Delaware T² Center

TRAVEL-LOG

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ADA Requirements – Part 3

Design and Construction Issues of Pedestrian Facilities

By: Alan S. Kercher, P.E. – T² Center Consultant

Part 1 of the ADA Requirements series of articles briefly discussed how ADA requirements affect Municipal Public Works Projects, as well as, transition plan requirements and the recent increase in complaints. The Barden v. Sacramento case was also highlighted. Part 2 summarized design requirements for curb ramps. Part 3 will discuss design of sidewalks. Part 4 will discuss ADA issues created by construction projects.

The American Disabilities Act Accessibility Guidelines (ADAAG) outlines the geometric design, construction tolerances, physical condition, and obstruction prevention of pedestrian facilities. The design controls listed below apply to each of the pedestrian facilities covered in this newsletter article including sidewalks.

- Alignment
- Width
- Grade Changes
- Profile Slope
- Cross Slope

The guidelines over these design controls attempt to provide safety and access for all pedestrians including those with disabilities.

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ROADWAY QUALITY MANAGEMENT PROGRAM

Part 1 – New Pavement Construction Standards

By: Alan S. Kercher, P.E.- T² Center Consultant

Implementing a roadway quality management program will help to ensure that municipalities are building and maintaining high quality roadways. This series of articles will discuss the key components of a quality management program that include pavement construction standards, utility control policies, contracts and specifications, and construction inspection. Part 1 will discuss the importance of implementing a comprehensive roadway quality management program, as well as, the need for adequate pavement construction standards.

In order to properly maintain any roadway system, all required maintenance and rehabilitation or other activities such as utility work in the roadway must be properly

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ADA Requirements – Part 3

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Sidewalks

Sidewalks are surfaces that are specifically reserved for pedestrian traffic. They should be free of obstacles, protruding objects, and vertical obstructions. Safety issues range from creating a tripping hazard to causing a pedestrian to use the street as a way around the obstruction, putting them in danger of being hit by a vehicle.

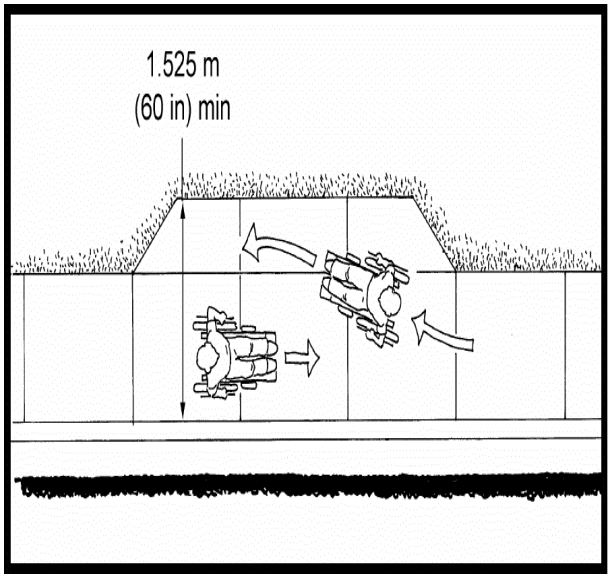
Obstructions

Obstructions in the path of a pedestrian facility can be a safety hazard for the disabled. Types of obstructions on sidewalks include utility poles, trees, lights, signs, signals and mail boxes. The ADAAG has outlined possible solutions for getting around obstructions or the possible removal of obstructions from the pedestrian facility altogether. Either the obstacles should be removed from the path of travel, or the path of travel should be diverted around the obstacles with the use of sidewalk widening or realignment at these locations.

Pedestrians with vision impairments are able to detect objects mounted on walls or posts if they are installed so that the leading edge is less than 27 inches above the sidewalk. Items mounted above this height but below 80 inches above the sidewalk should not project more than 4 inches into any pedestrian path.

Width

Sidewalks should be wide enough to accommodate two passing pedestrians in wheelchairs. ADA requires that the minimum sidewalk width be 36 inches. The American Association of State Highway and Transportation Officials (AASHTO) has designated 48 inches as the minimum sidewalk width. The Delaware Department of Transportation (DelDOT) has designated in its Policy Implement O-02 that the minimum sidewalk width shall be 60 inches with narrower sidewalks allowed only where geographic constraints prohibit a sidewalk 60 inches wide. DelDOT allows sidewalks to be 48 inches wide at overpasses and underpasses, and where existing 48 inch sidewalks are being replaced. Where 60 inch wide sidewalks cannot be accommodated, a 60 inch passing space should be provided every 200 feet of sidewalk length as shown below.



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ADA Requirements – Part 3

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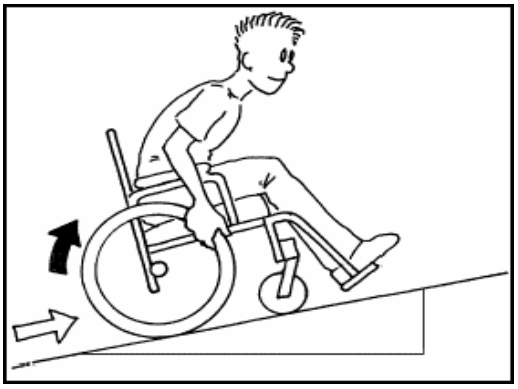
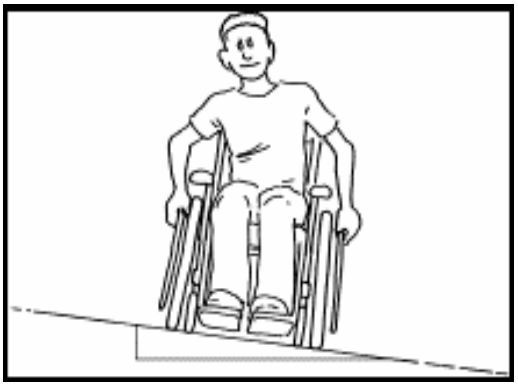
Slope

Sidewalks cannot have a cross-slope (side slope) grade greater than 2% (50:1). The profile (longitudinal) grade can not be greater than 5% (20:1); however the profile slope of the sidewalk may follow the slope of the adjacent roadway.



Profile Grade – 20:1 Max.



Cross-Slope Grade – 50:1 Max

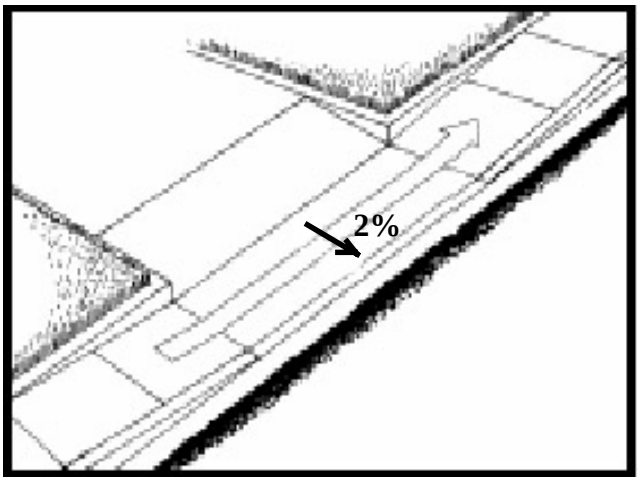
Where the sidewalk exceeds the maximum grade and is not adjacent to a roadway with the same profile grade, the sidewalk must be treated as a ramp. The slope can therefore not be greater than 12:1 (8.33%) and must have 60 inch level landings for every 30 inches of vertical rise.

Surface Texture

ADAAG also requires that sidewalks be constructed of a smooth, firm, stable, and slip resistant material such as concrete or asphalt. If brick, cobblestone, or textured pavements are used, they must be well-maintained to avoid irregular settlement and roughness. Joints in the concrete or other materials cannot have a width greater than ½ inch. Sidewalks should be constructed of a material that has a visual contrast to the adjacent vehicular travel way. People with visual impairments should be able to distinguish where the sidewalk ends and the road begins.

Driveway Entrances

Driveway entrances should have a maximum 2% cross-slope and 12:1 for entrance and exit slopes. Most driveway entrances do not meet this ADA requirement. It is important that all new construction incorporate these design requirements.



ADA Satisfactory Driveway Entrance

Changes in Level

Changes in level up to ¼ inch may be vertical and without edge treatment. Changes between ¼ and ½ inch shall be beveled with a slope no greater than 1:2 (vertical:horizontal). Changes in level greater than ½ inch shall be accomplished by means of a ramp.

References

More information on the ADA law, design standards, best practices and the proposed changes can be found on the following web sites:

http://www.usdoj.gov/disabilities.htm

http://www.access-board.gov/

ROADWAY QUALITY MANAGEMENT PROGRAM

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constructed. Additionally, new roads must be required to meet reasonably high quality standards. A poorly built road can deteriorate quickly and thereby become a "money pit" that will drain the municipality of precious funds for many years to come. Since the cost of these additional maintenance problems must be added to an already strained maintenance budget, the results could be financially devastating. Therefore, any successful roadway preservation program must include a comprehensive quality management program to ensure that all new roads, as well as, preventive maintenance and rehabilitation projects, are properly constructed.

The importance of a comprehensive quality management program cannot be overstated. We do not live in a perfect world, mistakes do happen and errors are made, even by the best contractors. The occurrence of mistakes can be amplified by the "low-bid" system utilized by government agencies to award construction contracts. There is a "fair market value" for the cost to construct a project. When forced to bid in a "low-bid" environment, there is a tendency for contractors to take short cuts to create a competitive advantage. Unfortunately, short cuts do occur in construction way too often. This "short-cut" phenomenon is similar to drivers speeding when there is no one enforcing the speed limit. There must be a safety net to protect the taxpayers. Proper contract documents coupled with a good inspection control program will help to ensure that the taxpayers receive a dollar's worth of goods and services for each dollar spent.

A comprehensive quality management program should include the following elements:

- Contracts and Specifications
- Inspection Program
- New Pavement Construction Standards
- Utility Control Ordinance

NEW PAVEMENT CONSTRUCTION STANDARDS

Agencies may have implemented pavement management systems that allow them to maximize taxpayers' investment in the maintenance, repair and rehabilitation of existing road surfaces. However, in order to cost-effectively manage a roadway system, stringent requirements must be in place to ensure that new roads, usually in subdivisions, are properly designed and constructed. Otherwise, it becomes a case of the "money pit syndrome." As stated above, good money spent to fix poorly designed and/or constructed roads is a waste of taxpayers' money. For example, initially the pavement may be structurally inadequate to begin with. Then, once the failures occur, rather than properly repairing the root cause of the problem, many agencies will compound the problem by spending as little money as possible to "cover up" the problems. As shown in the picture below, failure to fix the underlying problems will require additional repairs sooner rather than later.

Overlay failed because the underlying failure was not addressed

Unfortunately, many local agencies have adopted "minimum" construction standards for subdivision streets that are generic in nature. Many times the "minimum" standards are inadequate, resulting in streets which only last for a few years before major maintenance or rehabilitation is required. Minimum road construction standards typically result in poor performance due to several technical deficiencies in the design of the pavement thickness such as:

1. Traffic Loads

   A common practice for determining the structural capacity of a pavement is to base it on a

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certain number of vehicle trips per dwelling unit per day, using only car traffic or a minimal amount of heavier vehicles. This method usually fails to properly account for heavy traffic using local roadways. Heavy vehicles produce much more damage than do automobiles. For example, a fully loaded tractor-trailer will cause thousands of times more damage than a car. Therefore, failing to account for heavy truck traffic can result in the design of structurally inadequate pavements.

A typical subdivision street may be exposed to different types of heavy vehicles including: school buses in the morning and afternoon; if private trash haulers are used - several trash collection trucks from different companies may drive down a street on a single day; building supply delivery trucks - especially during the construction phase (many times significant base material damage is done, but the damage is never properly corrected); and large moving vans. If the street serves as a short cut to places such as a school or industrial park, these numbers may go up significantly.

For subdivision streets, accounting for damage caused by construction vehicles is crucial. Many times, a majority of the truck traffic that a pavement will experience during its initial design life occurs in the construction phase prior to placement of the final wearing course. This can accelerate the deterioration because the pavement is not at full strength. Although most agencies will require the "worst" areas to be patched, the remaining portion of the pavement may have lost a significant portion of its remaining life. This can result in early failure of the pavement which now becomes a financial burden for the taxpayers. In the photo below, anything short of complete removal of the asphalt layer in this street will ensure a quick failure of the final wearing course.

Failure of asphalt binder course prior to placing the final wearing course

2. Soil conditions

Soil conditions can vary greatly from one end of a municipality to the other, as well as, from one end of a street to the other. Since the load carrying (support) capability and moisture susceptibility of the soil can greatly affect the long term performance of the pavement, the variability of soil types and characteristics must be addressed. Minimum subgrade characteristics and soil testing requirements should be specified in the design requirements. Also, specifications must adequately address how to deal with unexpected soil conditions. In the photos below, a six-month old pavement failed because the soft/wet subgrade problem was not properly addressed.

Pavement Failure

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ROADWAY QUALITY MANAGEMENT PROGRAM

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Soft/Wet Subgrade

3. Drainage

Proper drainage is essential to the long-term performance of any pavement. Even when the best materials and construction practices are used in building or maintaining a road, if the drainage is poor, the life of the pavement will be much less than expected. Excessive moisture in the granular courses and the subgrade beneath the pavement surface causes damage in several ways, including:

i. Weakening of the Support Layers. Moisture in the soil reduces the internal friction between soil particles which lowers the shear strength of the soil. If the soil moisture is high, especially for long periods of time, the pavement could be severely damaged.

   Pavements rely on the lower layers to provide a stable, uniform support for the surface layers. When the lower layers are weakened by excessive moisture, they cannot adequately support the surface layers. This loss of support allows the surface layers to flex excessively, resulting in premature failure of the pavement.

ii. Spring Thaw. In northern regions that experience deep freezing, frost heave can be a problem. In warmer areas such as Delaware that experience freezing but not deep freezing, spring thaw can be a more serious problem. In the spring, when the ice lenses in the "frost layer" melt, the trapped water weakens the supporting soil layers. This is the reason why the formation of potholes is typically the greatest during late winter and/or early spring.

iii. Expansive Soils. Soils that are susceptible to shrinkage and swelling will experience significant changes in volume when moisture is allowed to accumulate. This change in volume can cause extensive damage to pavements. Shrinkage will result in loss of support for the pavement layers. Swelling will generate upward forces creating a heaving effect similar to frost heave.

In areas where wet subgrades can be a problem, the use of a permeable drainage layer and an underdrain system should be considered. Removing weak soils and/or the use of geosynthetics can also help greatly.

2007 Roadway Management Conference

The 15th Annual Roadway Management Conference will take place on April 2-4, 2007, at the Doubletree Hotel in Charlottesville, VA. The T² Centers in Delaware, Maryland, Pennsylvania, Virginia, and West Virginia host this conference on a rotating basis. The next conference that Delaware will host will be in 2009.

The 2007 conference will feature sessions on a broad array of topics for appointed officials, public works managers, engineers, planners, technicians, and contractors involved in the construction and maintenance of state and local highways and streets.

We will send you a detailed conference program in mid-January. We will also post the program on our web page at www.ce.udel.edu/dct/t2/t2.htm

Other Upcoming Events

February 14, 2007	Annual DelDOT Maintenance/Operations Workshop Kent Poly Tech High School, Woodside, DE Contact DelDOT for more information. 302-760-2288
March 13, 2007	Right-of-Way Appraisers' Course Clayton Hall, University of Delaware By Invitation Only
April 2-4, 2007	2007 Roadway Management Conference Charlottesville, VA (See page 6 of this newsletter for details)
April 17-18, 2007	NHI Course: Pedestrian Facility Design Kent Poly Tech High School, Woodside, DE Register online at www.ce.udel.edu/dct/t2/t2.htm

Most T² Center events are free to state and local transportation agencies in Delaware.
For more information, contact us at 302-831-6241.

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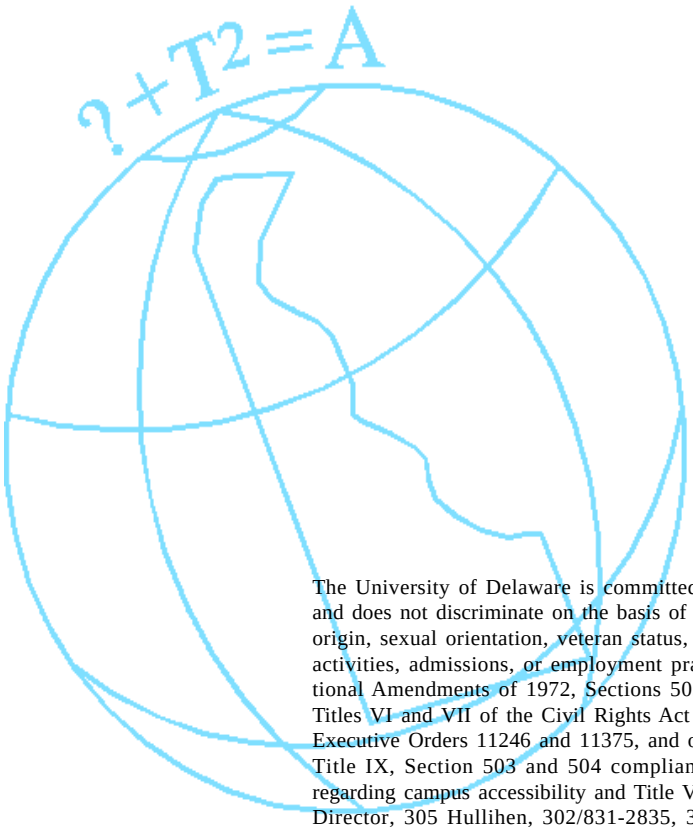

Delaware T² Center

The Technology Transfer (T²) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual state departments of transportation. Its purpose is to interchange the latest state-of-the-art technology into terms understood by local and state highway or transportation personnel.

The Delaware T² Center Travel-Log is published semi-annually by the Delaware Technology Transfer Center at the University of Delaware. T² Center articles also appear semi-annually in the TransSearch - the newsletter of the Delaware Center for Transportation. Any opinions, findings conclusions or recommendations presented in this newsletter are those of the authors and do not necessarily reflect views of the University of Delaware, Delaware Department of Transportation, or the Federal Highway Administration. Any product mentioned in the newsletter is for information purposes only and should not be considered a product endorsement.

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