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Walking Surface Hazards And The Codes

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Object

The object of this paper is to call attention to the American National Standards Institute Standard, ANSI A117.1, titled, "Providing Accessibility and Usability for Physically Handicapped People,"[1] and how it can be applied to sidewalks and crosswalks that lead to and from handicapped curb ramps. The premise considered herein is that a change in level greater than one-half (1/2) inch should be the threshold height for defective walking surfaces. These surfaces should be repaired according to ANSI A117.1. The paper refers, generally, to New York City and examines "prior notice" requirements for defects.

Background

When the writer began his forensic engineering practice in New York City, he was retained in a trip and fall case where an elderly woman had tripped on a change in level of approximately two (2) inches. The change in level was located within a crosswalk on a street that was being repaved. One half of the street, longitudinally, was repaved with a wearing course of asphalt. The other half of the street was paved with the binder course, awaiting the wearing course. This left a two (2) inch change in level which was not ramped for pedestrians. There was no question on both sides that a two (2) inch change in level was a defect and tripping hazard.

The writer has since been retained in several other trip and fall cases where the change in level was approximately one-and-a-half (1-1/2) inches and not ramped. Again both sides agreed that a change in level of one-and-a-half (1-1/2) inches was a defect and tripping hazard.

Over time the writer has asked several forensic engineers where the threshold height for a change in level could be found in the codes i.e., if a specific height was assigned to a change in level that determined a defect or tripping hazard in which code or regulation could it be found. There was general agreement that one-and-a-half (1-1/2) to two (2) inches was the "accepted range" of a change in level that would be considered a tripping hazard but no one could direct the writer to a specific code or regulation.

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A search was begun of the Administrative Code of the City of New York, along with the Rules of the City of New York, the New York City Department of Transportation, and the New York State Fire Prevention and Building Codes, for a definition of the height of change in level that would determine a defect or tripping hazard.

Following are codes that were researched. The writer selected sections that either referred to defective sidewalks or crosswalks or made reference to any change in level, since it is rare for codes to identify actual change in levels.

1. ***The Building Code of the City of New York, 1990-1991.***[2] The New York City Building Code refers to the ANSI 117.1-1986 standard relating to the physically handicapped in Title 27, Construction and Maintenance, Chapter 1, Building Code, Subchapter 4, Building Limitations, Subarticle 2, Facilities for people Having Physical Disabilities, through Section §27-292 which refers to the Reference Standards 4-6. Reference Standard 4-6 accepts the ANSI 117.1-1986 with modifications. No other reference to defects or hazards regarding change in level could be found.

2. In Section 27-109[3] of Title 27, Construction and Maintenance, Chapter 1, Building Code, Subchapter 1, Administration and Enforcement, Article 2, Matters Covered, states;

   "27-109 Building matters covered. The provisions of this code shall cover all matters affecting or relating to buildings, as set forth in section 27-103 of article one of this subchapter, and shall extend to excavation operations, and to all types of buildings and structures and their appurtenant constructions, including vaults, signs, projections, and accessory additions, together with all surface and sub-surface construction within the curb line, including curb cuts and driveways, the coverings thereof and entrances thereto, and the issuance of permits in reference thereto."

Section §27-109 includes surface and subsurface between the building line and the curb line. The writer interprets this to include the sidewalk surface.

3. ***The Rules of the City of New York,[4] Title 34, Department of Transportation, Highway Operations, Paragraph §2-02 Sidewalk Area – General,*** determines responsibility and defines defective sidewalks, but gives no change in level heights. Paragraph §2-02 states,

"(a) Property owners' responsibility. All property owners shall at their own cost install, reconstruct, repave and maintain in good repair, at all times the sidewalk, in front of and abutting their properties, including, but not limited to the intersection quadrant for corner property, in accordance with the specifications of the Bureau of Highway Operations – See 2-31 and 2-16 "Builders' Pavements."

(b) Defective sidewalks. Without limiting the generality of the previous subdivision (a), any or all of the following conditions, among others shall constitute a defective sidewalk requiring reconstruction, repaving or repair.

(1) The sidewalk pavement is either broken, missing, sunken or depressed, undermined, bulging, slippery and slick, has a excessively rough surface or is cracked to such an extent that pieces of the sidewalk pavement may be readily removed.

(2) There is an abrupt variation in elevation along or across a sidewalk." The above describes "defective" sidewalks, but does not attach a specific height to "abrupt elevation" or "broken sidewalk".

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4. ***The New York City Charter and Administrative Code,*** Chapter One, Section §19-110,[5] Ramps on curbs states;

"In the construction and installation of all new and reconstructed curbs at corner located street intersections and pedestrian crosswalks not located at street intersections, provisions shall be made for the installation of the following: two ramps at corners located at street intersections and one ramp at pedestrian crosswalks not located at street intersections. Such ramps shall be no less than four feet wide and shall blend to a common level with the roadway. If a common level is unobtainable, then the lip of such ramps shall not exceed a maximum of five-eighths of an inch and shall have a rounded edge. ....."

The Administrative Code places a height limit of an 5/8 inch where a curb ramp meets the surface of the roadway.

5. ***The Uniform Building Code, 1991***[6] states in Section 3304(i);

> *"Floor Level at Doors. Regardless of the occupant load, there shall be a floor or landing on each side of a door. When access for persons with disabilities is required by Chapter 31, the floor or landing shall not be more than 1/2 inch lower than the threshold of the doorway. When such access is not required, such dimension shall not exceed one (1) inch. Landings shall be level except for exterior landings, which may have a slope not to exceed 1/4 inch per foot."*

Section 3304(i) is included because it defines a change in level at doorways as 1/2 inch for the handicapped, and one (1) inch for others. The question raised by Section 3304(i), is, why include the half (1/2) inch or one (1) inch rule to doorways and not to other walking surfaces?

6. ***The Code of Federal Regulations, 24 CFR, Part 40,***[7] ***Accessibility Standards for Design, Construction, and Alteration of Publicly Owned Residential Structures.*** This section is similar if not identical to the ANSI A117.1-1986 change in level definition, but only applies to the handicapped and does not refer to others.

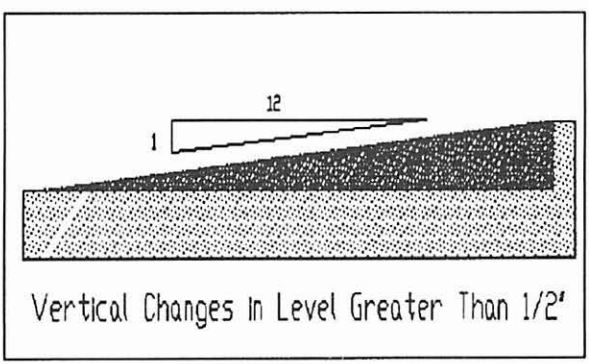

Fig. 1 shows the repair of a change in level greater than one-half (1/2) inch.

7. ***The American National Standard Institute (ANSI) A117.1-1986, revision of ANSI A117.1-1980, titled, "Providing Accessibility and Usability for Physically Handicapped People".***

The ANSI A117.1-1986 Standard, Section 4.3.8 Changes in Level, states;

> *"Changes in level along an accessible route shall comply with 4.5.2. If an accessible route has changes in level greater than 1/2*

in (13 mm), then a curb ramp, ramp, elevator, or platform lift shall be provided that complies with 4.7, 4.8, 4.10, or 4.11, respectively. Stairs shall not be part of an accessible route."

Accessible route is defined as;

"A continuous unobstructed path connecting all accessible elements and spaces in a building or facility that can be negotiated by a person with a severe disability using a wheelchair and that is also safe for and usable by people with other disabilities. Interior accessible routes may include corridors, floors, ramps, elevators, lifts, and clear floor space at fixtures. Exterior accessible routes may include parking access aisles, curb ramps, walks, ramps, and lifts."

Section 4.3.8 refers to the following sections: Section 4.7 refers to curb ramps, section 4.8 refers to ramps, Section 4.10 refers to elevators and 4.11 refers to platform lifts.

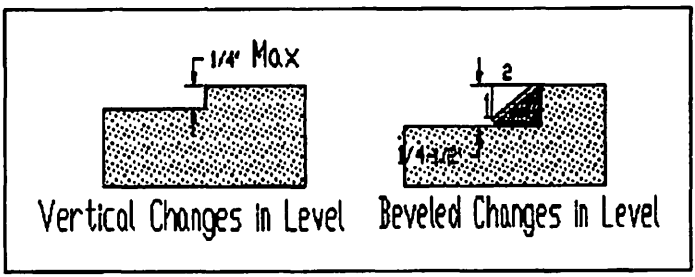

Fig. 2 shows a repair for a change in level between 1/4" to 1/2" and no repair for a change in level less than 1/4".

Figure 2 refers to Section 4.5.2 which states;

"Changes in Level. Changes in level up to 1/4 in (6 mm) may be vertical and without edge treatment. Changes in level between 1/4 in and 1/2 in (6 mm and 13 mm) shall be beveled with a slope no greater than 1:2 (see Fig. 7(c) and (d)). Changes in level greater than 1/2 in (13 mm) shall be accomplished by means of a ramp that complies with 4.7 or 4.8."

Referring to Section 4.5.2 the following sections specify the slopes of ramps: Section 4.7 states that ramp slopes shall be between 1:10 and 1:12. Section 4.8 states that ramp slopes shall be between 1:10 and 1:12 but no steeper than 1:8. See Table 3, Allowable Ramp Dimension for Construction in Existing Sites, Buildings, and Facilities.

Table 3

Allowable Ramp Dimensions for Construction in Existing Sites, Buildings, and Facilities

	Maximum Rise		Maximum Horizontal Projection	
Slope*	in	mm	ft	m
Steeper than 1:10 but no steeper than 1:8	3	75	2	0.6
Steeper than 1:12 but no steeper than 1:10	6	150	5	1.5

*A slope steeper than 1:8 not allowed

8. ***The New York State Fire Prevention and Building Code,***[8] 1984, Section 1100.1c, refers to the American National Standards Institute standard, ANSI A117.1-1980 "Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People."

No reference could be found defining a defect or hazard due to change in level other than the reference to ANSI A117.1-1980.

9. Refer to ***The Slip and Fall Handbook,*** by Stephen I. Rosen, J.D., Ph.D. (9), paragraph 2.76, page 21, which states;

   "Sidewalk Trip and Fall Accidents. The fall accident initiated by a trip on irregular walkway pavement of sidewalks is a most common accident. A ridge of one-half (1/2) inch or greater is sufficient to cause such a trip. Some jurisdictions have legislated that such trip and falls cannot be litigated unless the ridge was one (1) inch or greater. Most local and state codes are silent on this issue. ....."

10. Refer to the ***Slip and Fall Practice***[50] book by Charles E. Turnbow, page 14-27, paragraph §1484, Trivial Defect Rule, which states;

    "..... The courts usually have based their decision on some factual basis. There is often a difference of opinion of when a defect presents a safety hazard to the public. The consensus is that the defect or break in the sidewalk must be greater than 3/4 inch along the vertical edge. There is little question that breaks of this magnitude also create a substantial tripping hazard as a matter of fact. ....."

The excerpts from both Rosen and Turnbow are the opinions of the authors as to what the change in level should be that causes a defect and are not incorporated in any codes.

In most municipalities, in order to file a claim against the municipality, notice must have been given as to an existing defect. That is, the municipality would have had to have known that the specific defect existed and there must have been sufficient time, usually fifteen (15) days, for repair of the defect. Prior notice of a defect would be knowledge that someone had (or had been involved in) an accident at that location and placed a claim against the municipality, or that some written notification was given to the municipality previously. The New York City Charter and Administrative Code(11), Chapter 2, Actions Against New York City, Paragraph §7-201(c)(2), Actions against the city, states;

> *"No civil action shall be maintained against the city for damage to property or injury to person or death sustained in consequence of any street, highway, bridge, wharf, culvert, sidewalk or crosswalk, or any part or portion of any of the foregoing including any encumbrances thereon or attachments thereto, being out of repair, unsafe, dangerous or obstructed, unless it appears that written notice of the defective, unsafe, dangerous or obstructed condition, was actually given to the commissioner of transportation or any person or department authorized by the commissioner to receive such notice, or where there was previous injury to person or property as a result of the existence of the defective, unsafe, dangerous or obstructed condition, and written notice thereof was given to a city agency, or there was written acknowledgement from the city of the defective, unsafe, dangerous or obstructed condition, and there was a failure or neglect within fifteen days after the receipt of such notice to repair or remove the defect, danger or obstruction complained of, or the place otherwise made reasonably safe."*

The above excerpt is known as the "Pothole Law." Soon after this law went into effect, the Big Apple Pothole and Sidewalk Protection Corporation was formed. The "Big Apple", as it is commonly known, surveys the five boroughs of New York City and notes street and sidewalk defects on street maps using a variety of symbols. (See Figure 3) They then notify the City of the defects. An attorney with a slip and fall case can call the Big Apple and, for a fee, can obtain a copy of the particular map where the accident occurred to determine if prior notice was issued. A forensic engineer would then be retained to measure the defect and/or analyze the map to see if the defect lay within the area marked on the map. A forensic engineer may be asked to issue an oral or written report with his findings as to the cause and effect of the defect. If the maps do not

show a defect in the area of the accident, the attorney may call upon the forensic engineer to investigate if the cause of the defect was in design. A design defect may be used in a claim against the municipality. Repairs by the municipality can also serve as notice.

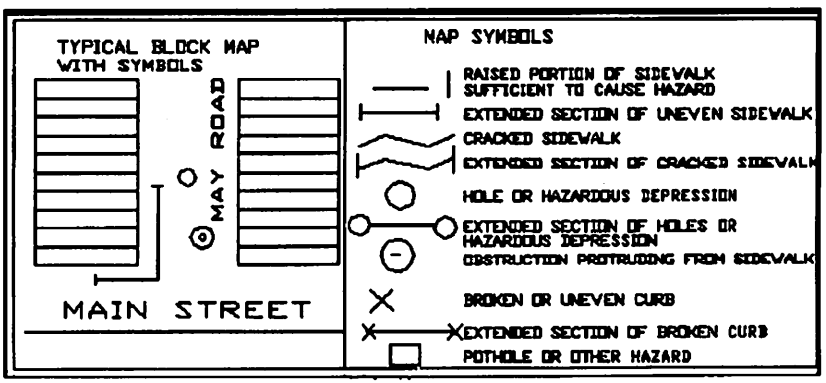

Figure 3.

The various types of notice: actual, implied, constructive, can be found in Black's Law Dictionary(12). Notice, in its legal sense, is defined by Black's Law Dictionary as follows:

> *"Notice in its legal sense is information concerning a fact, actually communicated to a person by an authorized person, or actually derived by him from a proper source, and is regarded in law as "actual" when the person sought to be affected by it knows thereby of the existence of the particular fact in question. It is knowledge of facts which would naturally lead an honest and prudent person to make inquiry, and does not necessarily mean knowledge of all the facts. In another sense, "notice" means information, an advice, or written warning, in more or less formal shape, intended to apprise a person of some proceeding in which his interests are involved, or informing him of some fact which it is his right to know and the duty of the notifying party to communicate."*

Conclusion

In conclusion, it is the writer's opinion that because curb ramps for the handicapped located on city streets are constructed to ANSI A117.1 Standards, sidewalks and crosswalks must also follow these standards since they are accessible routes to the curb ramps. Level differences in sidewalks and crosswalks greater than one-half (1/2) inch should be considered defective and be repaired according to ANSI A117.1 Standards.

Many papers have been written by engineers, physicians and safety experts on the height that the foot is lifted during the human stride, yet these findings are not incorporated into the Codes.

Following such strict standards for sidewalks and crosswalks in New York City would incur a tremendous expense in repairs. It is suggested that, in the interest of the public, clear and concise standards be implemented for the change in level of sidewalks and crosswalks.

The writer gratefully acknowledges the suggestions and comments of members of the Academy in preparation of this paper.

References

1. *ANSI A117.1-1986*, American National Standards Institute, 11 West 42nd Street, New York, NY 10036

2. *The New York City Administrative Code*, Titles 26 & 27, Building Code of the City of New York, Reference Standards, Rules and Regulations of the Department of Buildings, published by Gould Publications, 199/300 State Street, Binghamton, New York 13901-2782.

3. Ibid, section 27-109.

4. Ibid, Title 19, section §19-110.

5. *The Rules of the City of New York*, Title 34, Department of Transportation, Published by Lenz & Riecker, Inc., One Columbia Point, Albany, New York 12207.

6. *Uniform Building Code, 1991*, International Conference of Building Officials, 5360 South Workman Mill Road, Whittier, California 90601.

7. *Code of Federal Regulations*, 24 CFR, Part 40, Accessibility Standards for Design, Construction, and Alteration of Publicly Owned Residential Structures.

8. *New York State Uniform Fire Prevention and Building Code, 1984*, Division of Housing and Community Renewal, Two World Trade Center, New York, NY 10047, (212) 488-7138.

9. *The Slip And Fall Handbook*, by Stephen I. Rosen, J.D., Ph.D., 1983, Hanrow Press Inc., Post Office Box 1083, Columbia, Maryland 21044.

10. *Slip and Fall Practice*, by Charles E. Turnbow, 1988, Revision 3, 9/1991, James Publishing Group, Cross Publishing Division, P.O. Box 27670, Santa Ana, CA 92799, (714) 556-0960.

11. *The New York City Charter and Administrative Code*, Chapter 2, Actions Against New York City, §7-201, published by Lenz & Riecker, Inc., One Columbia Point, Albany, New York 12207.

12. *Black's Law Dictionary*, by Henry Campbell Black, M.A., 6th Edition by The Publisher's Editorial Staff, West Publishing Company, St. Paul, Minnesota.