

604-R-633 CURB RAMPS, LANDINGS, AND DETECTABLE WARNING SURFACES

(Revised 06-16-16)

The Standard Specifications are revised as follows:

SECTION 604, BEGIN LINE 1, DELETE AND INSERT AS FOLLOWS:

SECTION 604 – SIDEWALKS, CURB RAMPS, STEPS, AND HANDRAILS

604.01 Description

This work shall consist of constructing HMA or PCC sidewalks, curb ramps, concrete steps, or the reconstruction of PCC sidewalks in accordance with 105.03.

MATERIALS

604.02 Materials

Materials shall be in accordance with the following:

Coarse Aggregate, Class D or Higher, Size No. 53	904
Concrete, Class A.....	702
Detectable Warning Elements <i>Surfaces</i>	905.05
Fine Aggregate, Size No. 23, No. 24, or No. 15	904
Joint Filler	906.01
Joint Sealing Materials	906.02
Paint	909.05
Reinforcing Bars	910.01
Silica Sand.....	ASTM C 778

Hand railing shall be aluminum pipe in accordance with ASTM B 221, alloy 6063, temper T52 or galvanized steel pipe in accordance with ASTM A 53, grade B, all as specified.

The detectable warning surface in concrete curb ramps shall be selected from the Department’s list of approved Detectable Warning ~~Elements~~ *Surfaces* in accordance with 905.05.

The mortar bed material shall be high-strength mortar in accordance with ASTM C 387. Part of the mix water shall be replaced with a Type II polymer modifier meeting the requirements of ASTM C 1438. The proportioning of water and polymer modifier shall be as recommended by the manufacturer of the polymer modifier.

A type C certification in accordance with 916 shall be furnished for the masonry mortar and polymer modifier prior to use of the material.

A type C certification in accordance with 916 for the silica sand shall be furnished prior to use of the material.

CONSTRUCTION REQUIREMENTS

604.03 Portland Cement Concrete Sidewalks and Curb Ramps

(a) General Requirements

The location of curb ramps shall take precedence over the location of drainage structures and signal, utility, or light poles. Drainage structures *and poles* shall not be located within the limits of the curb ramp, exclusive of flared sides. ~~Poles shall be located so as not to impede the usage or safety of the curb ramps~~ *Poles located within a sidewalk shall not reduce the clear width to less than 4.0 ft.* Crosswalk markings shall be located such that the curb ramps ~~shall be and curb ramp clear spaces are~~ contained within the markings unless otherwise specified. The flared sides need not fall within the crosswalk lines. The normal gutter flow line shall be maintained throughout the curb ramp area, and appropriate drainage structures shall be used, as needed, to intercept the flow prior to the curb ramp area. Positive drainage shall also be provided to carry water away from the intersection of the curb ramp and the gutter line.

The bottom edge of curb ramps and the top of curb shall be flush with the edge of the adjacent pavement or the gutter line. *Vertical surface discontinuities shall be a maximum of 1/2 in. Vertical surface discontinuities greater than 1/4 in. up to 1/2 in. shall be beveled at a slope no steeper than 1V:2H.*

The curb ramp running slope shall not exceed ~~12:1~~ 8.33%, ~~except where conditions necessitate, a 10:1 slope may be utilized for a maximum rise of 6 in.~~ Curb ramp *and sidewalk* cross slope shall not exceed ~~50:1~~ 2.00% ~~except where infeasible.~~ *The slope of the turning space shall not exceed 2.00% in any direction. A running slope or cross slope that exceeds the maximum shall be as shown on the plans.*

Construction tolerance shall not apply to running slope and cross slope percentages.

(b) Excavation

Excavation shall be made to the required depth and to a width that will enable the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface in accordance with the section shown on the plans. All soft and yielding material shall be removed and replaced with acceptable material.

(c) Forms

Forms shall be of wood, metal, or other approved material and shall extend for the full depth of the concrete. Forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

(d) Placing Concrete

The foundation shall be thoroughly moistened immediately prior to the placing of the concrete. The proportioning, mixing, and placing of the concrete shall be in accordance with 702. The thickness of the concrete in the curb ramp, including flared sides, shall be as shown on the plans ~~for the type specified.~~

(e) Finishing

Immediately after striking off, the grade, running slopes and cross slopes shall be checked with a 2 ft level and a long handled straightedge of light construction that can completely span the surface. The level and straightedge shall be laid parallel and perpendicular to the grade or running slope at intervals of no more than 2 ft on curb ramps and 10 ft along sidewalks. All high spots shall be removed and depressions filled with fresh concrete and then leveled. Checking and leveling shall be continued until the surface has the required grade, running slope and cross slope and is free of voids.

The surface shall be finished with a wooden float. No plastering of the surface will be allowed. *The final surface shall be free from porous spots caused by the disturbance of coarse aggregate particles. Curb Ramp surfaces shall be coarse broomed and corrugated transverse to the running slope as shown on the plans. The surface texture of the flared sides shall be coarse broomed with the striations transverse to the slope.*

All exposed edges shall be finished with a 1/4 in. radius.

(f) Joints

The type and location of joints and the size of preformed joint filler shall be as shown on the plans.

All concrete joints shall be finished with a 1/4 in. radius.

Preformed 1/2 in. joint filler shall be placed around all appurtenances, such as manholes and utility poles which extend into and through the sidewalk, and between the sidewalk and any fixed structure, such as a building or bridge. The preformed joint filler shall extend for the full depth of the sidewalk or curb ramp, and shall be flush with the surface of the adjacent concrete.

(g) Detectable Warning ElementsSurfaces

Detectable warning surfaces shall be placed the full width of the curb ramp. Where forming is required for installation of the detectable warning surfaces, the border width shall not exceed 2 in. within the ramp width, as shown on the plans.

~~Detectable warning elementsurfaces shall be manufactured or field cut to completely fill the area of the curb ramp as shown on the plans~~ *contrast visually from the adjacent surfaces. The surface shall consist of truncated domes aligned in a square or radial grid pattern as shown on the plans.*

~~ElementsSurfaces~~ shall be installed to be level across joints or seams and shall be flush with the edges of adjoining concrete. *Surfaces from various manufacturers shall not be mixed in any individual curb ramp.*

1. Brick Surfaces

Brick ~~elementsurfaces~~ shall be placed in a mortar setting bed within the hardened concrete block out. The concrete base of the block out shall have a rough textured finish, such as would be produced by a screed or wood float. The depth of the block out shall be such that a mortar bed thickness of 3/8 to 3/4 in. is achieved for the nominal depth of the ~~element~~brick. The hardened concrete base shall be free of all material which might prevent the mortar setting bed from adhering. The concrete base shall be dampened with

water, but be surface dry immediately prior to the placing the mortar setting bed. The mortar setting bed shall be laid out the desired thickness, no more than 2 ft ahead of laying the ~~elements~~bricks. The ~~elements~~bricks shall be buttered with mortar on the bottom before placement into the setting bed. ~~Elements from various manufacturers shall not be mixed at any individual concrete ramp location.~~

Brick ~~elements~~surfaces shall be laid out in a running or stacked bond pattern with a 1/16 in average joint width. The joint width shall not exceed 1/8 in. Whole ~~elements~~bricks should be laid first, followed by ~~elements~~bricks cut to size, keeping the number of joints to a minimum. A masonry saw shall be used to produce a clean, accurate, straight cut. The joint between ~~elements~~bricks shall be completely filled with a dry fine aggregate. The fine aggregate may be obtained from a non-Certified Aggregate Producer, but it shall be natural sand having a gradation where at least 95% of the material passes the No. 4 sieve. Excess fine aggregate shall be removed from the surface of the ~~elements~~bricks.

2. Cast Iron Surfaces

Cast iron ~~elements~~surfaces shall be installed in accordance with the manufacturer's recommendations. When required, cutting of the ~~elements~~cast iron shall be in accordance with the manufacturer's recommendations. Cut edges shall be ground to a smooth shape consistent with the manufactured edges.

~~Approved elements other than brick or cast iron shall be installed in accordance with the manufacturer's recommendations.~~

(h) Curing

Concrete shall be cured for at least 72 h. Curing shall be in accordance with 504.04 except curing compound shall not be used in the area where detectable warning ~~elements~~surfaces are to be installed. ~~During the curing period all pedestrian traffic shall be excluded.~~

(i) Painting

~~The exposed surfaces of the curb throughout the width of curb ramps shall be painted yellow in accordance with 808.06. Silica sand shall be applied to the wet paint along the top of the curb at the rate of 6.0 lb/gal.~~

604.04 PCC Steps

PCC steps shall be in accordance with the applicable provisions of 604.03. ~~In addition, all exposed edges shall be rounded to a 1/4 in. radius.~~

604.05 Reconstructed PCC Sidewalk and Curb Ramp

Where existing concrete sidewalk is to be reconstructed, all disintegrated concrete, brick, stone, or other material shall be completely removed and replaced with new concrete sidewalk in accordance with 604.03.

Such sidewalk shall be constructed to a minimum depth of 4 in. unless another depth is designated and to the width of the adjoining walk, or to a width of no less than 48 in. from the *back* face of curb, or to such other width as directed.

The removal of concrete sidewalk shall be to uniform lines as directed. The sidewalk to be removed shall be cut in a straight line with an approved power driven concrete saw. The sawing shall be such that the portion of sidewalk to remain in place shall not be damaged. All portions which are damaged or removed back of the established line shall be replaced.

Unless otherwise directed, sidewalk which must be removed shall be removed between tool marks or joints. At locations where the sidewalk and curb are adjacent and the curb is deteriorated, the curb shall also be replaced as directed.

The new sidewalk shall have a joint pattern similar to the surrounding sidewalk. Sidewalk placed at drives shall be 6 in. thick, or the same depth of the existing drive, whichever is greater.

Where existing curb ramp is to be reconstructed for placement of detectable warning surfaces, all concrete, brick, stone, or other material shall be completely removed and replaced in accordance with 604.03.

604.06 Re-Laid Sidewalk

This work consists of the removal and re-laying of concrete, stone-slab, or brick sidewalk at the locations shown on the plans or as directed. In the operations of removing and re-laying, care shall be taken not to damage any of the sidewalk. Before re-laying, a cushion of fine aggregate shall be spread on the prepared subgrade to a depth of no less than 2 in. Cracked or damaged sections shall not be re-laid but shall be disposed of as directed. *The cross slope of the re-laid sidewalk shall be checked with a 2 ft level in accordance with 604.03(e).*

604.07 HMA Sidewalk

(a) Excavation and Forms

Excavation and forms, when required, shall be in accordance with 604.03(b) and 604.03(c).

(b) Bed Course

Bed course material shall be coarse aggregate No. 53 and shall be placed in lifts not exceeding 4 in. in depth. Each lift shall be thoroughly compacted.

(c) Placing HMA Sidewalk

HMA sidewalk material shall be placed on a compacted bed course in one or more courses. The mixture shall consist of HMA base, intermediate, or surface, ~~type A~~ *type B* in accordance with 402 *except the 9.5 mm surface gradation can go above or below the PCS control point in accordance with 401.05.* A MAF in accordance with 402.05 will not apply. Aggregate requirements of 904.03(d) do not apply. Compaction shall be accomplished by means of a hand operated or power roller of an acceptable type and weight in accordance with 402.15. In areas inaccessible to the roller, hand tamping will be allowed. In any case, the HMA sidewalk material shall be uniformly compacted. *The grade and cross slope shall be checked with a 2 ft level in accordance with 604.03(e).*

If the finished compacted surface is too open or remains sticky, the surface shall be given a coating of fine aggregate, well broomed over the surface, leaving no excess.

604.08 Backfilling and Finishing Shoulders and Slopes

After forms have been removed, the space on each side of the sidewalks shall be filled to the required elevation with suitable material which shall be firmly compacted and neatly graded. Adjacent shoulders and slopes shall be finished to the required grade and cross section.

604.09 Hand Rails

This railing shall be erected in a workmanlike manner, straight and true to grade. Posts shall be vertical and railings shall be parallel to the walk surface or the plane of the steps and spaced as shown on the plans. Fastenings shall be as indicated on the plans. Railing posts on masonry shall be held in place in a manner that develops the full strength of the railing post in bending.

Fabrication and placement of railings shall be completed in accordance with the applicable requirements of 711. Ends of tube sections shall be milled or sawed. Cut ends shall be true, smooth, and free from burrs and ragged edges. Welds shall be ground smooth. The rail system shall be continuous except as shown on the plans. Joints shall be spliced as detailed on the plans. Welding of steel shall be in accordance with 711.32 and welding of aluminum shall be in accordance with the applicable requirements of 803. Radiographic, magnetic particle, and dye penetrant inspection will not be required.

All aluminum surfaces in contact with concrete shall be coated with an aluminum impregnated caulking compound prior to installation. After installation and alignment, openings between metal surfaces and concrete shall be sealed in a watertight manner with the caulking compound.

Steel pipe railing not designated to be painted shall be galvanized after fabrication and prior to installation. Railing designated to be painted shall receive one shop coat of paint after fabrication and two field coats after installation. The type and color of paint shall be as specified on the plans. Cleaning and painting shall be in accordance with 619.

604.10 Method of Measurement

Concrete sidewalk, reconstructed concrete sidewalk, and re-laid concrete sidewalk will be measured by the square yard of finished surface. HMA for sidewalk will be measured by the ton of mixture placed. Bed course material will be measured by the ton.

Concrete curb ramps will be measured by the square yard ~~in accordance with the pay limits shown on the plans~~ and will include the ramp, turning space, flared side, and setback. Turning spaces shared by more than one curb ramp will be measured only once. Detectable warning surfaces and retrofitted detectable warning surfaces will be measured by the square yard.

Concrete steps will be measured by the cubic yard based on the neat lines shown on the plans.

Hand rails will be measured by the linear foot in accordance with the dimensions shown on the plans or as directed. Measurements will be made from end to end of the railing along the centerline.

Curb and curb and gutter will be measured in accordance with 605.09. Reinforcing bars, if used, will be measured in accordance with 703.07.

Joint material will not be measured.

604.11 Basis of Payment

The accepted quantities of concrete sidewalk will be paid for at the contract unit price per square yard for sidewalk, concrete. HMA for sidewalk will be paid for at the contract unit price per ton, complete in place. Bed course material will be paid for at the contract unit price per ton. Concrete steps will be paid for at the contract unit price per cubic yard for steps, concrete. Reconstructed sidewalk and re-laid sidewalk will be paid for at the contract unit price per square yard for sidewalk, reconstruct, or sidewalk, re-lay. *Detectable warning surfaces and retrofitted detectable warning surfaces will be paid for at the contract unit price per square yard.*

The accepted quantities of curb ramps will be paid for at the contract unit price per square yard for curb ramp, concrete, ~~per the type~~, complete in place.

Hand rails will be paid for at the contract unit price per linear foot.

Curb and curb and gutter will be paid for in accordance with 605.10.

Reinforcing bars, if used, will be paid for in accordance with 703.08. Curb, if directed to be replaced, will be paid for in accordance with 605.10.

Payment will be made under:

Pay Item	Pay Unit Symbol
Bed Course Material	TON
Curb Ramp, Concrete, _____	SYS
type	
<i>Detectable Warning Surfaces</i>	<i>SYS</i>
<i>Detectable Warning Surfaces, Retrofit</i>	<i>SYS</i>
Hand Rail, _____	LFT
type	
HMA for Sidewalk	TON
Sidewalk, Concrete	SYS
Sidewalk, Concrete, Reconstruct	SYS
Sidewalk, Concrete, Re-Lay	SYS
Steps, Concrete.....	CYS

The cost of the ramp, including border, turning space, flared side, return curb, and setback shall be included in the cost of the curb ramp.

The cost of excavation, backfill, joint material, and necessary incidentals shall be included in the cost of the pay items in this section.

The removal and disposal of concrete sidewalk which is unsuitable for re-laying and which has not been damaged due to negligence will be paid for in accordance with 202.14. Concrete sidewalk which is specified to be re-laid or to remain in place and which is damaged shall be removed and disposed of and replaced with no additional payment.

If directed, concrete sidewalk shall be constructed to a depth greater than that shown on the plans. Such additional thickness will be converted into the equivalent square yards quantity of concrete sidewalk of the thickness shown on the plans and will be paid for as such.

The cost of furnishing and applying sand to finished compacted surfaces shall be included in the cost of HMA for sidewalk.

The cost of the ~~concrete base, detectable warning elements~~*surfaces*, thin set mortar, and fine aggregate for filling joints, ~~and the painting of curb through the width of the curb ramp including the silica sand~~ shall be included in the cost of the ~~curb ramp~~*detectable warning surfaces*.

The cost of removal, disposal, and replacement of portions of the concrete curb ramp, concrete base, including border, detectable warning surfaces, thin set mortar, and fine aggregate for filling joints shall be included in the cost of the detectable warning surfaces, retrofit.

The cost of aluminum impregnated caulking compound and the painting of steel hand railing shall be included in the cost of the hand rail.

SECTION 905, BEGIN LINE 36, DELETE AND INSERT AS FOLLOWS:

905.05 Detectable Warning ~~Elements~~*Surfaces*

The detectable warning surface in concrete curb ramps shall be constructed using materials from the Departments approved list of Detectable Warning ~~Elements~~*Surfaces*, which is maintained by the Office of Materials Management. ~~An element~~*surface* manufacturer wishing to add a product to the approved list shall comply with Procedure L of ITM 806.

- (a) Brick detectable warning ~~elements~~*surfaces* shall consist of clay, shale, or similarly naturally occurring earthy substance, subjected to heat treatment at elevated temperatures to form bricks or pavers. The dimensions of the ~~element~~*brick* shall be 8 in. in length, 4 in. in width including any spacing lugs. The thickness of the ~~element~~*brick* shall be 2 in., excluding dome height and edge chamfers. The truncated domes on the surface shall be formed integral with the main body of the detectable warning ~~element~~*surface* and be present on the ~~element~~*brick* prior to heat treatment. The size and physical requirements of the ~~elements~~*bricks* shall be in accordance with ASTM C 902 for weather and traffic environment classifications Class SX, Type II, respectively. The truncated domes may

be ground off to meet the cap thickness requirement for compressive strength testing.

- (b) Brick detectable warning ~~elements~~*surfaces* shall be predominantly red-brown in color and shall be uniform throughout the ~~element~~*brick*. The color will be determined from the average of five color readings for detectable warning ~~elements~~*surfaces* when measured at the top surface between the raised truncated domes and determined in accordance with ASTM E 1349, CIE Illuminant D65, 10° Standard Observer, using instrument geometry of 45°/0°, and the CIE L*a*b* color system. The tested ~~elements~~*bricks* shall be within the limits as follows:

	Minimum	Maximum
L*	35.0	50.0
a*	6.0	36.0
b*	0.0	30.0

The value of a* shall not be less than 90% of the value of b*. The color difference of any installed ~~element~~*brick* after one year of exposure or of an individual detectable warning ~~element~~*surface* from the average color for any product or model from a manufacturer shall not be greater than 5.0 ΔE^* units. The color shall be uniform throughout the detectable warning ~~elements~~*surfaces*.

- (c) Cast iron detectable warning ~~elements~~*surfaces* shall be manufactured from gray iron in accordance with AASHTO M 105, Class 30A as a minimum. The truncated domes shall be as shown on the plans. The tops of the domes and the space between domes shall have a non-slip textured surface. The minimum thickness of the casting shall be 0.300 in. The minimum thickness shall not be measured within the area of integral reinforcing ribs or bracing, domes or the textured surface.
- (d) The height ~~tolerance~~*range* of the truncated domes shall be ~~within~~*between* 0.18 in. to 0.26 in. ~~The base diameter, dome top diameter and dome spacing shall be within $\pm 1/16$ in. of the design value.~~ The design values shall be within the ranges identified in the Standard Drawings. No more than two truncated domes per ~~element~~*surface* may be out of tolerance for dimensions.
- (e) Detectable warning ~~elements~~*surfaces* that are not classified as brick in accordance with 905.05(a) or cast iron in accordance with 905.05(c) will be considered. The detectable warning ~~elements~~*surfaces* shall meet the color requirements of 905.05(b) and the truncated dome requirements of 905.05(d).