/4".
4. EXPANSION JOINTS SHALL CONFORM TO SECTION 340, BE INSTALLED PRIOR TO CONCRETE PLACEMENT, AND AT A MAXIMUM SPACING OF 50'.
5. CONCRETE SHALL BE CLASS 'B' PER SECTION 725.
6. WHEN SIDEWALK AND ADJACENT CURB ARE CONSTRUCTED MONOLITHICALLY, ALL EXPANSION AND CONTRACTION JOINTS SHALL EXTEND ACROSS THE CURB.



**EXPANSION JOINT**



**CONTRACTION JOINT**

DETAIL NO.

230



STANDARD DETAIL  
ENGLISH

SIDEWALKS

REVISED

01-01-2014

DETAIL NO.

230