

New Hampshire
DOT
Research Record



**Durability of Truncated Dome Systems
(a.k.a. Detectable Warning Surfaces)**



Evaluation Report

Prepared by the Materials & Research Bureau of
the New Hampshire Department of Transportation

1. Report No. FHWA-NH-RD-MPS2002-2		2. Gov. Acc. No.	3. Recipient's Catalog No.
4. Title and Subtitle DURABILITY OF TRUNCATED DOME SYSTEMS (a.k.a. Detectable Warnings on Walking Surfaces)		5. Report Date APRIL, 2003	
		6. Performing Organization Code	
7. Author(s) DENIS M. BOISVERT		8. Performing Organization Report No.	
9. Performing Organization Name and Address NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION PO BOX 483, 1 HAZEN DRIVE CONCORD, NH 03302-0483		10. Work Unit No. (TRAVIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION PO BOX 483, 1 HAZEN DRIVE CONCORD, NH 03302-0483		13. Type of Report and Period Covered EVALUATION REPORT WINTER 2002/2003	
		14. Sponsoring Agency Code	
15. Supplementary Notes In cooperation with the U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION			
16. Abstract The Americans with Disabilities Act (ADA) has established accessibility requirements for State and local government facilities, places of public accommodation and commercial facilities. Under the ADA, the Access Board has developed and maintains design guidelines known as the ADA Accessibility Guidelines (ADAAG). ADAAG establish minimum requirements for new construction and alterations, which primarily cover facilities on sites, but has added new provisions specific to public rights-of-way. The provisions include the installation of truncated domes on sidewalks at roadway intersections. The guidelines apply where a pedestrian route is altered as part of a planned project to improve existing public rights-of-way. This report summarizes a test program to document the durability of eight truncated dome systems under winter maintenance conditions of plowing and surface de-icing treatment. Sidewalk test sections were pre-fabricated and dome systems were applied in a shop during December 2002 and January 2003. Following field assembly of the test sections, snow plowing operations were conducted as part of the City of Concord maintenance schedule in March 2003. The test area was also manually covered with snow and plowed repeatedly to compensate for the late start of the project. After 20 plowing cycles, two of the four products complying with the current dimensional requirements of the ADAAG stood out in their performance. Two of the four non-compliant products were also found to have durable qualities.			
17. Key Words TRUNCATED DOMES, ADAAG, BLIND, SIGHT IMPAIRED, DETECTABLE WARNING SURFACE, TACTILE, SIDEWALK, DISABILITIES, HANDICAP		18. Distribution Statement NO RESTRICTIONS. THIS DOCUMENT IS AVAILABLE TO THE PUBLIC THROUGH THE NATIONAL TECHNICAL INFORMATION SERVICE, SPRINGFIELD, VIRGINIA, 22161	
19. Security Classif. (of this report) UNCLASSIFIED	20. Security Class. (of this page) UNCLASSIFIED	21. No. of Pages 22	22. Price



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EVALUATION REPORT, WINTER 2002/2003
DURABILITY OF TRUNCATED DOME SYSTEMS
(a.k.a. Detectable Warnings on Walking Surfaces)



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April 2003

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ACKNOWLEDGEMENTS

The Bureau would like to thank the NHDOT Bridge Maintenance Bureau for its contributions to this evaluation, including fabrication of the test panels, installation of the dome systems and construction of the test site. The Bureau would also like to thank the City of Concord Highway Department for providing its equipment and manpower to plow and treat the test site.

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EXECUTIVE SUMMARY

According to the Federal Register of June 17, 2002, the Americans with Disabilities Act (ADA) has established accessibility requirements for State and local government facilities, places of public accommodation and commercial facilities. Under the ADA, the Access Board has developed and maintains design guidelines known as the ADA Accessibility Guidelines (ADAAG). ADAAG establish minimum requirements for new construction and alterations. The Access Board has undertaken rulemaking to supplement its ADAAG, which primarily cover facilities on sites, by adding new provisions specific to public rights-of-way. The draft guidelines would apply where a pedestrian route is altered as part of a planned project to improve existing public rights-of-way.

This report summarizes a test program to document the durability of eight truncated dome systems under winter maintenance conditions of plowing and surface de-icing treatment. NHDOT Bridge Maintenance Bureau coordinated with the product suppliers and constructed the test sections, assembled along the east side of Hazen Drive in Concord. The City of Concord plowed and treated the test section in conjunction with its regular municipal sidewalk maintenance. NHDOT Materials & Research Bureau documented the installation and evaluated the performance of the test sections.

Of the eight truncated dome systems tested, only four appear to be in compliance with the dimensional criteria of the draft ADAAG. The first winter's testing consisted of twenty plowing cycles in March 2003. Two cycles were on natural snowfall, while eighteen additional plowing cycles were performed on a single day by repeatedly removing snow, which had been placed on the test sections with a front-end loader. The Thin Paver and the Pressed Stone Block systems were identified as the most durable of the ADAAG compliant products. The Polymer Concrete and the Brick Paver systems also performed well, but do not appear to comply with the current ADAAG dimensional requirements. The remaining systems either performed poorly and/or did not comply with ADAAG.

BACKGROUND

Local jurisdictions covered by the ADA are required to construct or alter facilities in a manner making them accessible to people with disabilities. Previous guidelines focus mainly on facilities on sites. The ADA Access Board published guidelines for public rights-of-way addressing detectable warning surfaces in 1991, and issued them for comment in 1992 and 1994. Based on raised concerns about the specifications, the Board suspended its requirement for detectable warnings on the surface of curb ramps and other locations where pedestrian ways blend with vehicular ways without tactile cues. It undertook an outreach and training program, and sponsored research on tactile warnings at street crossings. The so-called moratorium ended in July 2001 with revised, draft guidelines being issued in June 2002. Additional revisions are currently being drafted, based on a four-month comment period and hearing held in October 2002.

Truncated domes provide a distinctive surface, which are detectable by cane or underfoot to alert people with vision impairments of the transition to vehicular ways. The warnings compensate for the sloped surfaces of curb ramps, which remove a tactile cue provided by curb faces. A 2-foot deep detectable warning surface is required where the ramp, landing, or blended transition connects to a crosswalk. They would be required to span the entire area where the curb drop-off is absent. This is especially important where there is no slope to help detect the presence of a ramp.

RESEARCH OBJECTIVE

This project evaluates the performance of eight truncated dome sidewalk systems for ease of installation and durability when subjected to normal winter maintenance and weather conditions. The products were not evaluated with regard to compliance with the color requirements of the draft ADAAG.

TEST SECTION CONSTRUCTION

Selection

The Materials & Research Bureau selected products from eight material and installation categories based on the availability of vendor and product information. A list of potential product suppliers was provided to the Bridge Maintenance Bureau. Vendors were contacted, and the products of those who cooperated with the State purchasing rules and/or responded to inquiries were used in the test sections.

Sidewalk Panel Fabrication

Due to the weather conditions, the Bridge Maintenance Bureau prepared the sidewalk test sections in their shop between December 10, 2002 and January 29, 2003. Sixteen concrete test panels were prepared, two for each dome system to be evaluated. Panels were constructed of Class A (3,000-psi) concrete as required by Section 520 of the NHDOT Standard Specifications for Road and Bridge Construction. A 12:1 upward grade panel and a 12:1 downward grade panel with installed horizontal lengths of seven feet represented each dome system. Individual panels were constructed as specified by the respective manufacturers to accommodate the truncated dome system assigned to that section. Five panel sets required recessed surfaces or saw cuts, while the Section 3 test panels were created by stamping the domes directly into the freshly finished concrete surface at the time of casting on December 31. Three panel sets were prepared with typical sidewalk surfaces for dome systems intended for post-construction applications.

Plain concrete panels were also fabricated for use as level sidewalk between the test panels. Seven-foot long panels would separate the sloped test panels at their upper ends. Five-foot long panels would be installed between the toes of the test panels. When assembled, each test panel pair and separation panel set would be 26 feet long.



Concrete panel fabrication in the Bridge Maintenance Bureau shop

Dome System Installation

Once the concrete had cured, installation of six truncated dome systems began on January 13, 2003 in the Bridge Maintenance shop. Sections 1, 2, 4, 5, 6 and 7 were installed per manufacturer application instructions. Representatives of ADA Fabricators, Inc. installed Section 5, Thin Pavers. The materials for Section 8, Brick Paver by Endicott Clay Product, did not arrive in time for installation prior to on-site assembly of the panels. Section 8 was installed in the field on February 19, 2003. Individual system installation information is listed below.

Field Assembly

The 229-foot test site is located along the east side of Hazen Drive, midway between the easterly curb and the existing bituminous sidewalk. Bridge Maintenance personnel began installing the pre-cast sidewalk panels on January 29, 2003. The area was cleared of snow, and prepared by placing and compacting a minimum 6-inch thick bed of Nitpak (crushed stone base) on the existing landscaped ground surface. Frozen soil was neither explored for depth nor removed prior to placing the bedding material. The shop-fabricated panels were transported to the site by flatbed truck and trailer, and lifted into place by a truck-mounted crane. Pre-cast panel installation was completed on February 10, 2003.

Cold Weather Concrete

A concrete approach ramp was cast-in-place at each end of the assembled pre-cast panels on February 14, 2003. This aspect of the project was coordinated with the US Army Corp of Engineers Cold Regions Research and Engineering Laboratory (CRREL) of Hanover, in association with an ongoing pooled-fund study titled “Extending the Season for Concrete Construction and Repair” (TPF-5(003)). That study, related to the use of antifreeze admixtures for cold-weather concrete, has included a number of previous field trials prior to the current project. The sidewalk placement was considered a “technology transfer” activity, with CRREL acting as an advisor to the Department’s batching, placement, finishing and curing efforts. More information regarding the concrete approach ramps is available at http://www.crrel.usace.army.mil/concrete.Extending_Concrete_Season.htm. Thermal insulation blankets protected the concrete until February 26, 2003, after which plowing of the test sections could begin as weather dictated.



During curing, February 20, 2003
South Ramp, Looking North



Ramp uncovered on February 26, 2003

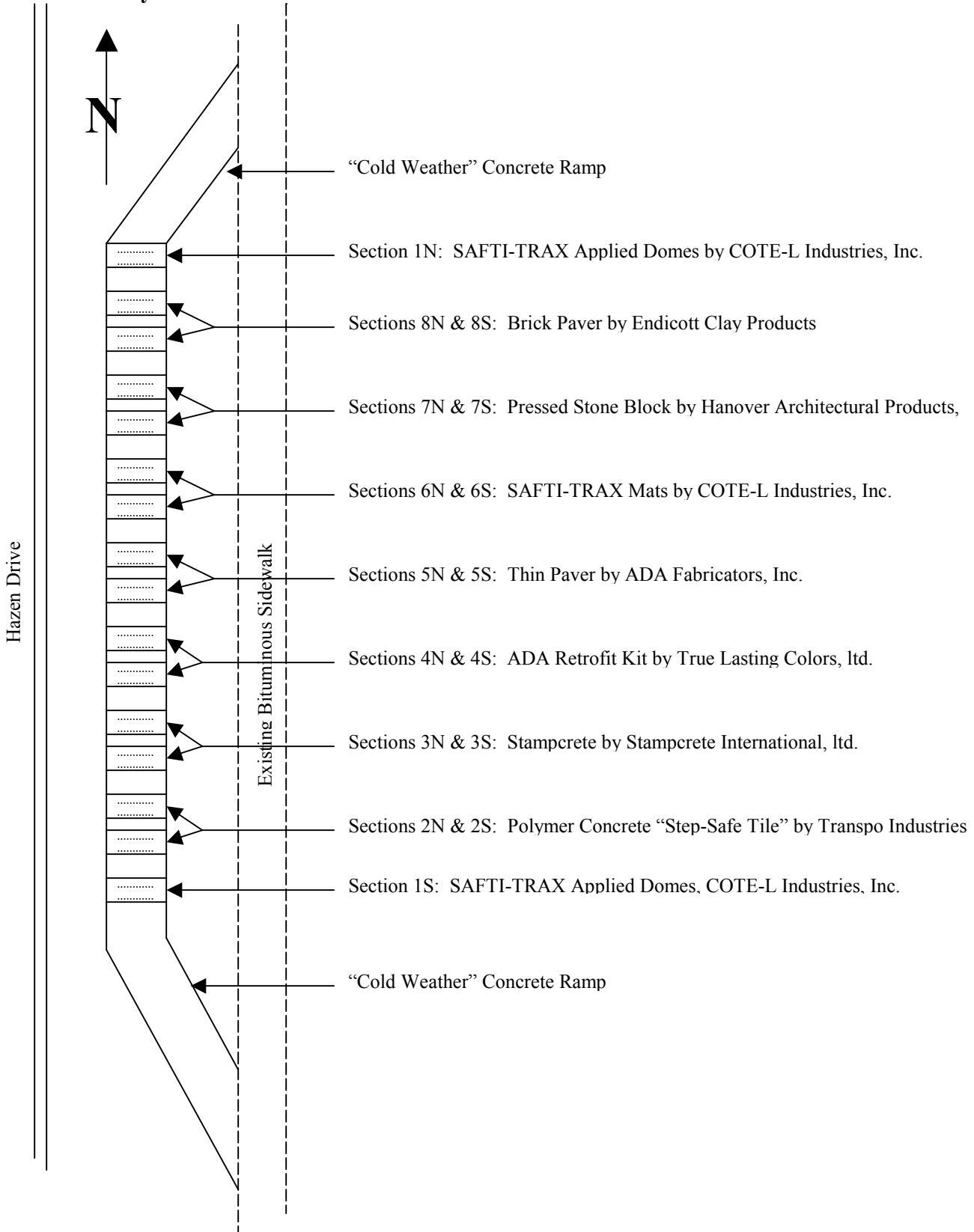


During curing, February 20, 2003
North Ramp, Looking South



Ramp uncovered on February 26, 2003

Site Layout



PRODUCT INSTALLATION DATA

Test Sections 1N & 1S:

Product: SAFTI-TRAX Applied Domes Detectable Warning System
Manufacturer: COTE-L Industries, Inc.
Installation: Concrete panel cast December 10, 2002 in Bridge Maintenance shop. System installed January 17, 2003 in Bridge Maintenance shop by following manufacturer's application instructions. Individual domes on a plastic sheet were applied to the concrete surface using Durabak adhesive. Colored sealer was then applied over the domes. Installation is considered easy, but the number of steps are lengthy compared to the other systems.
Product Cost: \$432.00 (both panels)



Section 1S



Section 1N

February 20, 2003
Completed Field Installation

Test Sections 2N & 2S:

Product: Polymer Concrete "Step-Safe Tile"
Manufacturer: Castek Division, Transpo Industries
Installation: Concrete test panel was cast on December 20, 2002 in Bridge Maintenance shop. $\frac{3}{4}$ " block out was created in the surface ($\frac{1}{2}$ " for the tile, $\frac{1}{4}$ " for the exterior grout). Grout was mixed and placed in block out area. $11\text{-}\frac{7}{8}$ " x $11\text{-}\frac{7}{8}$ " x $\frac{1}{2}$ " tiles were installed in grout. Installation occurred on January 13, 2003 in Bridge Maintenance shop. Installation was considered easy.
Comments: Diamond pattern domes do not appear to comply with current ADAAG requirements.
Product Cost: \$265.95 (both panels)



Section 2S



Section 2N

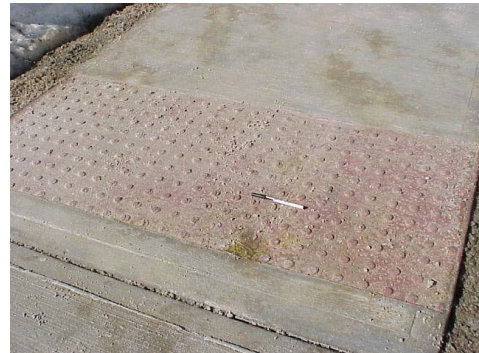
February 20, 2003
Completed Field Installation

Test Sections 3N & 3S:

- Product:** Stampcrete
Manufacturer: Stampcrete International, ltd.
Installation: Concrete test panel was cast on December 31, 2002 in the Bridge Maintenance shop. In accordance with the procedures outlined in the manufacturer's application instructions and video, domes were shaped into the surface of the fresh concrete by tamping a 24" square stamp immediately following finishing. Color pigmented sealer was applied to the domes on January 2, 2003 in the shop. Installation was considered easy.
Comments: The surface background is uneven. Domes heights vary, and many are deformed (perhaps an installation experience issue). NHDOT installers said quality of finish would improve with use of a stamp matching the sidewalk width. Approximately 10% of domes had lost their pigmented sealer at time of photos, below. Snow removal had been limited to hand shovels at that time.
Product Cost: \$321.75 (both panels), primarily for re-usable stamping equipment.



Section 3S

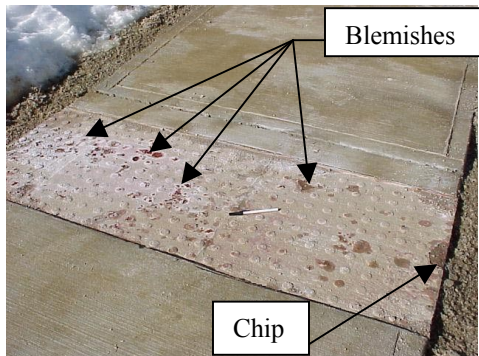


Section 3N

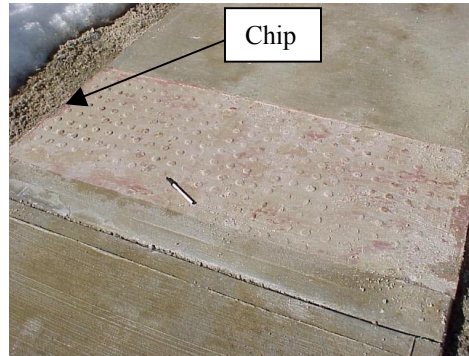
February 20, 2003
Completed Field Installation

Test Sections 4N & 4S:

Product: ADA Retrofit Kit
Manufacturer: True Lasting Colors, Ltd.
Installation: Concrete test panel was cast on December 16, 2002 in the Bridge Maintenance shop. Following procedures outlined in manufacturer's application instructions and video, domes were stamped into the surface-applied product using a 24" square stamp template on December 22, 2002. Color pigmented sealer was applied to the domes on January 23, 2003 in the shop.
Comments: Installation crew was unhappy with the initial result (the product mix did not appear stiff enough), and re-installed the system, taking additional care in measuring product proportions per the application instructions. The resulting installation was similar to the first attempt. Loose or high slump condition of the mix required that the sidewalk panel be lifted to near level to keep the mix from flowing. Dome heights vary, and some are barely visible. Four domes are missing. Conditions in photos include chipped edges and multiple surface blemishes.
Product Cost: \$469.24 (both panels), including re-usable stamping equipment



Section 4S



Section 4N

February 20, 2003
Completed Field Installation

Test Sections 5N & 5S:

Product: Thin Paver
Manufacturer: ADA Fabricators, Inc. (supplied by Genest Concrete)
Installation: Concrete test panel was cast on December 16, 2002 in the Bridge Maintenance shop. The installation surface was left with a 1/8" recess and a broom finish. Edges were saw cut where required for flanges on the dome panels. A manufacturer's representative was on hand January 29, 2003 when the 2' x 2' panels were set on a layer of adhesive, applied with a 1/4" x 1/4" square notch trowel. Several holes

were drilled to install mechanical fasteners into the concrete, followed by sealant application. Installation was easy; requires second day visit to apply sealant.

Product Cost: \$173.25 (both panels)



Section 5S



Section 5N

February 20, 2003
Completed Field Installation

Test Sections 6N & 6S:

Product: SAFTI-TRAX Mats

Manufacturer: COTE-L Industries, Inc.

Installation: Concrete test panel was cast on December 10, 2002 in the Bridge Maintenance shop. The dome mats were installed on January 16, 2003 by applying and spreading adhesive to the masked concrete surface in accord with manufacturer's application instructions. The mats were then pressed into place with a maximum 1 square foot flat board. This product was easiest to install.

Product Cost: \$432.00 (both panels)



Section 6S



Section 6N

February 20, 2003
Completed Field Installation

Test Sections 7N & 7S:

Product: Pressed Stone Block
Manufacturer: Hanover Architectural Products, Inc.
Installation: Concrete test panel was cast on December 20, 2002 in the Bridge Maintenance shop. A 2-3/8" recess was left in the concrete surface (2-1/8" for the block, 1/4" for the exterior grout). Exterior bonding mortar was mixed and applied to the concrete in the shop on January 13, 2003, followed by setting the 11-3/4" x 11-3/4" x 2-1/8" blocks into place. The joints were grouted on January 14, using sanded exterior grout. Installation was easy, requiring 2 days to apply products.
Product Cost: \$420.50 (both panels)



Section 7S



Section 7N

February 20, 2003
Completed Field Installation

Test Sections 8N & 8S:

Product: Brick Paver
Manufacturer: Endicott Clay Products
Installation: Concrete test panel was cast on December 31, 2002 in the Bridge Maintenance shop. A 2-3/8" recess was left in the concrete surface (2-1/8" for the block, 1/4" for the exterior grout). An enclosure was constructed to heat the test panels, which had already been assembled at the test site. Exterior bonding mortar was mixed and applied to the concrete in the field on February 19, 2003, followed by setting the 7-3/4" x 3-1/2" pavers into place. The joints were grouted on February 19, using sanded exterior grout. The protective tent was removed on February 26, 2003. Installation was easy, requiring 2 days to apply the products.
Product Cost: \$305.00 (both panels)



Section 8S



Section 8N

February 26, 2003
Completed Field Installation

TESTING AND DATA COLLECTION

Detectable Warnings

The ADAAG describes detectable warnings as a surface of truncated domes aligned in a square grid pattern. The truncated domes are specified with a base diameter of 0.9 to 1.4 inches (23 mm to 36 mm), a top diameter of 50 to 65 percent of the base diameter and a height of 0.2 inches (5 mm).

Dome spacing should have a center-to-center spacing of between 1.6 and 2.4 inches (41 to 61 mm), and a base-to-base spacing of at least 0.65 inch (16 mm), measured between the most adjacent domes on the square grid.

Early Documentation

Deterioration of Section 4S (ADA Retrofit Kit) was noted in the period between the test site completion and the beginning of plowing. The shell of the red applied product had been broken off several domes, exposing a powdery base. The material could be readily penetrated, appearing to have no particle bonding properties. In contrast, Section 4N was sound, apparently not suffering from the problem. Both panels had been installed from the same batch of mix.

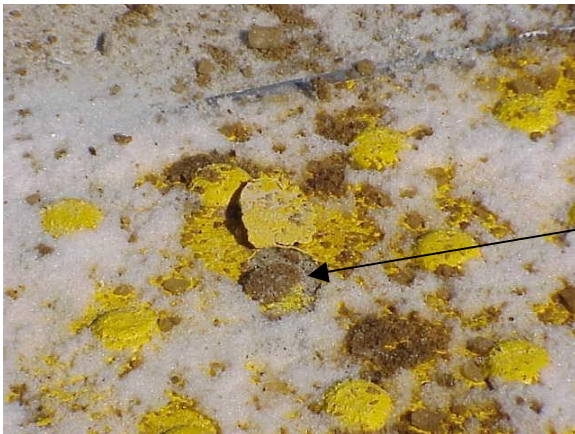
After a minor snowfall of about 2 inches, City of Concord Highway Department personnel were on site on March 7, 2003 to perform the first snow plowing of the test sections. Mr. Jim Major represented the City forces to discuss the method in which passes would be made and to coordinate the communication of plowing cycles to NHDOT for documentation. It was decided to make all plow passes from south to north to see if down-gradient panels would wear differently than up-gradient panels due to vehicle orientation as the panels were contacted.

The City generally clears the sidewalks with a 5-foot wide articulated 4-wheel drive vehicle with a hydraulically angled plow blade. The vehicle is also used to distribute a sand/salt mix. The mix includes a liquid product called Ice Be Gone. The liquid extends the salt supply and is less corrosive than salt, prolonging equipment life. Treatment would be applied at the same

frequency as the City's walks. The plow blade is generally free-floating (no down pressure). Blade angle settings are determined by a variety of factors such as whether the vehicle is traveling with or against traffic, driveways or other features. Snow is typically pushed toward the street/curb. This day's operator lead with the left end of the blade.

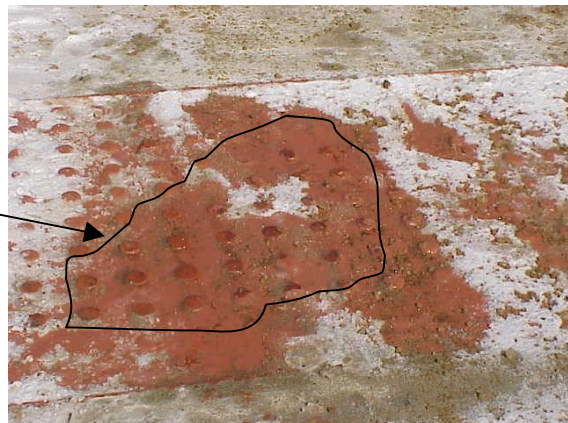


The first single pass of the plow damaged six of the sixteen test panels. All were up gradient panels. The up gradient panels face the south, and are nearly free of ice due to their sun exposure. Ice filled the space between domes or completely covered the down gradient panels. Damage ranged from removal of a single dome (Section 1S) to scalping or removal of up to 35 domes (Section 4N). A coordinate grid was created for each test panel to document damage locations. While facing a northerly direction, rows of domes were numbered from top to bottom; columns are lettered from left to right. Damage logs were created on spreadsheets for each section.



Section 1S: A single dome (J2) was removed from the panel in this plowing cycle.

Section 4N: 35 domes were either scalped or chipped, primarily within the central and western areas, shown.



A second minor snowfall was plowed on March 14, 2003. Thirteen test panels received damage ranging between the scuffing of dome surface texture (Section 2S) to a mass loss of domes. The table below summarizes the damage.

**Table 1
Summary of Early Damage**

Section	Damaged Domes	Removed Domes	Comments
1S	64	4	
1N	31	2	
2S	3	0	
2N	9	1*	*Tile chipped at installation
3S	19	0	Much color seal missing
3N	4	0	Much color seal missing
4S	31	129	
4N	0	0	
5S	0	0	
5N	0	0	
6S	4	0	
6N	18	13	Mat peeled up A3-9 to J3-9 K2-4 to R2-4. Mat was torn off K5-10 to R5-10.
7S	1	0	
7N	3	0	
8S	3	0	
8N	14	1	

The “Plow Rally”

The completion of the test section in late February 2003 resulted in concern that there may not be enough storms left in the winter season to constitute a satisfactory number of plowing cycles. Ample snow was piled at the edge of the site to prepare it for assembly of the test sections. A day was planned to generate as many artificial snowfall cycles as could be completed.



The NHDOT Mechanical Services Bureau provided a John Deere 544C front-end loader to place snow on the test sections on a sunny March 18 with temperatures in the mid-50s. The City-owned Holder C9700H plow vehicle cleared the snow eighteen times, generating much data. By the end of the “rally”, Sections 1, 4S and 6 had suffered severe damage; Section 6 (COTE-L SAFTI-TRAX mats) had been totally peeled off the sidewalk by this day’s 11th pass (a total of 13 passes).

EVALUATIONS

None of the products were difficult to install. However, only four of the eight tested systems appear to meet all of the dimensional requirements of the ADAAG. The compliant systems were Stampcrete, ADA Retrofit Kit, Thin Pavers and Pressed Stone.

The stamped types were the least attractive due to deformities of the domes and background mat. The stamped concrete system is applied directly into the freshly finished concrete, and is therefore only applicable to new construction. The use of a properly sized stamp for the Stampcrete system would improve this product. The ADA Retrofit Kit was more difficult to install due to the consistency of the product. Severe dome deformities in portions of these systems result in dimensional non-compliance with the ADAAG. These systems would require additional installation experience to produce constant and acceptable results. Each of these systems showed substantial damage and wear after the initial testing of 20 plow passes. Each also lost portions of their color seal, even in areas not contacted by the plow.

The Thin Pavers and Pressed Stone types are pre-manufactured products. These installations were considered more attractive due to their uniform appearance and well formed domes. The Thin Pavers performed best of the compliant systems. Only one dome was lost, and just over 10 percent of the domes suffered greater wear than abrasion of the six dots on the top of each dome surface. The Pressed Stone tiles lost no domes during the initial testing. However, substantial incremental wear was observed on 96 percent of the dome surfaces. Wear was most significant on the first row encountered by the plow, diminishing across the panels. The wear pattern is expected to extend throughout the dome field with long-term plowing.

Although they do not appear to meet the ADAAG requirements, the Polymer Concrete “Step-Safe Tile” and the Brick Paver systems (sections 2 and 8, respectively) performed well. The Polymer Concrete tiles lost no domes from plowing, and only 8 percent were damaged, primarily in the first row of contact as with other systems. Excluding those damaged by the front-end loader, the Brick Paver system also sustained damage in only 8 percent of its domes, including seven lost domes. These products would be worth considering for use if the manufacturers brought them into dimensional compliance. Specific requirement deficiencies are listed below.

The systems were each installed per the respective manufacturer’s instructions. The heaviest dome wear/damage at sections 2, 3, 5, 7 and 8 occurred at the domes first encountered by the plow. The two systems installed on normal sidewalk surfaces suffered substantial damage or

total destruction. Increasing the recess such that the domes are flush with the sidewalk surface plane may result in improved wear properties by reducing plow contact with the sides of the domes. Additional testing would be required to confirm this theory. Wear patterns did not appear to vary based on the upward or downward gradient of the panels. An observation and performance summary follows for each truncated dome system that was tested. Table 2 summarizes dome damage at the end of 20 plow passes.

Section 1-SAFTI-TRAX Applied Domes

- System does **not** appear to comply with the ADAAG:
 1. Dome tops are 67 percent of the base dimension.
- Domes are surface mounted, extending above the plane of the sidewalk surface.
- Dome failure typically began by shearing at the contact face with the plow. Repeated cycles resulted in loss of top or of entire dome.
- The product material is soft and resilient, not very durable against plowing.



1S at 5 passes



1S at 7 passes



1N at 17 passes

Section 2-Precast Polymer Concrete

- System does **not** appear to comply with the ADAAG:
 1. Domes are not positioned in a square grid pattern.
 2. Dome top is 94 percent of the base dimension.
- The tile is mainly flush with the plane of the sidewalk surface; domes extend above the plane, resulting in greater wear of the first row encountered by the plow.
- Materials showed high durability.



2S after 20 passes

Section 3-Stampcrete

- System specifications comply with the ADAAG.
- Uneven installation results in domes being above and below the sidewalk surface plane.
- Some domes were misshapen from fabrication
- Top of the higher domes showed wear at 20 plow passes.
- Color seal deteriorated soon after installation; continued wear under plowing.



3S at 6 passes

Section 4-ADA Retrofit Kit

- System specifications comply with the ADAAG.
- Installation occurs in a recess in the concrete; domes are below the sidewalk surface plane.
- Actual installation resulted in misshapen domes of varying height; some barely visible.
- 4S was totally destroyed in 5 plow passes. In spite of both panels being fabricated from the same batch of mix, this panel was easily damaged, even prior to plowing, as opposed to the sound condition of 4N.
- Color seal of 4N began peeling; top of domes wearing at 20 plow passes.



4S at 3 passes



4S at 14 passes



4N at 5 passes



4N at 14 passes

Section 5-Thin Paver

- System complies with the ADAAG.
- Mats are installed in a shallow recess in the concrete, making it flush. The domes extend above the sidewalk surface plane.
- At 11 plow passes, water would squeeze out from beneath the mat, perhaps indicating breakdown of adhesive.
- After 20 plow passes, minor wear to 11% of domes and the removal of some of the dots located at the top of the domes.



5S after 20 passes

Section 6-SAFTI-TRAX Mats

- System does **not** appear to comply with the ADAAG:
 1. Base diameter is 0.84 inch.
 2. Dome top is 79 percent of the base dimension.
- Material is soft and resilient
- Early damage resulted due to the lack of a recess in the concrete surface; the plow caught the mat edge and peeled the system off the concrete.



6S at 6 passes



6S at 9 passes



6N at 3 passes

Section 7-Pressed Stone Block

- System complies with the ADAAG.
- Tiles are set flush with the sidewalk surface plane; domes extend above the plane.
- Although generally resistant to plow damage, the first row of domes encountered by the plow showed progressive wear extending across the test panel.



7N at 10 passes

Section 8-Brick Paver

- System does **not** appear to comply with the ADAAG:
 1. Dome top is 86 percent of the base dimension.
- Pavers are set flush with the sidewalk surface plane; domes extend above the plane.
- Front end loader bucket damaged domes of 8S, rows 8 through 11 while preparing for fourth plow pass
- Four 8S domes lost by plow pass 3; no others through 20 passes.
- One 8N dome lost through 12 plow passes; no others through 20 passes.



8S at 4 passes

**Table 2
Summary of Damage After 20 Plow Passes**

Section	Damaged Domes	Removed Domes	% of Domes Damaged & Removed	Combined Percentage	Comments
1S	93	51	72	79	
1N	129	40	85		
2S	39	0	13	10	
2N	31	1*	6		* lost at installation
3S	27	16	16	18	
3N	56	0	20		
4S	0	270	100	75	Defect in mix?
4N	108	33	49		
5S	7	0	1	8	
5N	82	1	17		
6S		200	100	100	Sheet torn off
6N		200	100		Sheet torn off
7S	0*	0	0*	0*	* 96% of domes show
7N	0*	0	0*		overall incremental wear
8S	9	3	3	7	Excludes loader damage
8N	39	4	11		

RECOMMENDATIONS

The Bureau recommends the use of Thin Pavers and Pressed Stone Blocks for the 2003 construction season, as they are most durable of the compliant products tested. These products will be observed for long-term performance, including a second winter plowing season.

Although they do not appear to meet the ADAAG requirements at this time, the Polymer Concrete “Step-Safe Tile” and the Brick Paver systems (Sections 2 and 8, respectively) performed well. These systems would be acceptable if brought into dimensional compliance, or if ADA requirements are waived or revised.

IMPLEMENTATION

It is anticipated that the Department will incorporate truncated dome systems into its projects for the 2003 construction season. The Bureau will place the recommended products on the Qualified Products List. The list may be amended as evaluations continue. Visual contrast requirements were not evaluated as part of this research.