CURB RAMPS GENERAL NOTES:

1. In new construction or full-depth reconstruction, provide a separate curb ramp for each marked or unmarked pedestrian street crossing. Curb ramps shall be contained wholly within the width of the pedestrian street crossing as shown in the contract plans.

2. Alternatives are defined as changes to an existing highway that affect pedestrian access, circulation, or use. Alternatives include, but are not limited to, realigning, regrading, reconstruction, curb ramp modifications, historic restoration, or changes or rearrangements to structural parts or elements of a pedestrian facility.

3. A walkable surface is defined as a paved surface adjacent to a curb ramp or turning space, without raised obstacles, that could be inadvertently traversed by a user and is visually impaired.

4. In alterations, where an existing physical constraint prevents providing a separate curb ramp for each pedestrian street crossing, a single turning space for the area shall be permitted to serve each pedestrian street crossing. The use of a single ramp shall be approved by the engineer prior to construction. Diagonal ramps are not acceptable in new construction or full-depth reconstruction.

5. Detectable warning surfaces (DWS) are intended to indicate the boundary between a pedestrian route and vehicular route where there is a flush rather than curbed connection. DWS shall be provided at the following locations:
   - Curb ramps, blended transitions, and depressed corners at pedestrian street crossings
   - Pedestrian refuge islands
   - Boarding platforms at transit stops
   - 3. Boarding areas at Avon-St. or street level transit stops where the area is not protected to pedestrian cross traffic.

6. Detectable warning surfaces shall contrast visually with the adjacent gutter, roadway, or pedestrian access route surface, either light-on-dark or dark-on-light. Federal yellow color is preferred. However, other colors may be used if approved by the engineer.

7. In alterations, to avoid changing grade indefinitely in step roadways, a curb ramp length is not required to exceed 20 feet regardless of the resulting ramp running slope.

8. All slopes are measured with respect to a level plane.

9. Drainage structures, traffic signal equipment, or other obstructions shall not be installed on the curb ramp or turning space area.

10. In new construction, full-depth, water proof, maintenance hole covers, manhole covers, or utilities, shall not be constructed within any part of curb ramp of turning space. In alterations, where there are not changes noted outside of the curb ramp of turning space, they must not create a vertical discontinuity greater than 1/4 inch and a horizontal discontinuity between 1/4 inch and 1/2 inch shall be acceptable with a slope not steeper than 1/16 inch. The level shall be applied across the entire surface discontinuity.

11. In new construction, pull boxes, meter boxes, maintenance hole covers, vault lids, or similar, shall not be constructed within any part of curb ramp or turning space. In alterations, where these items cannot be relocated outside of the curb ramp or turning space, the vertical discontinuity shall not exceed 1/2 inch and a horizontal discontinuity between 1/4 inch and 1/2 inch shall be acceptable with a slope not steeper than 1/16 inch. The level shall be applied across the entire surface discontinuity.

12. All curb ramp joints and grade breaks shall be flush. Joints between the roadway surface and the gutter pan shall be flush.

13. The construction shall verify removal limits are sufficient to provide positive drainage, maintain existing drainage patterns, and avoid pooling in the final construction.

14. Flat pedestrian ramps may exceed 10.0% only where they abut a non-walkable surface, or where the adjacent ramp surface is elevated to pedestrian traffic.

15. The change in grade at the bottom of the curb ramp shall not exceed an algebraic difference of 15.0%. The center line of the gutter at the edge of a ramp, turning space, or blended transition shall not exceed 3.0%.

16. Grade breaks at the top and bottom of ramp pan shall be perpendicular to the direction of the ramp or grade breaks shall not be permitted on the surface of the ramp or turning space. Surface slopes that meet at grade breaks shall be flush.

17. A slope finishing, with sheets parallel to the direction of pedestrian traffic, shall be applied to all ramp and turning space surfaces.

18. In alterations, where a ramp or turning space exists into an existing grade that cannot be altered, the ramp or turning space may be walked to the required cross slope. The length of the cross slope shall be equal to or greater than the length of the ramp or turning space to provide a uniform rate of change. The rate of change on a ramp or turning space shall not exceed 5.0% per linear foot.

19. Design and construct curb ramps, turning spaces, and flare slopes with the flattest slopes possible. The slopes indicated in these details show the maximum slopes allowable. Preferred values to be used during design, layout, and construction are:
   - Ramp running slope 7.5%
   - Turning space running slope 7.5%
   - Turning space cross slope 1.0%
   - Flare slope 0.0-0.75%

NOTE: WHERE REMOVAL EQUIPMENT WILL BE USED TO CLEAR THE PEDESTRIAN ACCESS ROUTE, CONSULT THE ENGINEER PRIOR TO CONSTRUCTION TO DETERMINE THE WIDTH AND THICKNESS OF CURB RAMPS TO SUIT THE CLEARANCE OF SUCH EQUIPMENT.

-Curb Ramps M-608-1

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Sheet No. 1 of 10

Curved Development Branch

Issued by the Project Development Branch on 3/3/19
PERPENDICULAR RAMP
(TYPICAL)

PERPENDICULAR RAMP
(WITH VERTICAL RETURN CURB)

PERPENDICULAR RAMP
(DIRECTIONAL)

PERPENDICULAR RAMP NOTES

1. RAMP WIDTH - PROVIDE 5 FT. OR GREATER WHERE POSSIBLE. IF SITE CONSTRAINTS DO NOT PERMIT, PROVIDE 4 FT. MINIMUM. RAMPS SERVICING SHARED USE PATHS SHALL MATCH THE WIDTH OF THE PATH.

2. RAMP RUNNING SLOPE - 0.50 MAX.

3. TURNING SPACE RUNNING SLOPE - 2.0% MAX. TURNING SPACE RUNNING SLOPE IS MEASURED IN THE SAME DIRECTION AS THE RAMP RUNNING SLOPE.

4. RAMP AND TURNING SPACE CROSS SLOPE - 2.0% TYPICAL. AT CROSSINGS WITHOUT YIELD OR STOP CONTROL, OR WITH A SIGNAL WHERE PEDESTRIANS CAN PROCEED THROUGH THE INTERSECTION WITHOUT STOPPING OR SLOWING, THE CROSS SLOPE OF RAMPS AND TURNING SPACES MUST EQUAL THE HIGHWAY GRADE. AT MIDBLOCK PEDESTRIAN STREET CROSSINGS WITHIN PEDESTRIAN FLOW AREAS CROSSING THE RAMP AND TURNING SPACE CROSS SLOPE MUST EQUAL THE HIGHWAY GRADE.

5. TURNING SPACE DIMENSIONS - PROVIDE A TURNING SPACE AT THE TOP OF PERPENDICULAR RAMPS WITH A WIDTH EQUAL TO THE WIDTH OF THE CURB RAMP. TURNING SPACE LENGTH MUST BE 4 FT. MINIMUM, MEASURED IN THE DIRECTION OF THE RAMP RUN. WHEN A TURNING SPACE IS CONSTRAINED AT THE BACK OF SIDEWALK, INCREASE LENGTH TO 5 FT. MINIMUM IN THE DIRECTION OF THE RAMP RUN.

6. RAMP ALIGNMENT - RAMP SHALL BE ALIGNED TO BE FULLY CONTAINED WITHIN THE CROSSWALK OR STREET CROSSING THEY SERVE. PROVIDE ONE RAMP FOR EACH STREET CROSSING/DIRECTION. IN ALTERNATIVES WHERE EXISTING PHYSICAL CONSTRAINTS PREVENT PROVIDING ONE CURB RAMP FOR EACH CROSSING DIRECTION, A SINGLE DIAGONAL CURB RAMP (ON THE APPEX OF A CORNER) SHALL BE PERMITTED TO SERVE BOTH PEDESTRIAN STREET CROSSINGS. IF A DIAGONAL RAMP IS USED, A CLEAR SPACE 4 FT. X 4 FT. MUST BE PROVIDED AT THE BASE OF THE RAMP. THE CLEAR SPACE MUST BE WITHIN BOTH CROSSWALKS AND WHOLLY OUTSIDE OF ANY ADJACENT VEHICULAR TRAVEL LANES. DIAGONAL RAMPS ARE NOT ACCEPTABLE IN NEW CONSTRUCTION, OR FULL-DEPTH RECONSTRUCTION.

7. RAMP LENGTH - PERPENDICULAR RAMP LENGTH IS DEPENDENT UPON THE RAMP SLOPE, HEIGHT OF CURB, AND ADJACENT SIDEWALK CROSS-SLOPE WHICH MUST BE INTERCEPTED. SEE DETAIL A FOR CALCULATING RAMP LENGTH WHEN CHASING SIDEWALK CROSS-SLOPE. WHERE TERRAIN IS SLOPING A RAMP IS NOT REQUIRED TO CHASE SHAPE MORE THAN 15 FT. REGARDLESS OF THE RESULTING RAMP SLOPE.

8. RAMP FLARES - WHERE A RAMP EDGE ABUTS A WALKABLE SURFACE, A FLARED SIDE SHALL BE PROVIDED. RAMP FLARES SLOPES SHALL NOT EXCEED 10.0%.

9. VERTICAL CURB RETURNS - VERTICAL CURB RETURNS MAY BE USED ONLY WHERE A RAMP ALLOWS A WALKABLE SURFACE, OR WHERE A RAMP IS PROTECTED FROM PEDESTRIAN CROSS TRAFFIC (FOR EXAMPLE BY A SIGNAL CONTROLLED INTERSECTION). VERTICAL CURB RETURNS ARE NOT ACCEPTABLE IN NEW CONSTRUCTION, OR FULL-DEPTH RECONSTRUCTION.

10. GUTTER COUNTER SLOPE - 5.0% MAX.

TYPE 1 PERPENDICULAR CURB RAMPS
CURB HEIGHT MAY BE REDUCED TO 3" MIN.

TYPE 1 RAMPS FOR WIDE SIDEWALK
(3" REDUCED CURB)

NOT ALLOWABLE IN NEW CONSTRUCTION/FULL DEPTH RECONSTRUCTION
SEE GENERAL NOTE 4

CROSSWALK BAR (TYPICAL)

LANDING AREA RUNNING SLOPE 2% PREF., 5% MAX., MATCH RAMP CROSS SLOPE

NOTE
PLACEMENTS SHOWN ARE TYPICAL CONFIGURATIONS ONLY AND NOT INTENDED TO BE USED AS THE ONLY OPTION.

TYPE 1 DIRECTIONAL RAMPS
(3" REDUCED CURB)

COMPUTER FILE INFORMATION
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Project Development Branch

CURB RAMPS
STANDARD PLAN NO.
M-608-1

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Issued by the Project Development Branch July 31, 2019
ALL GRADE BREAKS PERPENDICULAR TO PATH OF PEDESTRIAN TRAVEL

TYPE 1 COMBINATION RAMP

COMBINATION CURB RAMPS TYPICAL CONFIGURATIONS

COMBINATION CURB RAMP NOTES:

1. The curb ramp placements shown are typical configurations only and not indicative of all options. Other curb ramp configurations may be acceptable as long as they conform to the criteria in these standards, and are approved by the Engineer.

2. Ramp and Turning space cross slope - 2.0% typical at crossings without yield or stop control, or when a signal where vehicles can proceed through the intersection without stopping or stopping. The cross slope of the ramp and turning space may equal the road grade at midblock pedestrian street crossings. The ramp and turning space cross slope may equal the road grade.

3. Where it is acceptable for a ramp or turning space cross slope to exceed 2.0% and match the road grade, the ramp above the turning space may be warped to tie into the adjoining detectable warning surface. The transition to the sidewalk cross slope should be smooth, evenly over the length of the ramp. Where used, the rate of change in cross slope may not exceed 3.0% per linear foot.

TURNING SPACE @

DETECTABLE WARNING SURFACE (DWS)

SEE DWS SHEETS FOR PLACEMENT DETAILS

CURB RAMPS

STANDARD PLAN NO.

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Standard Sheet No. 6 of 10

Project Sheet Number:

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**BLENDED TRANSITION & DEPRESSED CORNER NOTES**

1. **Perpendicular and Parallel Ramp Configurations** are preferred. Blended transitions and depressed corners should only be used where site conditions make them a more appropriate option, or where perpendicular or parallel ramps cannot be installed due to a physical site constraint.

2. **Ramp Width** - Provide 5 ft. or greater where possible. If site constraints do not permit, provide a 4 ft. minimum. Ramps serving shared use paths shall match the width of the path.

3. **Ramp Running Slope** - 8.3% max.

4. **Blended Transition Running Slope** - 5.0% max.

5. **Ramp and Turning Space Cross Slope** - 2.0% typical at crossings without yield or stop control, or with a signal where vehicles can proceed through the intersection without slowing or stopping. The cross slope of ramps and turning spaces may equal the highway grade.

6. **Turning Space Dimensions** - Provide a 4 ft. x 4 ft. minimum turning space at the bottom of ramp runs. The turning space may contain the detectable warning surfaces.

7. **Ramp Alignment** - Turning space shall be aligned to be fully contained within the crosswalk or street crossings they serve.

8. **Ramp Length** - Ramp length is dependent upon the ramp slope and the change of elevation from the turning space to the sidewalk. Where terrain is gentle, a ramp is not required to change grade more than 15 ft., regardless of the resulting ramp slope.

9. **Ramp Flares** - Where a ramp edge abuts a walkable surface, a flared side must be provided. Ramp flare slopes shall not exceed 10.0%.

10. **Vertical Curb Returns** - Vertical curb returns may be used only where a ramp abuts a non-walkable surface, or where a ramp is protected from pedestrian cross-traffics (for example by a radial channel or utility pole which blocks passage).

11. **Gutter Counter-Slope** - 5.0% max.

12. **DWS Placement** - DWS shall be placed around the radius and located at the back of curb on blended transitions and depressed corner ramps.
NOTES:

1. Detectable warning surfaces shall be placed in alignment with the back of curb.
2. Flared sides are preferable on raised intersection islands and shall be provided on islands which serve shared use paths or at locations where bicycle use is expected.
3. For cut-through median islands, detectable warning surfaces shall be placed in alignment with the back of curb and be separated by a minimum of 2 feet. If a 2-foot separation between detectable warning surfaces cannot be provided, no detectable warning surface shall be installed.
4. Curb ramp and cut-through widths should be the same width as any shared use path which they serve.
DETECTABLE WARNING SURFACE PLACEMENT

DETECTABLE WARNING SURFACE NOTES:

1. DETECTABLE WARNING SURFACES (DWS) SHALL BE INSTALLED AT SIDEWALK, SHARED USE PATH, OR STREET TRANSITIONS, AND SHALL CONSIST OF TRUNCATED DOMES SURFACES. ANY TRUNCATED DOMES PANELS OR PLATES WHICH ARE USED MUST BE ON THE CDOT APPROVED PRODUCTS LIST.

2. THE DETECTABLE WARNING SURFACE SHALL SPAN THE FULL WIDTH OF THE CURB RAMP, SHARED USE PATH, OR OTHER ROADWAY ENTRANCES AS APPLICABLE. A GAP OF 2 INCHES FROM THE EDGE OF THE DETECTABLE WARNING SURFACE TO THE EDGE OF THE CURB RAMP OR SHARED USE PATH IS PERMITTED.

3. WHEN DETECTABLE WARNING SURFACES ARE PLACED ON A SLOPE GREATER THAN 5.0%, TRUNCATED DOMES SHOULD BE ALIGNED IN THE DIRECTION OF THE RAMP RUN, OTHERWISE DOMES ARE NOT REQUIRED TO BE ALIGNED. TRUNCATED DOMES SHALL BE IN A SQUARE GRID OR RADIAL PATTERN. WHEN PLACED RADIALLY, PLACE ADJACENT DWS PLATES EDGE TO EDGE. EDGES OF CUT PLATES SHALL BE STRAIGHT.

4. LOCATE ONE CORNER OF THE DWS LEADING EDGE AT THE BACK OF CURB. NO POINT ON THE LEADING EDGE OF THE DWS MAY BE MORE THAN 5 FT. FROM THE BACK OF CURB. IF THE RADIUS OF A CORNER MAKES THIS IMPOSSIBLE, ORIENT THE CURB RAMP PERPENDICULAR TO THE CURB AND GUTTER.

5. WHERE PERPENDICULAR DIRECTIONAL RAMPS ABUT A WALKABLE SURFACE, THE LEADING EDGE OF THE DWS SHALL NOT BE PLACED FURTHER THAN 2 FEET FROM THE BACK OF CURB. IF THE RADIUS OF A CORNER MAKES THIS IMPOSSIBLE, ORIENT THE CURB RAMP PERPENDICULAR TO THE CURB AND GUTTER.

6. IF THE DETECTABLE WARNING SURFACE IS CUT, GRIND OFF THE REMAINING PORTION OF ANY CUT TRUNCATED DOMES. SEAL ALL CUT PANEL EDGES WITH AN APL SEALANT TO PREVENT WATER DAMAGE.

7. TRUNCATED DOME PLATES SHALL BE EMBEDED IN THE CONCRETE CURB RAMP WHILE THE CONCRETE IS PLASTIC.

8. DWS SHALL NOT BE PLACED OVER GRADE BREAKS.
DWS SPANS WIDTH OF CURB RAMP (WITHIN 2" OF EACH EDGE) FLARED SIDE TRUNCATED DOME PLATE FLARED SIDE OR RETURN CURB SET INTO WET CONCRETE

SECTION VIEW OF DETECTABLE WARNING SURFACE PLATE
(LOOKING AT PERPENDICULAR RAMP RUN FROM STREET)

SECTION VIEW FOR PARALLEL CURB RAMP TYPES
(LOOKING PERPENDICULAR TO TURNING SPACE)

SECTION VIEW FOR PERPENDICULAR CURB RAMP TYPES
(LOOKING PERPENDICULAR TO RAMP RUN)

DETECTABLE WARNING CURB RAMP TYPES
(LOOKING PERPENDICULAR TO RAMP RUN)

DETECTABLE WARNING SURFACE DETAILS

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Project Development Branch: July 31, 2019

STANDARD PLAN NO.
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