NOTES ON WALKS AND WHEELCHAIR RAMPS FOR DESIGNERS
and
CONSTRUCTION ENGINEERS

March 2012

All MassDOT Highway projects shall be designed so that they can be constructed in accordance with rules and regulations of the Massachusetts Architectural Access Board ("AAB") as provided in 521CMR, and the requirements of the Americans with Disabilities Act ("ADA") as provided for in the regulations of the United States Access Board and as required by the United States Department of Transportation, Federal Highway Administration. These requirements are principally listed in *Americans with Disabilities Act Accessibility Guidelines* ("ADAAG") and *Public Rights of Way Accessibility Guidelines* ("PROWAG").

These notes are a supplement to and not a replacement for CMR 521, PROWAG, and ADAAG Regulations.

Designers should be aware, when referring to the rules and regulations of either the AAB, or the US Access Board, that published values for dimension and slope are for finished construction, no tolerance is permitted below minimum or above maximum values. The regulations expect the Designers to be knowledgeable of construction practices, and to set tolerances to ensure constructible designs which comply with regulations. The design slopes and tolerances in the construction standards and in this guidance are set to ensure finished construction will meet those regulations.

Drawings detailing typical wheelchair ramps and driveway crossings, which have been shown to meet requirements under a wide range of conditions, are provided in the current *Construction Standard Details* and any Supplemental Drawings. Designers may make modifications to account for topography, right-of-way restraints, or other considerations, provided the design meets all requirements of the regulations (including minimum dimension, maximum grade, and other operational requirements of the ADA and AAB codes). The designer should have justification based on engineering considerations for alternative designs.

The term "Pedestrian" is all inclusive. It includes the able-bodied, those using assistance devices such as wheelchairs, canes, crutches, and walkers, as well as those who employ service animals or canes to detect the path. MassDOT projects are to be designed and constructed to facilitate the travel needs of all pedestrians, and while the able-bodied pedestrian may determine the "desired" path; the designed path must be one that accommodates all users as closely to the desired path as possible, with a reasonable expectation of safety.

DESIGN PROCESS

The designer shall, for the 25% review, provide a plan highlighting the full pedestrian network as currently exists within the project limits. This network shall include both constructed walks, as well as paths where pedestrians have established routes thru continuous usage as indicated by wear in grass or gravel. All street crossings within the project are to be located.

After having established the full existing pedestrian network, the designer shall provide a plan of the pedestrian network as proposed for the project, highlighting all locations where the pedestrian network has been relocated, narrowed, or discontinued and indicating how pedestrian movement between destinations is being maintained. The designer identify on the plan (or in the event construction is without plans by street, station and offset) the **locations** where the sidewalk is being widened for a passing area, and where the pedestrian network crosses a curb, street or driveway. Locations where the pedestrian network is accessed by other public or private walks, or doorways, or adjoins parks or plazas shall also be indicated and/or listed.

The designer shall review the network and the identified locations for obstructions to use by the spectrum of pedestrians and for deficiencies with respect to the ADA and AAB rules and regulations and highlight these locations. This review and identification of obstruction or deficiencies with respect to the regulation shall be included in the 25% submission for ADA/AAB review.

The goal of all MassDOT projects, with respect to permitted pedestrian access, is full pedestrian usability and maximum connectivity both to and through the project. The designer will pay special attention to the design of the identified locations. Locations where the sidewalk provides access to adjacent land or to the street by a curb cut are locations which are most likely to result in grading and geometric issues and may require more detailed grading at these locations, curb reveal adjustment, Rights of Entry to perform grading work outside the layout, or additional spot takings, or alternative design concepts. Documentation of these efforts is important so that if full compliance with ADA and AAB requirements is determined to be technologically infeasible, the efforts to meet regulations are documented as part of the variance request.

WALKS AND SIDEWALKS (Including Crosswalks)

1. A walk is a path designed and constructed for pedestrians.

   Walks include pedestrian/multi use paths, meandering walks along the roadway, and walks sufficiently offset from the roadway, such that the roadway profile need not govern the sidewalk profile. These walks must fully comply with the 521CMR and the US Access Board regulations in AADAG and PROWAG. All walks where any portion of the finished profile is greater than 5% are considered ramps, and must be designed and constructed as such. If a ramp system is impractical or unfeasible, variances from AAB and US Access Board regulations are required.

A **sidewalk** is a walk immediately adjacent to a roadway or offset from the roadway by a uniform planting strip. The sidewalk profile is controlled by the roadway profile with minimal ability to make adjustments. By regulation of the AAB "if the slope of the **natural topography** exceeds one-in-20 (1:20) (5%) a ramp is not required" for a sidewalk.

If the sidewalk designed on a bridge or bridge approach has a profile greater than the natural topography and greater than 5.0%, it must be designed as a ramp, or if impracticable or unfeasible, a variance from AAB regulations must be obtained.

2. The finished cross slope on any walk or sidewalk shall not exceed 2.0%, in accordance with 521CMR. Construction tolerances must be accounted for in design; or if there are no plans, when setting lines forms and grades in construction.

   All sidewalks and walks, regardless of material, shall be designed and constructed to a cross slope of 1.5% with a construction tolerance of ±0.5% allowed. Other cross slopes may be considered; however, the sum of design cross slope plus construction tolerance shall not exceed 2.0%, and both the design slope and the construction tolerance must be included on the construction plans and in the Special Provisions.

   On bridges, the sidewalk cross slopes shall be 1.0% in accordance with *Bridge Manual*. Construction tolerance is per bridge specification; however, the finished cross slope shall not exceed 2.0% per CMR 521.

3. A minimum 4'-0" sidewalk complies with 521 CMR provided it is designed with certain additional considerations. These additional considerations must be shown and detailed on the plans and include, but may not be limited to the following:
   - 4'-0" minimum walk width excluding the curb width.
   - Passing areas are required in any case where a 5'-0" minimum walk width is not provided.
     - Passing areas are to be 5'-0" by 5'-0" "level" passing areas, excluding the curb, at intervals not exceeding 200 feet (*Must Be Shown On Plans*)
     - Passing areas are to be level with appropriate transitions (5.0% for a distance based on the sidewalk profile to provide the level area)

4. The MassDOT recommends a walking surface width not less than 5'-0". When the sidewalk is to be constructed adjacent to a curb, it is shown on the plans as 5'-6" which includes the curb width. When the sidewalk is separated from the curb by a planting strip, it is generally dimensioned separately and is at least 5'-0".

5. An unobstructed 3'-0" path of travel, excluding curb must be maintained, past any sidewalk obstruction, including but not limited to utility poles, mail boxes, trees and open areas around them, street lights, traffic signal bases and pre-cast foundations and other signal hardware, hydrants, signs and poles.

6. In no case shall any sidewalk be constructed with less than 4'-0" of walking surface, nor shall any path of travel be constructed with less than 3'-0" of unobstructed width. In cases

where it is physically impossible to provide sufficient cross section to safely accommodate vehicles, as well as pedestrians and obstructions, additional Right of Way must be obtained as either a formal taking or as a permanent sidewalk easement, or a variance from the Mass AAB demonstrating "impracticability" is required to reduce sidewalk width must be applied for and obtained prior to construction. If a variance is not granted and obtaining additional cross section is unfeasible, a sidewalk cannot be constructed and a non-walkable surface must be installed on any surface constructed behind a curb.

7. Walk surfaces shall be designed and constructed as firm, stable and slip resistant surfaces. They shall lie generally in a continuous plane with a minimum of surface warping. Openings in the path of travel are to be sized not to permit the passage of a ½ inch diameter sphere. Where the openings are elongated (slots) the long direction of the opening is to be perpendicular to the dominant path of travel.

   Changes in level shall not exceed ¼ inch. Changes in level greater than ¼ inch but less than ½ inch must be beveled with a slope not exceeding 1(v):2(h). Changes in level greater than ½ inch must be smoothed to a grade of less than 5%.

CURB CUT WHEELCHAIR RAMPS

8. Curb cut wheelchair ramps are constructed to remove barriers (curbs) which would prevent the free use, by pedestrians, of sidewalk facilities that cross streets.

9. Curb cut wheelchair ramps on bridges should be avoided. If a wheelchair ramp is required to be placed on a bridge, written approval is required from the MassDOT employee authorized to approve the structural elements of the Bridge Sketch Plans for the project (see E-11-004 or subsequent directives). Wheelchair ramps on bridges must have approved plans, prior to any wheelchair ramp construction.

   Special detailing of the reinforcement and curb reveal may be required to maintain the performance of the railing/barrier system.

10. Curb cut wheelchair ramps should be placed within the general pedestrian flow to the greatest degree possible, to provide pedestrians the safety to see and be seen before crossing the street. Paired reciprocal curb cut wheel chair ramps are preferred; however, apex ramps serving two directions may be used when intersection geometry precludes use of paired ramps. The entrance to the curb cut wheelchair ramp must be fully contained within the cross walk (or both cross walks in the case of the apex ramp) if they exists at the location.

11. Each curb cut wheelchair ramp location is unique. The general styles of ramps used are based on pedestrian movements, intersection geometry and roadway layout.

    Published guidance for design of curb cut wheelchair ramps allows certain types of ramps to be a minimum of 3'-0" wide and recommends a minimum width of 5'-0" for other types. The Highway Division standard is 5'-0" for all ramps at the curb line regardless of type.

The width of a transition ramp after the turn from the level landing is dependant on overall sidewalk width, but generally not less than 4'-0". Commonly used curb cut wheelchair ramp types are shown in the *Construction Standard Details*. Any one of these styles will require modification to fit the site conditions and constraints.

Curb cut wheelchair ramps will have most of the elements described below.

12. The **ramp** which runs from the roadway to the level landing. It must open directly to the roadway and be aligned perpendicularly to the curb at its mid point. The curb cut wheelchair ramp entrance is the entire portion of the ramp which is constructed flush with the roadway, and usable by wheelchairs. No lip is permitted where the roadway meets the ramp. The curb cut wheelchair ramp entrance does not include transition ramps or flares.

    Where a stop line is warranted, no part of a wheelchair ramp entrance shall be placed on the vehicle approach side of that line. The wheelchair ramp entrance is to be centered on the crosswalk whenever possible, however, no part of the wheelchair ramp entrance shall be outside the crosswalk. Side slope transitions, however, may extend beyond the stop line or outside the crosswalk.

    Ramp slopes are designed to be 7.5% ±0.5% construction tolerance, however, these slopes may be flatter when warranted by site conditions. In accordance with 521CMR finished slopes shall not exceed 8.3%.

13. **Level landings** are required at top of a curb cut ramp from the street. This provides a turning area for the wheelchair user to change direction from the curb cut to the sidewalk, and to wait for an opportunity to safely cross the street or for a crossing phase in a signal to begin. Where the curb cut ramp is an apex type opening, serving two directions of travel, a level landing in the street and within both crosswalks is also required to facilitate changes in direction.

    Level Landings are designed to strict controls for slope and dimensions. The minimum turning area (level landing) is 4 ft deep by 5 ft wide (the width of the ramp at the curb line); however, the preferred dimension is 5 ft by 5 ft.

    The level landing shall be designed with a 1.5% (±0.5% construction tolerance) slope toward the street, and slope of 0.0% ±0.5% running parallel with the street. This is to ensure both drainage, and that the level landing the level landing complies with the regulation not to exceed 2% in any direction.

14. The **tactile or detectable warning** panel consists of truncated domes. The dimensions of the truncated domes, alignment and spacing are shown in the *Construction Standard Details*. The warning panel shall be placed on the entire width of the ramp opening. The panel is set back from the curb line by 6 inches and is generally placed on the ramped portion of the curb cut by may extend onto the level landing to meet the requirement of 2 feet of panel in the direction of travel.

15. The **transition ramp** generally is the portion of a sidewalk which ramps between a landing and the full height sidewalk. Transition ramp slopes are designed to be 7.5% ±0.5% construction tolerance, however, these slopes may be flatter when warranted by site conditions. The exception is that for high side transition ramps, the transition ramp length is limited to 15 feet which may result in a slope exceeding that allowed by regulation. In this case, the 15-foot length is the standard for determining acceptance and the slope is not the determining value.

16. **Flares** are triangular areas adjacent to ramps and the transition curb. They are not designed as primary pedestrian path areas; however they should be kept free of obstructions. The length of the flare as measured along the curb need not exceed 15 feet regardless of slope.

17. Fixed objects (i.e. utility poles, hydrants, signs, signal foundations, etc.) shall not be placed in any part of the wheelchair ramp.

18. Catch basins should be located immediately up-grade of the wheelchair ramp entrances.

SURFACE TESTING

Sidewalks and wheelchair ramps when measured with a 2-foot "smart level" shall meet the grades specified herein, as shown in the standards, or as shown in the contract plans and specifications. *In any case where the level rocks when placed on a surface*, measurement shall be taken in both extreme positions and neither measurement shall exceed the allowed slope.

The slope of a segment of sidewalk shall be measured in the direction of travel and parallel to the roadway. Cross slopes on tangent sections of sidewalk are measured perpendicular to the run of the sidewalk. Cross slopes on sections of sidewalks which follow a curve are to be measured on radial lines.

The cross slope of a constructed sidewalk shall not exceed 2.0%.

The slope of a level landing after construction shall not exceed 2.0% in any direction.

The slope of a constructed ramp, when measured in the direction of travel, shall not exceed 8.3% except when the transition length is limited to 15 feet. In this case, the 15-foot length is the standard for determining acceptance and the slope is not the determining value.

The cross slope of a wheelchair ramp shall not exceed 2.0% when measured perpendicular to the direction of travel.

VARIANCES

All MassDOT projects shall be designed and constructed to meet all state and federal regulations associated with pedestrian access. There are conditions which will be encountered; however, where full compliance is structurally impracticable, or technologically infeasible, or where the cost of compliance is excessive without any substantial benefit to persons with disabilities, or prohibitive in some other manner. In these cases variances from the rules and regulations of the Massachusetts AAB, and/or the United States Access Board are required.

Designers and/or project managers must be familiar with federal and state regulations for purposes of designing projects which are accessible to all users, and when technically infeasible conditions are present, to begin the process of applying for variances. Regulations are generally found in state regulation 521 CMR which can be accessed from the web site of the Massachusetts Architectural Access Board, and in Public Right of Way Accessibility Guidelines (PROWAG) which can be accessed from the web site of the United States Access Board. Variance requests should be made as soon as a non-compliant condition is recognized. The designer may recognize that the condition exists early in the design phase; it may become apparent in the ADA/AAB review, or in attempting to modify a design to address comments of a review. Sometimes the condition may not become apparent until construction is underway.

Regardless of the stage at which the non-compliant condition becomes apparent, it is solely the designer's responsibility to prepare the documents required to request approval of a variance. When variances are requested in the design phase of a project, they must be approved prior to advertising. When conditions requiring a variance are discovered during construction, the variances must be applied for in a manner which causes minimum delay to the project.

State and federal regulations, while often the same, are not always identical. To simplify the process, a single application is prepared. The Massachusetts Architectural Access Board Application for Variance Curb cuts/sidewalks, as modified in the attached copy to recognize PROWAG regulations is the basic form for all variance requests. A copy of the modified form is attached to this document. The designer is responsible for completing the form, except that on page 4 the designer is only required to fill in the names and addresses of the Local Building Inspector, the Local Commission on Disability, and the Local Independent Living Center that represent the city or town where the project is located.

While the application with all supporting documentation is prepared once, there is a multi-step approval process as described below.

Variance Process

Once a condition requiring a variance is determined, the designer should begin preparing the variance request form and all associated supporting documentation. This documentation includes plans (11x17 format), photographs, and a written estimate of the cost of compliance, as well as a total cost estimate of the preferred design if the variance were to be granted. These documents must address each regulation from which relief is requested as well as each deficient location on the project. The documentation should also include alternative designs and estimates

of attempts to address the condition requiring variance approval. In addition, there should be a narrative addressing the deficiencies of or other problems and prohibitions in implementing any of the alternatives, leaving the preferred design with the requested variances, as the most viable design.

The variance request and associated documentation shall be submitted to the Highway Division's ADA/AAB review section by the project manager. The ADA/AAB section will review the submission, and may request additional design work looking at specific design modifications, request other modification of the documentation, reject the package, or accept it.

The project manager will receive a memorandum stating that the submission provides sufficient documentation that a determination of technical infeasibility has been made, and if the variance request is only for federal regulations no further work is required.

If the variance request is for state regulation, the memorandum will ask that the designer prepare four additional copies of the package as well as a compact disc of the package for distribution and submittal as required by the Massachusetts Architectural Access Board. The designer must be available to the Board to respond to questions, attend a site visit with Board representative if requested, and defend the variance request to the Board in a formal hearing if required.

When the Highway Division receives the decision of the Board, with any conditions they may add, a copy will be forwarded to the project manager and designer. When the project has already proceeded to the construction phase a copy will also be forwarded to the District.

The Commonwealth of Massachusetts
Department of Public Safety
Architectural Access Board
One Ashburton Place, Room 1310
Boston Massachusetts 02108-1618
Phone: 617-727-0660
Fax: 617-727-0665
www.mass.gov/dps

Docket Number

_____
(Office Use Only)

APPLICATION FOR VARIANCE
Curb cuts/sidewalks

In accordance with M.G.L., Chapter 22, Section 13A, I hereby apply for modification of or substitution for the rules and regulations of the Architectural Access Board as they apply to the location(s) described below on the grounds that literal compliance with the Board's regulations is impracticable in my case.

PLEASE ENCLOSE:

1) **A filing fee of $50.00 (Check/Money Order) made payable to "The Commonwealth of Massachusetts" and all supporting documentation (e.g. plans in 11" x 17" format, photographs, etc.). In addition, the complete package (including plans and photographs) must be submitted via one compact disc.**

2) **The completed "Service Notice" form provided at the end of this application certifying that a copy of your *complete application* has been received by the Local Building Inspector, Local Disability Commission (if applicable), and Local Independent Living Center for the city/town that the property in question resides in. A list of the local entities can be found by calling the Architectural Access Board Office or the Local City/Town Clerk. For a list of the Local Independent Living Centers you can either call the Architectural Access Board Office or visit the Massachusetts Statewide Independent Living Council website at http://www.masilc.org/membership/cils.**

1. State the name and address of the owner of the project:
   _____
   _____E-mail:_____
   Telephone:_____

2. State the exact location of the area in question (e.g. Northwest corner of Main St. and Broadway) (use additional sheets if necessary):
   _____
   _____

3. Describe the project (e.g. complete reconstruction of Rt. 20 from Main St. to Broadway):
   _____

4. Check the work performed or to be performed:
   _____New Construction _____Reconstruction/Alteration _____Repair

5. Briefly describe the extent and nature of the work performed or to be performed (use additional sheets if necessary):
   _____
   _____

6. State each section of the Architectural Access Board's Regulations for which a variance is being requested:
   6a. Check appropriate regulations:
   _____1996 Regulations _____2002 Regulations _____2006 Regulations

SECTION NUMBER	**LOCATION OR DESCRIPTION**
_____	_____
_____	_____
_____	_____
_____	_____

6B. State each PROWAG regulation for which a variance is being requested:

REGULATION NUMBER	**LOCATION OR DESCRIPTION**
_____	_____
_____	_____
_____	_____
_____	_____

7. For each variance requested, state in detail the reasons why compliance with the Board's regulations is impracticable (use additional sheets if necessary), including but not limited to: the necessary cost of the work required to achieve compliance with the regulations (i.e. written cost estimates); and plans justifying the cost of compliance.
   _____
   _____
   _____

8. Has the project been out bid?_____
   Has the contract been awarded?_____
   8a. If the contract has been awarded, what date was it awarded?
   _____
   8b. Has the project been completed?
   _____
   8c. If work has been completed, state the date work began:
   _____
   Completion date:_____

9. State the estimated cost of the total project:_____

10. Has any other work been performed at this location within the past 36 months?_____

11. Is this project funded by the Massachusetts Department of Transportation?_____

12. Has the project been accepted by the City or Town?_____
    If yes, state the date that the project was accepted:_____

13. To the best of your knowledge, has a complaint ever been filed on this project relative to accessibility? _____yes _____no

14. State the name and address of the architectural or engineering firm including the name of the individual architect or engineer responsible for preparing drawings of the project:
    _____
    _____
    E-mail:_____
    Telephone:_____

15. State the name and address of the local or state building official responsible for overseeing this project:
    _____
    _____
    E-mail:_____
    Telephone:_____

Date:_____

_____
Signature of owner or authorized agent

PLEASE PRINT:

_____
Name

_____
Address

_____
City/Town State Zip Code

_____
E-mail

_____
Telephone

ARCHITECTURAL ACCESS BOARD VARIANCE APPLICATION
SERVICE NOTICE

I, _____, as_____

for the Petitioner _____submit a

variance application filed with the Massachusetts Architectural Access Board on _____

20 _____.

HEREBY CERTIFY UNDER THE PAINS AND PENALTIES OF PERJURY THAT I SERVED OR CAUSED TO BE SERVED, A COPY OF THIS VARIANCE APPLICATION ON THE FOLLOWING PERSON(S) IN THE FOLLOWING MANNER:

	NAME AND ADDRESS OF PERSON OR AGENCY SERVED	**METHOD OF SERVICE**	**DATE OF SERVICE**
1			
2			
3			

AND CERTIFY UNDER THE PAINS AND PENALTIES OF PERJURY THAT THE ABOVE STATEMENTS TO THE BEST OF MY KNOWLEDGE ARE TRUE AND ACCURATE.

_____

Signature: Appellant or Petitioner

On the _____ Day of _____ 20 _____
PERSONALLY APPEARED BEFORE ME THE ABOVE NAMED

_____

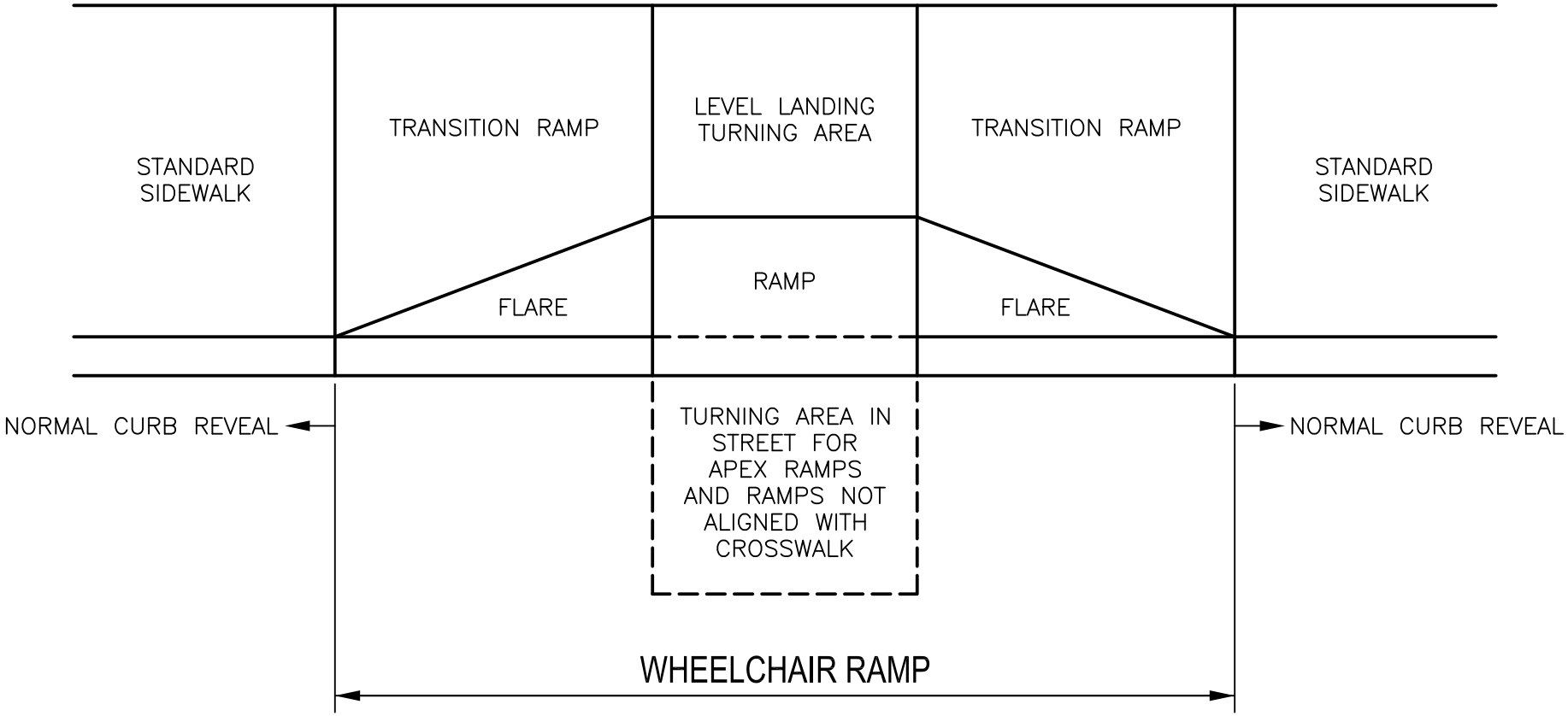
(Type or Print the Name of the Appellant)

_____ _____

NOTARY PUBLIC **MY COMMISSION EXPIRES**

WHEELCHAIR RAMP: ALL ELEMENTS NECESSARY TO TRAVEL FROM THE STREET TO FULL HEIGHT SIDEWALK AND VICE VERSA.

RAMP: THE INCLINED SECTION JOINING THE STREET AND THE LEVEL LANDING.



WHEELCHAIR RAMP NOMENCLATURE