

Montana Department of Transportation
Research Program

FINAL REPORT

Detectable Warning Devices (Truncated Domes) for use by the Visually Impaired

Location: Cascade County–Great Falls; 6th St. N.W.

Project No.: STPU 5201(11)

FHWA No. MT 00-05

Description: Final Report of experimental analysis and performance of various detectable warning devices (DWD) for sidewalk curbs ramps

Evaluation Date: October 2007

Date Constructed: July-August 2003

Principal Investigator: Craig Abernathy
Experimental Project Manager

Objective

Test the durability of several manufacturer designs in the use of truncated domes as preferred detectable warning devise (DWD) for use by the visually impaired at curb ramps. Report on the construction application of each treatment, durability and maintenance requirements of such products. This analysis is to document the condition of these devices after the 2006-2007 season. All treatments were installed during the months of July and August of 2003.

Experimental Design

Seven similar types of truncated domes were installed at 15 random curb ramp locations in a seven block linear area of 6th St. N.W. The following are the names of the chosen manufacturers and the products selected. Refer to attachment ‘A’ at the end of this document to locate the approximate curb ramp locations of these devices.

1. ADA Fabricators

Copolymer Composite Tiles (see page 3)

2. Disability Devices

Wet Anchors Box Systems (see page 4)

Polyurethane Detectable Warning Mat (see page 5)

3. Vanguard ADA Products of America

Applied Truncated Domes (see page 6)

4. Strongwarn Industries

Applied Latex Modified Mortar Domes (see page 7)

5. Cote-L Industries

Safti-Trax Plastic Sheets (see page 8)

Safti-Trax New Rubber Mat (see page 9)

Final Analysis

Rating criteria for these products as performing good, fair, or poor is related to the reviewers experience while participating in the installation of these devices, initial performance documentation, several 'visual only' visits to these sites, and the ongoing annual evaluations. Performance can be based on a combination of quality of adhesion, loss of dome or relief of dome (tactile function), torn bases, color retention, and the overall appearance of the feature. These devices are installed in areas that encompass both private and municipal ownership. No restrictions were given during winter season maintenance on snow removal. It is most likely that snow removal may be done by any means; shovel, blade, broom or no removal at all. The DWD's were visited several times during the winter over the course of the project. Most of the treatments were not maintained for snow or ice removal. Several devices, adjacent to residential areas were kept free of snow; those treatments exhibited accumulated damage from some type of blade being used for snow removal as detailed in this report.

Most all treatments exhibited some form of distress during the winter months. The worst performer was the Disability Devices Wet Anchor Box System, which has failed and has been removed. Note that the Wet Anchor Box was improperly installed that led to the premature failure of the glue. However there was substantial loss of dome relief due to blade damage. The other Disability Devices product; Polyurethane Detectable Warning Mat, have failed and been removed.

To date the best performers are the ADA Fabricators and Vanguard ADA products. Those products that have been rated as poor performers are the Strongwarn Industries, Cote L Industries, and Disability Devices respectively.

Treatments that rely on glues to secure them to the surface showed continued accelerated loss of adhesion. It can be assumed that this will continue to deteriorate over time. Those treatments that used surface paints or epoxies exhibit the best adhesion. Loss of color retention has not been an issue to date.

Regardless of the positive performance of the aforementioned manufactures, those products will not be promoted for use by the MDT. Issues of complexity of installation or proprietary service to perform those installations are not feasible with the needs of the State. None of the DWD's in this report is capable of preventing dome loss by blade interaction. Products that are out of the box ready, easy and understandable installation instructions, whether retrofit or in situ and made of tougher materials are what are being tested currently.

All products chosen in this project were first generation detectable warning devices and have been surpassed by the new generation products which use metals such as iron and steel in their construction. Those types of products are currently being evaluated and illustrate a higher performance than any of the products in this report.

All reports to date can be found at: http://www.mdt.state.mt.us/research/projects/6th_street.shtml

Manufacturer: **ADA Fabricators**
Treatment: **Three installations of Copolymer Composite Tiles**
Site Location: **1A, 1B, 1C**

All three site installations were in fair condition at the time of this inspection. Minimum wear on domes. Continued loss of adhesion was observed with the interior seams of treatment 1C & 1B. The following images are the individual treatments with comments.



Installation 1A: Located on the northeast corner at the intersection of the east entrance to the Expopark adjacent to 5th Ave. N.W.

Adhesion fair. Interior seams beginning to curl up. 10% loss of domes on leading edge of mat due to blade damage. Minimum wear on domes. Color good. Accumulation of debris diminishes the tactile function of the device



Installation 1B: Located on the southwest corner of the intersection 4th Ave. N.W. & 6th St. N.W.

Adhesion fair. West interior seam continues to curl and accumulate debris. Perimeter seam still tight. Color good. Minimum wear on domes.



Installation 1C: Located on the southwest corner of the intersection 5th Ave. N.W. & 6th St. N.W. This treatment connects the east-west pedestrian walkway.

Same condition as 1B, has suffered minimum dome loss.

Manufacturer: **Disability Devices**
Treatment: **One installation of the Wet Anchor Box system**
Site Location: **2**

This treatment performed poorly since construction. Approximately 35% of dome relief has been lost through use of a shovel or blade apparatus during the 2004-05 winter. Domes are wearing rapidly. The edges within the treatment and perimeter are beginning to lose adhesion. The tactile response is spongy, substantial air pockets beneath the mat, severe loss of adhesion. The setting pins are breaking off. Color is good. This treatment has been determined as a trip hazard and has been removed.

Note that this device was improperly installed and most likely led to its premature failure.



Installation 2: Located on the southwest corner at the intersection of 6th Ave. N.W. and 6th St. N.W.

Image is condition of device prior to removal

Manufacturer: **Disability Devices**
Treatment: **Two installations of the Polyurethane Detectable Warning Mat**
Site Location: **3A, 3B**

Installation 3A has been removed at the time of this inspection. Installation 3B failed during the 2006 inspection and was removed. Both devices exhibited severe dome loss through blade damage, lack of adhesion, and loss of mechanical attachment.

Manufacturer: **Vanguard ADA Systems**
Treatment: **Three installations of the Applied Truncated Domes**
Site Location: **4A, 4B, 4C**

All installations were in fair condition at the time of inspection. Color good. Treatment 4A displayed no deterioration. Treatment 4B & 4C have cracked at the mortar sidewalk joint, not associated with the performance of the product. Treatment 4C has lost one dome documented in the spring 2004 report. This product has performed well, however there is an issue with the tactile function the device. The domes spread out to an overall flat shape. The top of the dome is greater than the required .5" which decrease the tactile effect these devices are designed for.



Installation 4A: Located on the southwest corner of 5th Ave. N.W. and 6th St. N.W.

This treatment connects the north-south pedestrian walkway.



Installation 4B: Located on the northwest corner of 5th Ave. N.W. and 6th St. N.W.

This treatment connects the east-west pedestrian walkway.

South end of treatment deteriorating at mortar joint.



Installation 4C: Located on the northwest corner of 2nd Ave. N.W. and 6th St. N.W.

East mortar joint failing.

Manufacturer: **Strongwarn Industries**
Treatment: **Three installations of the Applied Latex Modified Mortar Domes**
Site Location: **5A, 5B, 5C**

These installations have performed poorly, Substantial dome loss since last inspection, due to apparent blade damage. Base paint/adhesion is good. Color retention is fair.



Installation 5A: located at northwest intersection of 1st Ave. N.W. and 6th St. N.W.

50% loss of domes.



Installation 5B: Located at the southwest intersection of 3rd Ave. N.W. and 6th St. N.W.

40% loss of domes.



Installation 5C: Located on the southeast corner of the east Expopark entrance and 6th St. N.W.

60% loss of domes.

Manufacturer: **Cote-L Industries**
Treatment: **Two installations of Safti-Trax Plastic Sheets**
Site Location: **6A, 6B**

All installations were in poor condition at the time of inspection. Treatment 6A is continuing to lose adhesion around the edges of the mat. The anti-skid coating over the top of the rubber domes with treatment 6A & 6B is continuing to flake off. It is unclear if this is a result of blade damage, sunlight deterioration or through the action of freeze-thaw. Substantial dome loss by blade damage is apparent on both sites.



Installation 6A: located on the southwest corner of the intersection 2nd Ave. N.W. and 6th St. N.W.



Installation 6B: located on the northwest corner of the intersection 4th Ave. N.W. and 6th St. N.W.

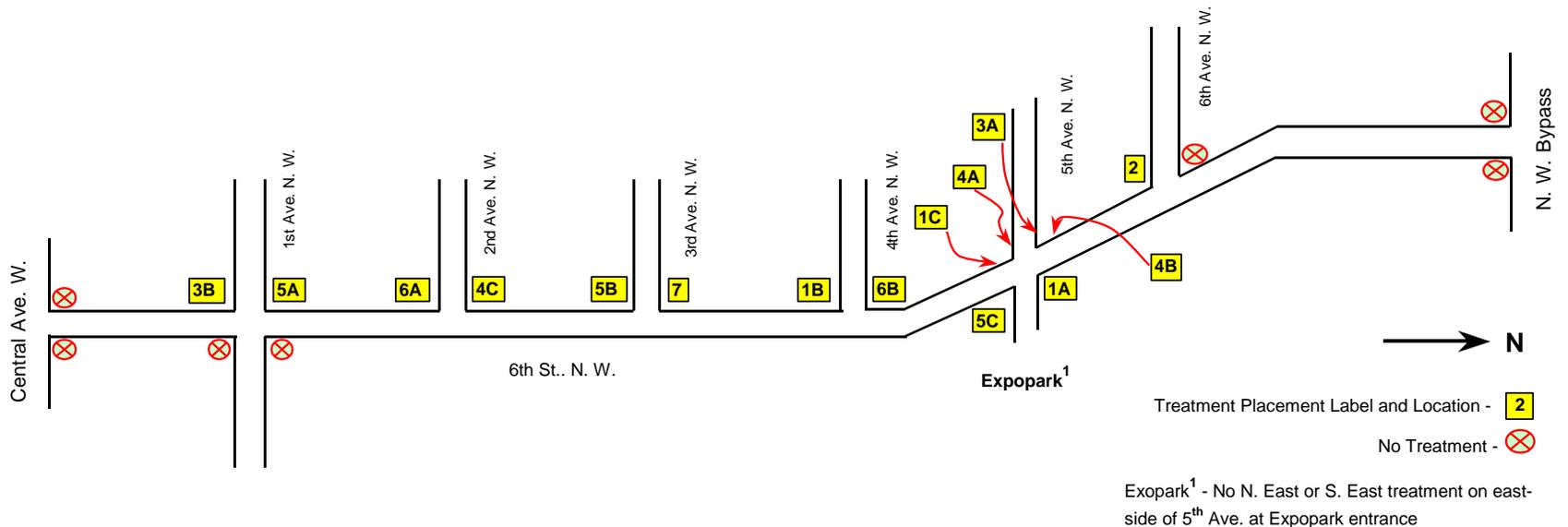
Manufacturer: **Cote-L Industries**
Treatment: **One installation of Safti-Trax New Rubber Mat**
Site Location: **7**

This treatment is failing rapidly. The surface of the mat has continued to rip and tear. There is substantial dome loss since the 2006 evaluation. Edges are loosing adhesion. Color is fair. At this time it is not a trip hazard.



Installation 7: Located on the northwest corner of the intersection of 3rd Ave. N.W. and 6th St. N.W.

<u>Treatment Type</u>	<u>Manufacturers</u>	<u>Label</u>	<u>Frequency</u>
Copolymer Composite Tiles	ADA Fabricators	1	3 (a, b & c)
Wet Anchor Box System	Disability Devices	2	1
Polyurethane Detectable Warning Mat	Disability Devices	3	2 (a & b)
Applied Truncated Domes	Vanguard ADA Systems	4	3 (a, b & c)
Applied Latex Modified Mortar Domes	Strongwarn Industries	5	3 (a, b & c)
Safti-Trax Plastic Sheets	Cote-L	6	2 (a & b)
Safti-Trax New Rubber Mat	Cote-L	7	1



Experimental Layout
 Detectable Warning Devices
 Truncated Domes for Curb Ramps
 Project STPU 5201(11)
 Great Falls