

	INDIANA DEPARTMENT OF TRANSPORTATION INTER-DEPARTMENT COMMUNICATION <i>Standards Section – Room N642</i> <i>Writer's Direct Line</i> 232-6775	
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December 20, 2004

DESIGN MEMORANDUM No. 04-19
TECHNICAL ADVISORY

TO: All Design, Operations, District Personnel, and Consultants

FROM: /s/ Anthony L. Uremovich
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Contracts and Construction Division

SUBJECT: Sidewalk Curb Ramps

SUPERSEDES: *Indiana Design Manual Section 51-1.08*

EFFECTIVE: May 25, 2005, Letting

Projects which include curbs and sidewalks at pedestrian crosswalks will require sidewalk curb ramps to eliminate physical barriers for ease of access to such crosswalks. A pedestrian crosswalk is defined as the portion of a street ordinarily included within the prolongation or connection of lateral lines of sidewalks at an intersection. It also includes any portion of a highway or street distinctly indicated as a crossing for pedestrians by means of lines or other markings on the pavement surface.

A curb ramp provides a sloped area within a public sidewalk that allows pedestrians to accomplish a change from sidewalk level to street level. A curb ramp typically includes the ramp and flared sides and specific surface treatments, but does not include the landings at the top and bottom of the ramp.

Curb ramps are to be placed at all crosswalks which extend from a paved sidewalk in each intersection with a curbed public roadway or curbed signalized commercial drive. Curb ramps should not be used at private drives, alleys, or unsignalized commercial drives. Instead, a sidewalk elevation transition as shown on Recurring Plan Details 604-R-484d, page 14 or 15 should be

placed. At T-intersections, the designer should ensure that curb ramps are located on the side opposite the minor intersecting road if a sidewalk is present or is to be provided.

For partial 3R projects, curb ramps should be considered as described in *Indiana Design Manual* Chapter Fifty-six. Curb ramps should not be considered for signing, pavement marking, or roadway lighting projects.

A. Location

When determining the locations of curb ramps, the designer should consider the following:

1. Curb ramps should be located directly opposite one another for each crosswalk, and should be placed within the transverse limits of crosswalk lines, where crosswalk lines are used.

The placement of curb ramps affects the placement of crosswalk lines and vehicle stop lines. Conversely, the location of existing crosswalk lines and stop lines affect the placement of curb ramps. Some of the crosswalk-line constraints are shown in Figure 04-19A, Types of Curb Ramps at Marked Crossings, and in Recurring Plan Details. The *Manual on Uniform Traffic Control Devices* contains additional constraints on crosswalk- and stop-line placement.

2. Each ramp should be designed and placed to provide continuity of the sidewalk corridor direction of travel while providing pedestrians the shortest but most direct route across a street.
3. The designer should ensure that the landing area at the bottom of each curb ramp does not encroach upon through-lane vehicle traffic which has the right of way at the same time a pedestrian is attempting to use the crosswalk parallel to it.
4. The curb ramp and associated landings should not be compromised by other highway features (e.g., guardrail, catch basins, utility poles, fire hydrants, sign or signal supports, etc.).
5. There should be full continuity of use throughout. Opposing curb ramps should always be provided in all required intersection quadrants, including intersections with some quadrants outside the project limits.
6. Curb ramps should be located or protected to prevent their obstruction by parked vehicles.

7. Approval of a Level One waiver of the accessibility requirements for physically impaired individuals is required for locations where there are valid reasons to restrict or prohibit pedestrian access. Such waiver is described in *Indiana Design Manual* Section 40-8.04(01) Item 2.
8. The normal gutter flow line should be maintained through the curb ramp area. Appropriate drainage structures should be placed as needed to intercept the flow prior to the curb ramp area. Positive drainage should be provided to carry water away from the intersection of the curb ramp and the gutter line, thus minimizing the depth of any flow across the crosswalk.
9. If modifications to the details shown on the INDOT Standard Drawings are required so that a curb ramp can be better accommodated, such details and the required pay quantities should be shown on the plans.
10. The impact of utilities location on curb-ramp placement and construction should be minimized. The designer is responsible for being aware of potential utility conflicts. If utilities are present, coordination should be in accordance with Section 10-2.0.

B. Types of Sidewalk Curb Ramps

Details for placement of curb ramps and an illustration showing appropriate locations for all curb ramp types are shown on Recurring Plan Details 604-R-486d, page 1. Determining which curb ramp is most appropriate depends on the exact conditions of the site. Curb ramps are categorized below by their structural design and how they are positioned to the sidewalk or street.

1. Perpendicular Curb Ramp. This curb ramp is perpendicular to the curb and requires a wide enough sidewalk to provide a 12:1 running slope. **This is the preferred design.** The length of the ramp depends on the height of the curb where the ramp is to be located. Details of a ramp with an integral curb and of a ramp with a separate curb are shown on Recurring Plan Details 604-R-484d, pages 3 and 5, respectively. A landing should be provided at the top of the ramp. If site infeasibility precludes construction as shown on Recurring Plan Details 604-R-484d, pages 3, 5, or 6, the level landing width may be decreased from 1200 mm to 900 mm (4 ft to 3 ft), and the running slope may be increased to 10:1 for a maximum 150 mm (6 in.) rise. New construction should always provide adequate right of way for a perpendicular curb ramp. Some portion of the curb ramp, typically one of the flared sides, may fall within the curved intersection corner. See Recurring Plan Details 604-R-484d, page 12 for details of improved access to perpendicular curb ramps.

The standard perpendicular curb ramps are as follows:

- a. Type A. This type should be specified where a curb ramp is required entirely within the pedestrian walkway. It is the preferred type where the sidewalk is adjacent to the curb.
 - b. Type C. This type should be specified where a curb ramp is required outside the pedestrian walkway, in the utility strip. It is the preferred type where there is a utility strip between the sidewalk and the curb.
 - c. Type D. This type should be specified where a curb ramp is required near an obstruction which can not be removed. It is the preferred type for this situation, and may be used with or without a utility strip present.
2. Diagonal Curb Ramp. A diagonal curb ramp is a single curb ramp that is located at the apex of the corner at an intersection, and serves two intersecting crossing directions. Since the ramp is diagonal to the path of travel, it is only accessible if level landing or maneuvering spaces are provided at both the top and bottom of the ramp. If creating a level landing is too difficult or a 1.2-m (4-ft) clear space cannot be provided, a diagonal curb ramp should not be considered. If site infeasibility precludes construction as shown on Recurring Plan Details 604-R-484d, page 4 or 7, the landing width may be decreased from 1.2 m to 0.9 m (4 ft to 3 ft) and the running slope may be increased to 10:1 for a maximum 150 mm (6 in.) rise.

Diagonal curb ramps should only be used where perpendicular or parallel curb ramps are infeasible and no other option is available, or if a field investigation warrants their use for alterations affecting existing sidewalks.

If diagonal curb ramps are to be used, durable crosswalk markings are required on the street pavement. Specific constraints for crosswalk markings and stop-lines placement are shown on Figure 04-19A, Types of Curb Ramps at Marked Crossings. Each diagonal curb ramp should be wholly contained within the crosswalk lines, including any flared sides. There should be at least 1.2 m (4 ft) between the gutter line and the corner of the two intersecting crosswalk lines as delineated within the intersection pavement area. See Figure 04-19A for an illustration of these criteria.

The standard diagonal curb ramps are as follows:

- a. Type B. This type should be specified where a curb ramp is required entirely within the pedestrian walkway, the corner radius is greater than 3 m (10 ft), and placement of a Type A ramp is infeasible. At the bottom of the ramp, the perimeter length is 2.4 m (8 ft), regardless of the corner radius.

- b. Type E. This type should be specified where a curb ramp is required outside the pedestrian walkway in the utility strip, the corner radius is greater than 3 m (10 ft), and placement of a Type B ramp is infeasible.

This type should also be specified where a curb ramp is required outside the pedestrian walkway in the utility strip, the corner radius is greater than 3 m (10 ft), an obstruction which cannot be removed is present, and placement of a Type C ramp is infeasible.

At the bottom of the ramp, the perimeter length is 2.4 m (8 ft), regardless of the corner radius.

3. Parallel Curb Ramp. A parallel curb ramp has two ramps leading down towards a center level landing at the bottom between both ramps and has level landings at the top of each ramp. A parallel curb ramp may be specified for a narrow sidewalk, steep terrain, or at a location with a high curb, as the ramp can easily be lengthened to reduce the grades. A parallel curb ramp should not be installed where it is possible to install two perpendicular curb ramps. A wall or curb may be required along the back edge of the ramp as shown on Recurring Plan Details 604-R-484d, page 8. The designer should show details for such wall or curb on the plans and include a unique special provision.

Parallel curb ramps should only be used where perpendicular curb ramps are infeasible and no other option is available.

The standard parallel curb ramp is type F. This type should be specified where the corner radius at least 4.5 m (15 ft) but less than 7.5 m (25 ft), and only if a field investigation warrants its use for alterations affecting existing sidewalks.

4. Depressed-Corners Curb Ramp. Depressed corners gradually lower the level of the sidewalk to meet the grade of the road, street, or signalized approach. This curb ramp should be specified only at a corner where the sidewalk parallels only one of the intersecting roadways.

The standard depressed-corners curb ramps are as follows:

- a. Type H. This type should be specified where the sidewalk is adjacent to the curb.
- b. Type G. This type should be specified where there is a utility strip between the sidewalk and the curb.

5. Mid-Block Curb Ramp, Type K. This type should be specified at a mid-block location. It may be used where the sidewalk is adjacent to the curb or where there is a utility strip between the sidewalk and the curb.
6. Median Curb Ramp, Type L. This type should be specified where a raised paved or unpaved median of 2.4 m (8 ft) or greater width obstructs the crosswalk. Where the median width is less than 2.4 m (8 ft), a detail should be shown on the plans.

C. Selection Guidelines

The following provides guidelines for selecting the appropriate curb ramp.

1. Sidewalk and Utility-Strip Widths. The INDOT *Standard Drawings* show minimum sidewalk widths and utility-strip widths. These minimum widths are intended for new construction and reconstruction, typically to construct perpendicular curb ramps. Parallel curb ramp type F may be used where an existing sidewalk cannot be widened to the minimum width.
2. Obstructions. It is desirable to move an obstruction wherever practical. Where it is not practical to move the obstruction, the direction of traffic relative to the placement of the curb ramp should be considered. It is important that drivers can see a physically impaired person using the curb ramp. Where obstructions are present, such as signal controller boxes, planters, signal pole bases, etc., a perpendicular curb ramp type D should be used. No obstruction should be permitted within flared sides which are paved.
3. Best Practices. The following should be considered.
 - a. A level maneuvering area or landing should be provided at the top of each curb ramp.
 - b. The ramp slope should be perpendicular to the curb, with a maximum of 8.33%. Details regarding curb ramp slopes are shown on Recurring Plan Details 604-R-484d, page 2.
 - c. The counterslope of the gutter area or street at the flat of a curb ramp should be a minimum of 20:1.
 - d. Curb-ramp geometrics to be used are summarized in Figure 04-19B.

Type	Ramp Width (m)	Ramp Slope	Landing Width (m)	Landing Depth (m)	Flare Slope	Clear Space (m)
PERPENDICULAR						
A	1.2 ¹	12:1 ²	1.2	1.2 ¹	12:1, Pvmt.	N/A
C	1.2 ¹	12:1 ²	1.2	1.2 ¹	12:1, Pvmt.	N/A
D	1.2 ¹	12:1 ²	1.2	1.2 ¹	12:1, Pvmt.	N/A
DIAGONAL						
B	1.2 ¹ to 2.4	12:1 ²	N/A	1.2 top & bot	12:1, Pvmt.	1.2
E	1.6 to Vari	12:1 ²	0 to 1.6	1.2	12:1, Sod	1.2
PARALLEL						
F	Sdwk.	12:1	Sdwk.	1.2	N/A	1.2
DEPRESSED-CORNERS						
H	1.8	12:1	1.8	1.8	12:1, Sod ³	1.2
G	1.5	12:1	1.5	1.5	12:1, Sod ³	1.2
MID-BLOCK						
K	1.2	12:1	1.2 ¹	Sdwk.	N/A	N/A
MEDIAN						
L	1.6	50:1	1.6	N/A	12:1, MM ⁴	N/A

¹ If 1.2-m width or depth is site-infeasible, it may be reduced to 0.9 m.

² If 12:1 slope is site-infeasible, it may be steepened to 10:1 for a rise of not more than 150 mm.

³ If 1.8-m depth is site-infeasible, this may be steepened or replaced with a vertical curb.

⁴ MM = median material.

5. The landing cross slope should be 50:1, but if it is site-infeasible, it may be steepened.

6. The landing slope should be 50:1, the maximum longitudinal gutter slope should be 20:1, and the width of the area with detectable warning devices should be 0.6 m.

SUMMARY OF CURB-RAMP GEOMETRICS (Metric Units)

Figure 04-19B

Type	Ramp Width (ft)	Ramp Slope	Landing Width (ft)	Landing Depth (ft)	Flare Slope	Clear Space (ft)
PERPENDICULAR						
A	4 ¹	12:1 ²	4	4 ¹	12:1, Pvmt.	N/A
C	4 ¹	12:1 ²	4	4 ¹	12:1, Pvmt.	N/A
D	4 ¹	12:1 ²	4	4 ¹	12:1, Pvmt.	N/A
DIAGONAL						
B	4 ¹ to 8	12:1 ²	N/A	4 top & bot	12:1, Pvmt.	4
E	5.5 to Vari	12:1 ²	0 to 5.5	4	12:1, Sod	4
PARALLEL						
F	Sdwk.	12:1	Sdwk.	4	N/A	4
DEPRESSED-CORNERS						
H	6	12:1	6	6	12:1, Sod ³	4
G	5	12:1	5	5	12:1, Sod ³	4
MID-BLOCK						
K	4	12:1	4 ¹	Sdwk.	N/A	N/A
MEDIAN						
L	5.25	50:1	5.25	N/A	12:1, MM ⁴	N/A

¹ If 4-ft width or depth is site-infeasible, it may be reduced to 3 ft.

² If 12:1 slope is site-infeasible, it may be steepened to 10:1 for a rise of not more than 6 in.

³ If 6-ft depth is site-infeasible, it may be steepened or replaced with a vertical curb.

⁴ MM = median material.

5. The landing cross slope shall be 50:1, but if it is site-infeasible, it may be steepened.

6. The landing slope should be 50:1, the maximum longitudinal gutter slope should be 20:1, and the width of the area with detectable warning devices should be 2 ft.

SUMMARY OF CURB RAMP GEOMETRICS (English Units)

Figure 04-19B

D. Curb Ramp Lengths and Slopes

Curb ramps should be designed with a maximum slope of 12:1, or 8.33%. See Figure 04-19C, Lengths of Perpendicular Curb Ramps, to determine the length of a curb ramp which is perpendicular to the curb. The figure assumes a 2% sidewalk cross slope and a level longitudinal grade.

Change in Elevation, mm	Ramp Length, m
100	1.6
125	2.0
150	2.4
175	2.8
200	3.2

Metric Units

Change in Elevation, in.	Ramp Length, ft
4	5.5
5	6.5
6	8.0
7	9.0
8	11.0

English Units

LENGTHS OF PERPENDICULAR CURB RAMPS

Figure 04-19C

For a curb ramp which is not perpendicular to the curb, the following formula should be used to determine its length. The formula assumes a 2% sidewalk cross slope and a level longitudinal grade.

$$L_{CR} = \frac{h}{\cos \theta (G_R - G_S)} \quad \text{[Equation 04-19D.1]}$$

Where:

L_{CR} = Curb ramp length, m (ft)

H = Change in elevation, m (ft)

G_R = Curb ramp grade, % / 100

G_S = Sidewalk cross grade, % / 100

θ = Angle to which the curb ramp is out of perpendicular to the curb

E. Algebraic Difference Between Curb Ramp and Gutter Slopes

The algebraic difference between a curb ramp slope and the gutter or pavement slope should be less than 11%. If this is not possible, a 0.6-m (2-ft) wide level strip should be provided between the grades. See Recurring Plan Details 604-R-484d, page 2.

$$\Delta G = |G_R - G_G|$$

[Equation 04-19D.2]

Where:

ΔG = Algebraic grade difference, %

G_R = Ramp grade, %

G_G = Gutter grade, %

$|G_R - G_G|$ = Absolute value of grade difference, %

A level strip is required if $\Delta G \geq 11\%$.

F. Detectable Warning Devices

Sidewalk curb ramps are to include detectable warning devices. These consist of a standardized surface feature to warn people with vision impairments that they are approaching a street or driveway. The color and texture of these devices must contrast visually with adjoining surfaces. Details and explanations are shown on Recurring Plan Details 604-R-484d, page 2 and the INDOT *Standard Specifications*, respectively.

G. Pedestrian Signal Controls

If a pedestrian crosswalk and curb ramp are present at an intersection with a traffic signal that has pedestrian-signal-activating pushbuttons, the following will apply.

1. Location. Pushbutton controls should be located as close as practical to the curb ramp and, to the maximum extent feasible, should permit operation from a level area immediately adjacent to the controls. Controls should be placed so as not to create an obstruction to the curb ramp.
2. Surface. A sidewalk area of 1.2 m by 1.2 m (4 ft by 4 ft) should be provided to allow a forward or parallel approach to the controls. In a restricted area, such sidewalk area may be reduced to 0.9 m by 0.9 m (3 ft by 3 ft).

H. Pay Limits and Pay Quantities

The pay limits for curb ramps are shown on Recurring Plan Details 604-R-486d, page 13. The approximate pay quantity for each type of curb ramp is described in Figure 04-19D, Quantities for Curb Ramps. Quantities for curb or curb and gutter within the curb ramp limits should be incorporated into the project's appropriate curb or curb-and-gutter quantities. Quantities for sidewalk required outside the curb ramp pay limits, including those for additional landing area or improved access area, should be incorporated into the project concrete sidewalk quantities. If flared sides are sod instead of concrete, such sodding should be incorporated into the project sodding quantities.

Curb Ramp Type	150-mm Curb		200-mm Curb	
	Assumptions for Calculation Purposes (Top Landing Not Incl. in Area), All Dimens. m	Area (m ³)	Assumptions for Calculation Purposes (Top Landing Not Incl. in Area), All Dimens. m	Area (m ³)
A	Sdwk. width 3.6	5.4	Sdwk. width 4.5	8.6
B	Sdwk. width 4; R = 3	13.6	Sdwk. width 4.5; R = 3	18.2
	Sdwk. width 5.5; R = 7.5	18.0	Sdwk. width 6; R = 7.5	25.5
C	Utility-strip width 1.8	2.2	Utility-strip width 2.4	2.9
D	Utility-strip width 1.8	2.2	Utility-strip width 2.4	2.9
E	Utility-strip width 3 (one side only); Sdwk. W = 1.2, R = 3	8.9	Not possible to construct on utility-strip width of 3	n/a
	Sdwk. W = 2.1, R = 7.5	4.8		
F	Sdwk. width 1.2; R = 4.5	12.0	Sdwk. width 1.2; R = 4.5	13.0
	Sdwk. width 1.2; R = 7.5	18.0	Sdwk. width 1.2; R = 7.5	20.0
G	Sdwk. 1.5, Util. 1.8; R = 7.5	4.0	Sdwk. 1.5, Util. 1.8; R = 7.5	5.0
H	Sdwk. Width 1.8; R = 7.5	5.3	Sdwk. Width 1.8; R = 7.5	6.4
K	Sdwk. width 1.5	7.4	Sdwk. width 1.5	9.3
L	Grass median width 5	8.0	Grass median width 5	8.0

QUANTITIES FOR CURB RAMPS (Metric Units)

Figure 04-19D

Curb Ramp Type	6-in. Curb		8-in. Curb	
	Assumptions for Calculation Purposes (Top Landing Not Incl. in Area), All Dimens. ft	Area (SYS)	Assumptions for Calculation Purposes (Top Landing Not Incl. in Area), All Dimens. ft	Area (SYS)
A	Sdwk. width 10	7.0	Sdwk. width 12	11.1
B	Sdwk. width 13; R = 10	16.4	Sdwk. width 15; R = 10	19.4
	Sdwk. width 18; R = 25	21.4	Sdwk. width 20; R = 25	30.6
C	Utility-strip width 6	2.7	Utility-strip width 8	3.5
D	Utility-strip width 6	2.7	Utility-strip width 8	3.5
E	Utility-strip W = 10 (one side only); Sdwk. W = 4, R = 10	10.7	Not possible to construct on utility-strip width of 10	n/a
	Sdwk. W = 7, R = 25	6.0		
F	Sdwk. width 4; R = 15	14.3	Sdwk. width 4; R = 15	16.1
	Sdwk. width 4; R = 25	21.6	Sdwk. width 4; R = 25	23.3
G	Sdwk. 5, Util. 6; R = 25	4.9	Sdwk. 5, Util. 6; R = 25	6.0
H	Sdwk. Width 6; R = 25	6.3	Sdwk. Width 6; R = 25	7.7
K	Sdwk. width 5	8.9	Sdwk. width 5	11.1
L	Grass median width 16	9.3	Grass median width 16	9.3

**QUANTITIES FOR CURB RAMPS
(English Units)**

Figure 04-19D

I. Implementation

Plans and contract documents must be revised such that curb ramps are not shown to be placed at drives. Instead a sidewalk elevation transition should be shown to be placed. Where feasible, the preferred types of curb ramps should be shown to be placed.

Recurring Plan Details set 604-R-484d, attached hereto, should be called for through the August 17, 2005, letting. Beginning with the September 14, 2005, letting, the recurring plan details will be incorporated into revised INDOT *Standard Drawings* series 604-SWCR and 604-SDWK. The details will then no longer be required to be called for in specific contracts.

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Attachments

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