# EVALUATION OF DETECTABLE WARNINGS/DIRECTIONAL SURFACES ADVISORY COMMITTEE (EDWAC)

**Division of the State Architect**
**Underwriters Laboratories Inc.**

**Minutes of a Public 2-Day Meeting held on:**
**Thursday, February 17, 2005 and**
**Friday, February 18, 2005**

1102 Q Street, 5th Floor Conference Rooms
Sacramento, California

# DAY ONE

## MEETING ATTENDANCE ON THURSDAY, FEBRUARY 17, 2005

**Committee Members Present**
Doug Hensel
Jeff Holm
Arfaraz Khambatta
Eugene (Gene) Lozano, Jr.
Minh Nguyen
Michael Paravagna
Paula Anne Reyes-Garcia
Richard Skaff
Jane R. Vogel

**Committee Members Absent**
Victoria Burns
David Cordova
Tom Whisler

**DSA Staff Present**
Derek M. Shaw

**UL Staff Present**
Jeff Barnes
Michelle Courier
Esther Espinoza
Andre Miron

**Others Present**
Robert Branning, HUB Has It
Donna Coe, Naviplate, Inc.
Greg R. Francis, GRF Comm Provisions, Inc.
Craig Gerber, Cold Spring Granite
Francis, G. Hamele, Wausau Tile
Paul Hantz, Wausau Tile
Mark Heimlich, Armor-Tile
Jon Julnes, Vanguard ADA Systems Of America
Jeff Koenig, Detectable Warning Systems Inc.
Phil Montgomery Sr., Disability Devices, Inc.
Duane Sippola, MetaDome, LLC
Michael Stenko, Transpo Industries, Inc.
Dustin Upgren, Cold Spring Granite
Chip Van Abel, Naviplate
Ed Vodegel, Flint Trading, Inc.
Lex Zuber, HUB Has It

## FEBRUARY 17, 2005

***<u>General</u>* – A meeting of the Evaluation of the Detectable Warnings/Directional Surfaces Advisory Committee (EDWAC) was held on February 17 and 18, 2005 at the California Community Colleges Building in Sacramento, California. The purpose of the meeting was to introduce and discuss known technologies, review testing programs provided in a draft of proposed requirements, and to discuss other issues related to the evaluation of detectable warnings and directional surfaces.**

***The following minutes/meeting report is not intended to be a verbatim transcript of the discussions at the meeting, but is intended to record the significant features of those discussions.***

### 1. Call to Order (Jeff Barnes/UL)

Jeff Barnes called the second meeting of the advisory committee for detectable warnings to order at 10:15 a.m. Jeff delayed the start of the meeting by 15 minutes, in order to permit late arriving members to arrive. By 10:15 am, only six EDWAC members were in attendance. Jeff noted that the meeting would proceed with committee discussions, information presentations, and comments collected, however there would be no voting. Any activity requiring final action, such as voting, would be postponed until there was a minimum of nine members in attendance.

### 2. Review of Meeting Protocol (Jeff Barnes/UL)

Jeff conducted a quick review of the meeting protocol. At the November 10, 2004 meeting, a quorum was determined as being met, if at least nine members (approx. 75 percent of the committee members) were in attendance. Jeff noted that the meeting would start and proceed that day, although there was no quorum, since only six of the twelve EDWAC members were in attendance on February 17, 2005 at the start of the meeting.

Jeff stated that only topic discussions could be held, with no voting until later in the day, if an additional three members arrive late to the meeting, or until the next day, if nine or more members attend the meeting on Friday, February 18, 2005. All committee voting for motions will be conducted by establishing a simple majority, which follows Robert's Rule of Order.

Jeff emphasized the scope and goal of the committee, which consist of establishing performance criteria for detectable warnings and directional surfaces. The committee needs to establish the longevity of the product in the field, in order to determine its compliance with the State of California building codes. After five years the product should not degrade in its performance characteristics by greater than 10 percent. When questioned by Richard Skaff if bonding material would be included as part of performance characteristics to be evaluated by the EDWAC, Jeff Barnes responded that yes, "attachment" would be included.

**3. EDWAC Member Introductions/Roll Call (Jeff Barnes/UL)**

EDWAC members, UL and DSA staff took turns introducing themselves.

**4. Review/Adopt Minutes of November 10, 2004 Meeting (Jeff Barnes/UL)**

Jeff asked if any committee members had questions or comments concerning the November 10, 2004 meeting minutes. There were no comments from EDWAC members.

**5. Motions Before Committee from November 10, 2004 Meeting (Jeff Barnes/UL)**

Jeff Barnes submitted the following eight definitions for review. The definitions were originally proposed at the November 10, 2004 meeting. Jeff noted that at the request of

DSA, minor editorial revisions were added to all of the previous definitions, which are consistent with the definition format used in building code documents. See Exhibit A, from the Exhibits for the February 17 – 18, 2005 Meeting Agenda, for the text of the proposed definitions.

Jeff submitted the following definition for review and discussion:

1*) DETECTABLE WARNING is a standardized surface or feature, consisting of truncated domes and the field surface between and surrounding the truncated domes, that is built into or applied to walking surfaces or other elements to warn visually impaired persons of hazards in the path or travel.*

Richard Skaff asked if the terms "truncated domes" should be defined? If not, Richard would recommend adding a reference to the source in the definition. For example, a reference could be made to ADA, or California Building Code CCR, Title 24, Part 12, Chapter 11B.

Jeff Barnes pointed out that the term "truncated domes" is already defined within the building codes. At the previous meeting, a motion was made by Gene Lozano to clarify the definition of detectable warning by adding the terms "truncated domes, and the field area between the domes". The point of the current proposed definition was to address this motion.

Richard Skaff suggested adding references to the definition, which would refer to the Americans With Disabilities Act Accessibility Guidelines (ADAAG) sections, or the building code, which could be worded to state "California Building Code, Title 24", with the section number provided in parentheses.  However specific details or definitions from the building code would not be necessary.

Gene Lozano agreed with Richard Skaff suggestion that references should be added to the definition for detectable warning, although he would not recommend referring to ADAAG, since the scope of the committee is limited to Title 24.

Paula Reyes-Garcia notes that the correct reference if used in the definition, should be "CCR Title 24, Part 2 (Chapter 11B) and Part 12".

Richard Skaff added that a possible problem would be that Chapter 11B does not define color.  However, Chapter 11A does define colors, and should be used as a reference.

Gene Lozano reported that in Article 1133B.8.3 of the building code specifies that the color yellow is required for transit boarding platforms, and the color is also cross-referenced to vehicular way requirements.

Jeff stated that as it relates to this definition for detectable warning, color does not play into the definition. The proposed definition is a clarification of what the detectable warnings consists of, which is truncated domes and the field surface between the domes.

Richard Skaff however, disagreed with the proposed definition.   Richard noted that unclear definitions have been a problem in the product determination by local authorities and what they are required to do with detectable warnings.  There was a report about one local entity that's been attempting to use detectable warnings, which uses the color red or black instead of the usual international yellow. This does not meet the intent of building codes, which is to use the regulation yellow color. These agencies have not been looking at Chapter 11A, therefore it is important to use the correct references in the definitions. It should be noted that detectable warnings consist of size, shape and color. Although, the proposed definition need not get into all the specific details of size, shape and color, it should make the statement that detectable warnings consist of size, shape and color.

Jeff Barnes stated that within the building code, color requirements are not specified except in specific instances. This would be part of the discussion topic planned for Friday, February 18, 2005, when the resiliency and color aspects of detectable warning would be discussed. In terms of the definition, to redefine the building code to state that the color yellow is always required would be beyond the scope of the committee to define color in detectable warnings. The purpose of the committee is to establish performance criteria, not the color of a particular detectable warning. If a detectable warning has color, then the committee should consider if the color is or is not likely to fade over time. It's important to look at the performance aspect of color. The code provides the guidelines, and it is up to DSA and other lawmakers to clarify the code if color is to be specified in other instances thus changing the requirements.

Minh Nguyen was in agreement with both comments, and is concerned that if references were made to the code in this definition, then the EDWAC would need to consistently refer to code throughout the requirements, on nearly every single item. Minh agreed with Jeff Barnes that the EDWAC should be concerned primarily with performance and evaluating testing material. The committee is not responsible for redefining the building code. If the committee agrees to add references in this definition, then caution should be taken so as not to leave out or overlook important details. Therefore, adding references to the definitions is probably not a good idea.

Jeff Barnes was in support of Minh's comments, and noted that in the first paragraph of the initial draft proposal (Exhibit B) refers to the California Code of Regulations, Title 24, Parts 1 and 12. Therefore, using this building code reference incorporates the code definitions into the proposed draft proposal, and specifically to the definitions provided in the draft document.

The committee agreed that it would be acceptable to not provide code references in the definition, as long as the first paragraph retains its current reference to the building code. The modified definition was accepted. All members verbally agreed, and plan to formally address this acceptance once the EDWAC has a quorum in attendance.

Jeff submitted the following definition for review and discussion:

*2) DIRECTIONAL SURFACE is a standardized surface or feature, consisting of raised bars and the field surface between and surrounding the raised bars, that is built into or applied to walking surfaces to guide visually impaired persons along the path or travel.*

Paula Reyes-Garcia suggested that the last sentence in the definitions for detectable warnings and directional surfaces should be corrected from "hazards in the path or travel" to "hazards in the path of travel".

**<u>Manufacturer/Public Comments for Item 1 and 2:</u>**

<u>Jon Julnes Comments</u>:

a) Pursuant to linking references to definitions, the California Building Code defines detectable warning as truncated domes.  So linking references to the building code would not clarify the definition any further. The reason why it was defined as “truncated dome” was because truncated domes are a specific term.  Domes are generally accepted as half of a hemisphere, and the word “truncated” means the top is cut off. The definition is specific enough not to require further reference, since the building code does not more clearly define “truncated domes.”  The current proposed definition is sufficient to define detectable warnings.

Derek reports that the building code doesn’t provide a definition for truncated domes. Although, the code does offer a definition for the term “detectable warnings.”  The code specifies, “Detectable warnings is a standardized surface or feature built into or applied to walking surfaces or other elements to warn visually impaired persons of hazards in the path of travel.”

b) Jon Julnes reaffirmed his comments that the current definition was sufficient to describe the purpose of the committee, which was to define mechanisms to validate the structural integrity of future products and so forth.   The location of where and how are clearly defined in the state codes, which has nothing to do with the structural integrity of the issues being discussed by the committee.  Linking would be a moot point.  The current definition was valid, and should stand on its own.

<u>Mark Heimlich Comments:</u>

He supported the proposed definition, which was complete and accurate, and needed no references added.   However, if references were to be made, then a description of the raised bar would need to be part of the definition for directional surfaces.

The committee agreed that Paula's proposed revisions were needed, and that no other revisions would be necessary.

Jeff submitted the following definition for review and discussion:

*3) SHAPE is the ability of the detectable warning/directional surface material, and in particular the surface features (truncated domes and raised bars) of the material, to retain its original shape when subjected to varying degrees of temperature, moisture, pressure, or other stress.*

Paula Reyes-Garcia questioned whether salt spray, chemical testing, and the durability of plastic materials are tests applicable to the "shape" definition.  If chemical testing is added, will specific chemicals be noted in the definition, or will this information be added to other stress tests?

Jeff introduced Andre Miron, who has been with UL for nine years with extensive experience in material science, and who had been directly involved with developing the proposals in Exhibit B.

Jeff Barnes announced that Jeff Holms from Highway Administration had just arrived at the meeting.  However, one more member would still be needed in order to have a quorum.

Andre Miron explained that samples were to be subjected to various conditions, prior to testing, so yes, tests with chemical interactions, salt-spray, and UV exposure, would be applied to the tests used to evaluate shape. Therefore these tests would be part of the scope of shape. Other stress tests do a good job of lumping everything in, but the committee can discuss this further, if necessary.

Paula Reyes-Garcia recommended that while discussing and defining the conditioning tests in the performance section of the standard, that the committee should specify which tests are to be conducted in testing for shape, attachment, color fastness, and similar durability testing. The list of tests would not be needed in the definition

Gene Lozano asked if flammability and toxicity were part of "shape" testing? Toxicity has been a huge concern for transit operators, who must deal with tunnels, and other surface construction concerns.

Jeff Barnes noted that these issues were not meant to be addressed by the EWAC at this time. It appears that EDWAC members are discussing the design elements of particular products, questioning the types of materials manufacturers need to manufacture from, and the ratings of those materials. These issues may eventually be addressed, in terms of flammability and toxicity, although at this time the focus should be on detectable warnings and their durability, which is the main goal of the EDWAC. Eventually recommendations could be made in the final report proposing that these and other issues should be addressed. The committee's purpose for the immediate future is to diligently work on the durability of detectable warnings and directional surface products.

Minh Nguyen questioned whether while defining shape, dome texture should be addressed in relation to the evaluation of shape?

Jeff Barnes reported that there were no established criteria for surface texture, and what it was required to look like, other than it's shape. Therefore, at this point there is no need for further discussion on this issue. At the previous meeting, there was a suggestion that slip resistance should be considered as part of this group's work, and this is an issue that could be considered later as an add-on recommendation after the performance criteria of the product has been established, and it's longevity determined.

Minh Nguyen asked if the committee shouldn't be trying to determine the shape and type of testing, in order to establish slip resistance criteria? Shouldn't the evaluation of texture be included as part of the testing program for truncated domes?

Jeff Barnes stated that the challenge for the committee is that there is no requirement for texture in the building code. The committee's goal is to establish performance criteria, and not determine the texture requirements of the detectable warnings. However, as noted earlier, the committee can consider making recommendations to DSA, at the conclusion of the committee's assigned task.

Minh Nguyen replied that he was not looking to establish texture, but to propose a test program to test texture over a period of time. Manufacturers may manufacture a product with a slip resistance texture, but there currently are no specified test methods to evaluate slip resistance. The committee should consider how evaluating texture could meet these slip-resistance criteria.

Jeff Barnes replied that in terms of the shape evaluation, the committee would be reviewing details of what is actually being proposed, and whether the shape construction can retain its shape, with no deforming or grinding down of material occurring over a period of time.

Minh questioned how slip resistance would be verified whenever the manufacturer claims that their product provides slip resistance? Minh reminded the committee that individuals can trip on the domes, so if a manufacturer constructs a non-slippery surface, then the committee should proceed by evaluating that surface. Persons with high heels for example can trip or slide on slippery ramps.

Jeff Holm made the observation that determining a test program for slip resistance is beyond the scope of the committee. Durability remains the main issue for the committee. It's possible that there is a durability issue in relation to slip resistance of the domes, and if this is the case, then the committee can address this as part of its assigned task. However, to solely look at slip resistance, is not part of the committee's goal in determining proposed requirements for the durability of detectable warnings.

Paula Reyes-Garcia suggested that if the committee agrees to make a final recommendation for slip resistance that the recommendations include references to any testing that is already available. If the manufacturer wants to state that their product has slip resistance, then it should meet these established test requirements.

Jeff Barnes announced that the committee should proceed with durability determination as the main focus, and once a quorum is available, consider whether to make a recommendation to address slip resistance because of the high interest on this issue among EDWAC members. The committee could consider making a simple suggestion that DSA needs to consider slip resistance, or if time permits recommend a few more specific proposals after additional committee discussions and research.

**Manufacturer/Public Comments:**

Mark Heimlich Comments:

Mark agreed with shape definition, and supports recommending tests on slippage, and flammability or any other tests that may be introduced and discussed later as the committee continues to evaluate detectable warning products.

Jon Jules Comments:

a) Jon agreed with the test recommendation for slippage, and has seen that slippage can become a problem within 6 months, 12 months, or 2 years after the product has been installed. Some manufacturers offer a short-term warranty such as 12 months for example, if an approved installer is used, for promoting non-slipping detectable warning products.

b) The color issue should also be addressed, and Jon recommends that the designated color be yellow. There are currently too many colors being used throughout the country. Jon would prefer yellow be the required color, however whichever color is used, a position needs to be taken where only one color is used by all. Consistency is needed to address the color issue.

Richard Skaff supported the comment on color by noting that DSA in their original interpretive manual had the general intent that curb ramps should be consistent no matter the location of the ramp placement in California. Richard recommended that curb ramp designs should be standard, which includes using a standardized color.

Although the slopes may be different due to topography, the color yellow should be consistent, and the design standardized.  The other issue to note about color is that it's a color easily seen, and generally used as a visual warning for curb ramps.  If the committee uses this color determination for durability using UL as a basis, it's going to set a standard, and this is needed for the entire curb ramp concept.  It should be inclusive of all the issues that have come up such as fire, slip resistance, color, and other related safety concerns.

Jeff Barnes made note that there are several issues associated with detectable warnings that will require further clarification, and consistency needs to be maintained. The committee cannot address all of those issues, and the focus of the committee needs to remain on durability.  All comments provided have noted very good issues that should be addressed.  The committee can assist in this matter by providing general recommendations in the final report to DSA.

Gene mentioned that the ADAAG appendix does provide wet and dry requirements. Gene suggested that DSA look into these requirements for discussion later by the committee.  Both Title 24, and ADAAG, have ground finish sections that make note of slip resistance requirements. The walking surface sections have wet and dry requirements, and percentage requirements for the specified surface areas.

Derek Shaw from DSA volunteered to research these requirements and provide the necessary information to the committee for further discussion.

Jeff Barnes submitted the following definition for review and discussion:

*4) CONFORMATION is the process of confirming that the detectable warning/directional surface meets dimensional specifications of the truncated domes and raised bars as specified in the California Building Code, California Code of Regulations, Title 24, Part 2 and the California Referenced Standards Code, California Code of Regulations, Title 24, Part 12.*

Gene Lozano provided his support for the proposed definition. In considering the dimensions of the detectable warning products, discussion of the height of dome was needed. The committee should consider the verification of the dome height, and whether the code specified dimension of 0.2 " height should be described as the measurement of the highest point of the field area and the highest point of the dome, meeting all nominal requirements. The committee shouldn't dictate the type of textured material to be used by the manufacturer. However, it should be noted that some manufacturers use raised elements that may reduce the dimension of the dome height, especially at the top of the dome when the area wears off reducing the 0.2 height requirement. The EDWAC should consider expanding the definition to include dimension heights, by defining the height as the highest point of the field area and the highest point of the dome.

Minh Nguyen asked if this would require the committee to require a specific height measurement and asked if this was a form of testing the texture of the surface?

Eugene Lozano responded by noting that determining a height measurement method should not dictate how a manufacturer designs the textured surface, instead the product must maintain a uniform nominal 0.2" surface, between the height of the field surface and the top of the dome. Whether or not the manufacturers provide raised elements in the surfaces, the nominal 0.2” high surfaces needs to be maintained. If just a strict interpretation of this requirement were used, it would be possible that a product with a 0.2” nominal dome, provided with raised areas that also measure 0.2”, could result ultimately with a flat surface.  Establishing a consistent policy about height dimensions is not about dictating texture. It is about maintaining a uniform 0.2” elevation, regardless of the process used for providing slip resistance.

Derek Shaw reported that in the building code, the definition of the term “nominal,” includes a plus or minus dimension that may address some of the wearing out of the micro-texture, which are described as the small raised areas on the product’s surface. With regard to dome height there is a plus or minus 0.020-inch height variation that is allowed for detectable warning products.

Gene Lozano agreed that although this is correct, these nominal dimensions are provided only for the domes, and does not refer to the surrounding field-area surface around the dome.

Derek Shaw confirmed that Gene’s comment was accurate, and that the method and place of measurement was not defined in the building code.

Arfaraz Khambatta suggested that this could probably be addressed in the shape part of the definition, or as part of the durability of the shape.

Jeff Barnes noted that in the proposed requirements that would be discussed later in the day; there is a Section 5, under the title Construction, that is currently blank.  The area is being saved for information to be inserted before the next meeting, which includes information discussed by the committee earlier. For example, what are the dimensional requirements from the code that need to be confirmed as part of the evaluation of detectable warning products? One of the clarifications needed would be to determine where to measure the two points. UL has internally discussed as an option, measuring the difference between the dome and field surface, without measuring texture surfaces. The other option considered was the same as Gene's suggestion, which is to measure the height of the textured area (if used) and the height of the textured dome area. However, none of this information is needed in order to create a definition for conformation. The committee needs to define the vague term of conformation that is not clearly documented or defined elsewhere. UL was proposing to define the term "conformation," as confirming that the detectable warning product meets building code specifications. As this is developed, the method of how conformation is to be accomplished will be considered. The proposal so far, to determine height compliance of truncated domes, is to basically measure from the top of the truncated dome and any textured surface added there to the height of the field surface from the top of any textured surfaces added to the field surface. Jeff asked if all members were in agreement that definitions be developed along this line for height agreement.

The EDWAC members agreed with the proposed method for determining the height requirements of truncated domes, and with the definition for conformity.

**<u>Manufacturer/Public Comments</u>:**

<u>Jon Julnes Comments</u>:

Jon agreed with Gene Lozano, that the committee should consider measuring texture when determining dome height requirements. Textured surfaces are more likely to be worn down, and can differentiate from the original construction from day one to five years out. Therefore, determining continuity in the design of the measurement system from one product to another would be important. Jon supported Jeff's proposed height definition for dome and field surface area with textured surfaces.

Jeff Barnes confirmed that the dome height definition had been recorded and will be fine-tuned and made available as an attachment for the next EDWAC meeting. Before the next meeting Section 5 of the draft proposal document (Exhibit B) will be populated with constructional requirements, and will include guidelines for verifying measurements. The updated draft document will provide a final recommendation of the revised definition as discussed earlier.

<u>Dustin Upgren Comments</u>:

Agreed with Gene Lozano. The 0.2" height dimension of the dome is a conformity issue, which should be addressed by either measuring the highest point of the field background, or providing an average of the height of the field background. Whichever method used should provide a nominal tolerance on that as well as the dome height if the same or of various heights.

Jeff Barnes submitted the following definition for review and discussion:

*5) ACOUSTIC QUALITY is the ability of a material to retain its original sound characteristics when impacted by an object.*

Gene Lozano made a recommendation to postpone discussion of acoustic quality until the next day, after the acoustic quality presentation by Beezy Bentzen.

Jeff Barnes announced that Beezy Bentzen would be providing a power point presentation by teleconference, on resilience and acoustical quality characteristics of materials.  Jeff agreed that Gene's suggestion was a good idea.

EDWAC members supported Gene's suggestion to postpone discussions on acoustic quality until after the presentation on Friday, February 18, 2005.

Jeff Barnes submitted the following definition for review and discussion:

*6) ATTACHMENT is the ability of a material to maintain a complete and durable mechanical bond with a substrate.*

EDWAC members had no comments or objection to the definition of attachment

**<u>Manufacturer/Public Comments</u>:**

<u>Chip Van Abel Comments:</u>

Chip asked if the building code or any other document defined the word "complete" in relation to attachment.  Does the word "complete" require that a particular product should be 100 percent attached to the surface?  There are instances when the manufacturer may not want complete attachment to a surface.  For example, a hollow may be provided under the surface, which has been constructed in this manner intentionally. This would be a situation in which the manufacturer would not want to provide complete attachment to the surface in order to fit address other issues.

Jeff Barnes responded by noting that the definition for attachment was not intended to bar these types of construction.  Modification to the proposed definition may be needed to address this design issue.

<u>Mark Heimlich Comments:</u>

Mark recommended adding the words “as designed and installed” after the word “complete.”  This would permit a product designed to have partial contact with a surface, and to continue to perform as designed, with no significant change occurring over time.

Jeff Barnes announced that the current new wording for the definition proposed is: “*ATTACHMENT is the ability of a material to maintain a complete and durable mechanical bond as designed and installed, with a substrate.”*

<u>Chip Van Abel Comments</u>:

The new definition might work, although the problem is that attachment is not an exact science. The committee might want to consider designating that a minimum of 5, 7 or 14 percent gap is acceptable.  A manufacturer is not going to allow a gap between the surfaces on portions of the plate.  However, the definition may not need to be addressed by the EDWAC, if the committee accepts the five-year warranty claims by manufacturers, without requiring third party test verification.

Jeff Barnes reminds the committee members that a definition needs to be determined, so that the group can proceed with establishing performance requirements for durability testing. The product will be measured to determine if it has maintained its ability to adhere to the substrate over the course of a five-year aging process.  Making reference to a warranty would not provide scientific justification to verify that the product had longevity. A definition of attachment will still be required.

Minh Nguyen requested a clarification of the attachment test. When the test is conducted to determine durability of mechanical bond, is there a force applied for a period of time. If yes, should we add a pound force requirement to the definition? For a product to be durable, it can be noted that it must meet certain pounds per square force, over a certain period of time applied at a 45-degree angle or something similar.

Jeff Barnes reminded committee members that lengthy discussions on the different types and methods of tests were planned over the next two days. In terms of the definition, it is important not to over identify a test at this time, because the designated tests for detectable warnings has not yet been selected. UL have some suggestions to make on testing, and requests for additional information planned, which will be presented as part of the scheduled meeting. In terms of the definitions the group needs to identify the definition for “attachment”. It is critical to have a basis of concepts in order to build and proceed with the standards development process. Jeff understands Chip’s concern about redefining the term “ complete,” which might result in requiring modifications to the manufacturers designed product. To add the terms “by design” will not lend itself to requiring a uniform adhesion for consistency. A definition is needed that indicates the specifics of the manufacturer’s adhesion process or methodology.

Michelle Courier proposes simplifying the definition by removing the word “delete” so that the definition now reads: “*ATTACHMENT is the ability of a material to maintain a durable mechanical bond with a substrate.*”

Richard Skaff further proposes to revise the definition to include the manufacturers intended design.

Jeff Barnes reports that the proposed wording for the definition of attachment has been modified to the following: "*ATTACHMENT is the ability of a material to maintain a durable mechanical bond as designed and installed, with a substrate."*

Jeff Holm agreed with the "as designed" but did not agree with the "and installed" wording. Jeff proposed to keep only the wording "as designed, with a substrate". The words "as installed" does not help with the definition because, the committee needs to consider who is meant by the terms "as installed"? Will a competent trained person be installing? Definition should instead keep the words "as designed".

Michael Paravagna voices his support since it would not be possible to test the durability of product installation.

Jeff Barnes asked if the committee concurred with the newly proposed definition.

EDWAC Members agreed with the modified definition for attachment.

**<u>Manufacturer/Public Comments</u>:**

<u>Mark Heimlich Comments:</u>

Mark proposed the terms "as installed" because what is being measured is the change from "as installed" to after product testing. It would be difficult to state, "as designed", because no one is aware what this means. The plan is once the sample arrives, have it installed using adhesive if that is what the manufacturers specifications require, and have changes measured after testing.

Jeff Barnes proposes a new definition: "*ATTACHMENT is the ability of a material to maintain a durable mechanical bond as installed in accordance with the manufacturer's installation instruction, with a substrate."*

<u>Jon Julnes Comments:</u>

Although this is not a committee formed to develop building codes, the committee should consider that "as installed" lends itself to many open-ended things, just as mentioned earlier by Jeff Holm. It's not known who will be installing these products in the field. Jon has seen many great products installed badly, and inconsistently out in the field. The EDWAC cannot validate what will take place out in the field.

Jeff Barnes added a clarification to the phrasing of test methods, which is that any test program that was developed, as part of this process for a detectable warning would be processed to the manufacturer's specified installation instructions. Manufacturers will be required to provide samples of products installed in accordance with their installation instructions. It is understood that there are variables on how products are actually installed in the field. However, these are variables that cannot be addressed unless we also address how the manufacturer rates their product. This requires that the product be tested to that rating and uses the manufacturer's installation process. As long the product is installed to the instructions in accordance with methodology, then it would be suitable. The last definition was: "*ATTACHMENT is the ability of a material to maintain a durable mechanical bond as installed in accordance with the manufacturer's installation instruction, with a substrate."*

Mark Heimlich Comments:

Recommends that the definition would be clearer if the words “with a substrate” were moved to before the “design” wording.

Jeff Barnes provided an updated version of the proposed definition:

“*ATTACHMENT is the ability of a material to maintain a durable mechanical bond with a substrate, when installed in accordance with the manufacturer’s installation instruction.”*

All EDWAC members in attendance agreed with the new definition for attachment.

Jeff Barnes submitted the following definition for review and discussion:

*7) COLOR FASTNESS is the ability of the material or coating to retain its original hue without fading or changing when exposed to environmental conditions.*

Minh Nguyen requested a list of the environmental conditions referenced in the definition for color fastness. He also asked if the street sweeper’s simulated testing part of the testing program?

Jeff Barnes reported that there is a list of proposed test conditions in the draft standard that will be discussed later such as: freezing, thawing, chemical resistance, spills, heat cycling, and other types of test conditions likely to occur to the product if subjected to the environment.

Gene Lozano asked if fading by the sun was included, such as UV testing?

Jeff Barnes confirmed that UV testing is included as part of the proposed test program. Later in the meeting, while presenting information on environmental testing, Andre Miron will discuss several different tests that simulate these environmental factors. It would be advisable to leave the words “environmental conditions” in the definition since the final environmental factors have not yet been determined.

Derek Shaw while admittedly not an expert on color studies, noted “hue” is only one aspect of several components that define color such as the terms hue, saturation, and brightness. Using the word ”hue” is a limiting or incomplete description of color when discussing color fastness.

Andre Miron replied that the description could be viewed that way. In the vernacular, “hue” is just another word for “color.” In the technical sense however, the word “hue” is different from some of the other factors that make up color. Andre agreed that replacing the word “hue” with “color” is advisable.

Jeff Barnes incorporated the word “color” into the definition, which is an all-encompassing term. The definition was modified to read: *COLOR FASTNESS is the ability of the material or coating to retain its original color without fading or changing when exposed to environmental conditions.*

All EDWAC members supported the modified definition of color fastness.

**Manufacturer/Public Comments:**

Dustin Upgren Comments:

The EDWAC should consider putting in a retention percentage either in the definition for color fastness, or in the testing section to be discussed on Friday, February 18, 2005. If the percentage of retention to retain its original hue is added, a retention value should be added, such as 90 or 100 percent retention. In addition, the definition should also specify that there would be no fading or changing over a specific time period.

Gene Lozano reported that the legislation specifies 90 percent retention over five years.

Jeff Barnes concurred, noting that the product should retain the original characteristics within 90 percent for over five years. Other factors to consider when discussing color requirements would be determining the color needed and the acceptable fading percentage. Another question is to define what 10 percent change of color means, which is vague since it is not a real linear scale. This will be a challenging topic to define.

Jeff Holm commented that these are definitions, not requirements. So it should be acceptable to add the words “without fading” to the definition, and not need to consider the requirements for the future at this time.

Andre Miron suggested that perhaps the committee might consider adding “without “substantial fading or changing” to clarify the definition for color fastness. This might be advisable since this is how the legislation describes color fastness. Many references have referred to “substantial degradations”, which is defined as not more, that 10 percent degradation. The committee can later define substantial fading or changing when the tests methods are more clearly defined

Mark Heimlich Comments:

Agreed with the modified definition, and stated that there was no need to define percentages here as with the other topics already discussed.

The committee revised the definition for color fastness, and agreed on the following definition.

***"COLOR FASTNESS is the ability of the material to retain its original color without significant fading or changing when exposed to environmental conditions."***

Jeff Barnes submitted the following definition for review and discussion:

*8) RESILIENCE is the ability of the material to absorb energy when deformed elastically without creating a permanent deformation.*

The committee decided that discussion and voting for this definition should be tabled until the proposed requirements for resilience are discussed on the second day of the meeting and after Beezy makes her presentation.

**6. Committee Travel Reimbursement (Derek Shaw/DSA)**

Derek Shaw announced that Beth DePaola from DSA would provide travel reimbursement information to all members needing this information during the lunch break.

**7. Small-Sample Versus In-Place Large Scale Testing (Andre Miron/UL)**

Andre Miron made a presentation on the difference between small-sample testing in a laboratory environment and on-site, large-scale testing out in the field. These are the two basic methods of testing available for evaluating detectable warning products. The end result of choosing the correct testing method is to establish a test methodology that permits a testing agency to confirm the five-year life of the material installed in the field.

There are pros and cons for using each of the two laboratory-testing methods.

A) Large Scale Testing – Requires that lab technicians visit field sites, install the materials at the sites, and leave the product installed on location for five years, to be exposed to the environment. Eventually an evaluation would be performed to determine if the substantial degradation characteristics have been met. This would require that products be installed in several extreme-service locations. Most of the tests would require minimum five years of testing, plus additional testing would be needed at the laboratory site. Laboratory technicians are required visit the test are for general servicing and to conduct testing, and/or remove portions of the material from the location to continue testing back at the lab. This method of collecting test portions from field site, results in some damage to part of the service location. Installing in only one or several places, limits the variance of different places, and does not allow proper comparison and true representation of all possible test sites and test conditions. The test and environmental conditions in the field are mainly uncontrolled. This means that test results in the field are very unpredictable over the five-year test schedule, which makes it difficult to compare test results since locations frequently differ. Overall, large scale testing is expensive because installation is required, the testing is conducted for a full five years, and regular visits to the field for testing, maintenance and retrieving samples from the field site for further laboratory testing, shipping and travel cost could all become very expensive.

B) Small Samples in Laboratory Testing – Specimens would be prepared by the manufacturer in accordance with the standard and submitted for accelerated aging in a laboratory. Presently the committee may be looking at approximately 3000 hours of aging. The longest aging test is the light exposure test, and other aging tests have smaller time frames. 3000 hours is about 125 days of testing, plus addition time for evaluation and testing for the additional tests conducted after the environment conditions are completed. This requires that specialized samples be prepared. For the manufacture, providing special samples can be considered a negative option, since field installation would usually be easier. However, testing in a laboratory is a better method for testing to worst-case situations. Lab testing makes it easier to test a wide variety of conditions that the material might be exposed to in real life conditions. The comparison of test data is easier since the lab conditions can be controlled. Another benefit of testing in the laboratory is that since products are subjected to specific, known tests, the failure test data can be more useful. When a manufacturer becomes aware of tested material not meeting requirements, the failing tests are identified, and this information can assist manufacturers in seeking troubleshooting solutions. This information will assist the manufacturer in determining how to change the material, in order to improve the product as needed. Overall cost of projects is generally lower. The length of age testing for lab testing is about 125 days, vs. five years for large scale field-testing. There appears to be more advantages to conducting small-scale test vs. large scale testing, and the cost is usually much lower for laboratory testing.

C) Test Method Comparison – There are more pros to small scale than large scale field-testing. Reduced cost, reduced lab time and general test flexibility is better for small sample lab testing. In addition, more representative conditions can be done on small sample lab testing, and the testing in the lab is more consistent. This provides consistent lab conditions for each product tested. Although conducting tests in large-scale field areas such as Death Valley would demonstrate maximum weather conditions with heat and sun as an important factor, other environmental tests conditions would be difficult to test at the same site, such as freeze-thaw conditioning. In a lab, testing can be done on samples representing all environmental conditions as required, to make certain that the product can be installed anywhere in California. However, this cannot be done quite as readily in the field.

Minh Nguyen suggested that lawyers and lawsuits might become a problem if testing was done over five years, and then something happened because the aging test conducted in a lab was not sufficient to properly determine long-term aging.

Arfaraz Khambatta questioned whether combining several environmental test conditions would be possible? For example combining environmental conditions such as salt spray, with moisture and heat conditions, variations in temperatures, etc. Or should conducting environmental test conditions be done separately?

Andre Miron replied that the decision to test separately or in combinations would still need to be determined. If all testing is conducted in a lab, then environmental test conditioning can be done either separately, or in combinations. It’s possible to condition products separately in order to determine if the products meet certain requirements. Assembly line testing can be done by testing samples in series, and exposing samples to various conditions such as UV radiation, salt-spray, water immersion, chemicals, and then proceed to test the samples after conditioning.  Another option would be to prepare more specimens for testing and simply look at each of the conditions separately, not worrying about interaction between conditioning tests.  For example, exposure to sunlight is not likely to make the specimens more susceptible to salt-spray.  This is something that will need to be looked at when the definitions for these conditions are created.  At this time the standard is written so that the environmental conditions are conducted separately.  After lunch, environmental conditioning would be discussed in more detail.   At that time, discussions would be held as to whether testing should be done all at once, on one set of specimens, or in various sets subject to different conditions.

Arfaraz Khambatta suggested that combinations of heat, with the chemical reaction from salt spray would probably have an effect on the material or substrate.

Andre Miron agreed that there are environmental conditions such as water immersion, when the conditioning should be done with an elevated temperature. This is not to imply that immersion in water simply consists of immersion in water at room temperature. There are more factors than the title of the exposure, which would be covered more fully, when we discuss environmental conditioning.

Jeff Holm asked if there are there any examples of situations where only field-testing would be needed.  In the highway system, all testing is done in the laboratory. All durability tests are done in the lab too.  A pavement isn't left out for five years, simply to see if it will perform as required.  Are there instances where you might want to conduct field-testing?  Maybe field verification?

Andre Miron replied that field- testing is done, in few cases, although usually in a very specialized type application, where the product is being used only in a certain environment, or if only one manufacturer produces a product for a specific purpose. The corporation needs to know if the product will stand up well over a period of time. In Andre's experience with testing various materials', this type of testing is not likely. Field-testing is done on rare occasions for specific uses only. Testing agencies prefer laboratory-controlled conditions, where you can look carefully at how the product is performing under conditioning and testing, and how it's performing in relation to other materials of a similar kind. This type of testing and evaluation cannot be done properly with products that are field-tested.

Jeff Barnes added that a driving force behind this philosophy for lab testing is the "time to market" for this particular application. To meet compliance with the state code would require at least five years evaluation in order to obtain any type of approval for that product, if all test criteria are met. Which doesn't meet the reality of the current situation. These products need to get to market or possibly are products that are already out in market, that need to go through an approval process that would be established at less than five years. An aging test of possibly 125 days (4 months) would mean that the approval process would be only five months in length, instead of a five-year evaluation program. Only by using laboratory testing can the goal of shorter time periods be met.

**Manufacturer/Public Comments:**

Mark Heimlich Comments:

There is a viable third option, which is using a full-sized installed sample in a laboratory environment. In a lab, a tile size of 2 by 4 feet, approximately eight square feet, can be reserved for testing. In this area, a slab concrete could be poured, in a area the size of a two-car garage, about 600 sq. feet. These large lab test areas can be used for testing incoming samples. Small-scale lab testing however would still be needed for extensive testing. A large-scale lab testing area would be very useful for conducting tests such as freezing, thawing, wear, and sound tests all conducted under lab controls using the same substrate, in a laboratory setting providing the same consistent type of testing for all products.

Jeff Barnes replied that this is an option, which could be a very demanding, costly design for a lab. A large environmental chamber would be needed that could test for cold, heat, and all kinds of different environmental conditioning cycles, as well as abrasion tests or other types of impact tests. This would be very expensive, particularly if multiple chambers are needed to handle several manufacturers submitting their products for testing at the lab over the same time period. This would require multiple large environmental chambers, which is expensive since they likely cost a few hundred thousand dollars each. In addition, lots of floor space would need to be reserved to be used for large test chambers.

Arfaraz suggested that the shape of the sample to be tested should be considered carefully. In many cases detectable warnings are used at corner curb ramps, with a surface that is not a straight, but rounded instead. Using specimens with rounded edges would better test the effects that the durability of a product has in relation to the color of the cut section, or the texture of slip resistance, etc, rather than testing with a rectangle-shaped specimen. Therefore, Arfaraz recommended using specimen samples that have been provided with two edges, which are straight and rounded, including an edge that cuts through domes.

Jeff Barnes commented that this is an interesting suggestion not considered yet in the proposed draft. This topic discussion should be postponed until later so as to be added to the discussions planned for establishing performance criteria for tests.

Gene commented that there is another issue to consider. The effect of and the twisting and turning of the wheels on wheeled products, such as wheelchairs and scooters, on curb ramps with domes. This may require additional testing on the domes to account for the type of physical stress caused by wheeled devices, and to verify adhesion durability.

Jeff Barnes noted that this was already being covered in the testing proposed as a 45-degree attachment test that will be discussed later. The committee will consider this further when looking at that performance test.

<u>Jon Julnes Comments:</u>

Arfaraz's idea might sound unusual, but may more accurately represent the real world scenario of how these products are installed. Manufacturers have different product types (liquefied, inset, stamped, etc.) that are of specific sizes and shapes, and to fit the product in the field, these products would have to be cut into individual smaller units to fit the specified areas. Having test samples precut, as discussed earlier, would illustrate how well the product adheres to a surface. Individual cut sections may permit moisture to enter inside the device and as a result of adherent placement, demonstrate potential freeze-thaw damage and/or moisture penetration problems. Jon supports Arfaraz's recommendation, that specimens should be required to have a straight edge, and a non-straight edge for testing. Cut domes, and others edges may inherently affect the design standard and the structural capacity of the system.

Michelle Courier added that from a testing standpoint, the most severely constructed sample would be requested for testing, so that the worst-case scenario would be represented in all testing.

Jeff Barnes noted that testing with specimens cut with rounded edges and cut domes would probably only be a factor when a product was not completely secured. These samples might have a hollow base, so possibly only these types of products would require using the specially cut specimen samples for testing.

Paul Hantz Comments:

It should be noted that all products could deteriorate if placed in a scenario that is not recommended by the installation instructions.

Richard Skaff concurs with Paul Hantz that most products might deteriorate during testing, since all material compositions change when cut, or whenever a saw cut is used on plastic, tile, concrete, etc. Cutting could change the composition, the structural integrity, and this is part of the durability issue, which may cause the breakdown of material to occur sooner than it normally would have. It's important to determine if moisture or other changes can occur on the material because of cutting. There is also the increased likelihood of accessibility.

Andre Miron stated that, most materials need to be cut when providing specimens, due to limited space in the lab. This should naturally address the concern discussed earlier regarding testing a specimen with a cut edge.

Richard Skaff affirmed that this would be fine, as long as all samples are tested the same way with a standardized cut, and with domes cut consistently in the same method.

<u>Paul Hantz Comments:</u>

Conducting tests in a laboratory using 6 by 6 or 12 by 12 sized specimens, would require very specific cutting instructions. Very different cuts are likely needed on different areas of the domes. There's also going to be lots of control in a laboratory environment, which would be useful for standardized testing. Paul agreed that field-testing is probably a five-year process, however maybe field verification could be used instead of field-testing.

Jeff Barnes confirmed that there is a need have samples reflect real life. Samples should not be a simple square/rectangle shape and should have different types of cuts, including cuts through the domes. Specimen samples used for testing should be reflective of this.

<u>Jeff Koenig Comments:</u>

Agreed with providing assorted cuts on specimens, provided that all samples were treated the same, for each manufacturer submitting samples.

Jeff Barnes mentioned that having consistent standardized tests would be part of the benefit of small-scale testing.

Richard Skaff was concerned with stamped concrete domes. These types of domes are constructed and installed in the field by contractors, rather than built elsewhere and sent to a site for installation. Stamped concrete domes are created on site, and will likely have lots of variations based on the person constructing the tiles and on the methods of stamping. Richard asked how UL proposed to include this process in the testing of detectable warning products, and still get an analysis that is reasonable, with a standardized outcome.

Jeff Barnes noted that these types of products would require lots of consideration and discussion from the committee, and input would be needed on how to move forward with these types of products. The first concern would be that the product needs to meet conformance requirements, and the consistency process should be addressed. Conformation to dome height, width, and spacing would be needed, and should be consistently applied. This consistency would need to be met as part of any type of certification process.

Richard Skaff questioned specifically how would testing on stamped concrete be done? Since stamped concrete are constructed in the field, each pour is different, and each stamp may be applied differently. It would seem impossible to consistently test this type of process and confirm that the system works. Richard was very concerned about these issues, since he doesn't believe that this process works consistently out in the field.

Andre responded that in considering stamped concrete, which is different from other systems types, establishment of a separate type of requirements might be necessary. As to how to conduct tests, one possible idea would be to consider pouring a one foot tile, and have it stamped, according to the installation instruction. Andre understands that cutting concrete is difficult and would be troublesome, although may not be needed in many cases. Concrete could be poured as needed, using a set of molds and stamps that would create specimens that would work for the tests applicable for the product. Andre understands that there may be a variance in concrete when using different types of aggregate. Obviously using a fine stamp pattern on coarse aggregate would not work. In the certification of the stamp, or stamped process, a range of acceptable concrete materials would need to be defined. Andre notes that it would be difficult to define these materials, but not impossible. When examining some of the tests aimed at polymeric type detectable warning systems, it is evident some of the tests are not applicable to concrete type substrates. For example, it’s likely that the stamped concrete detectable warning system would not degrade significantly more than the concrete around it as a result of UV radiation. At least, there is no deterioration from a mechanical standpoint.

Richard Skaff replies that there is a possibility of degradation, at least that of color. There has been previous evidence of fading when the detectable warning products used carbon for color contrast, which faded. Hi-carbon has replaced some of the carbon materials used, since hi-carbon is a chemical used for color contrast, and is a material not as likely to fade. Richard noted that laboratory manufactured concrete samples are different, and better products than concrete samples created in the field. So strictly testing lab created products would not fully reflect real world stamped concrete products. It should be noted that many agencies are using stamped concrete tiles because they are cheaper, quicker and easiest to install that other types of detectable warning products. Unfortunately, there are many reported problems with using these types of products, since dome tops may fall off, and field constructed tiles are not uniform, nor is anyone testing these products to check for consistency. Each contractor has a crew in the field that probably stamps the tiles differently, with a different amount of pressure, and there are no concrete standards that determine a set mixture or a range to be used in preparing the poured concrete.

Andre Miron responded by suggesting that this unique situation might require lab testing with field verification added. The process and the stamp would be tested in a lab using manufacturers installation instructions, and than a technician would be sent to the field for verification of each installation. This would be very expensive, and time extensive, and might become a difficult problem to handle.

Jeff Barnes summarized that on this discussion topic, there is definitely a product process that needs to be explored further. As the committee evaluates different test programs, all members should keep this product design (stamped concrete) in mind to consider and to offer recommendations where appropriate. The committee can then conduct research on these recommendations by contacting different manufacturers to request input on how to address some of the concerns in the test program. It would be necessary to review different test programs to determine applicability of some of the tests for these types of products.

<u>Paul Hantz Comments:</u>

Paul asked if UL is considering two different test systems for different basic materials? For example, concrete vs. plastics, and compression vs. absorption? Are there two parallel lines of testing being proposed?

Jeff Barnes replied that the general concept was to provide consistency in terms of conducting performance test, since we are tasked with looking at the durability of the product, and not in establishing the initial rating of the product. As much as possible, an attempt should be made to use just one set of tests when examining different types of materials.

Mark Heimlich Comments:

a) It's important to simulate real world conditions whenever possible when preparing samples. For example samples should be created in a real world environment. If a 3 by 5 foot area is normally stamped on one stamp, than you would get a different result than if you carefully stamp a small one-square foot area, which can be controlled.

b) Mark complimented the EDWAC on adopting a new meeting format, which permits manufacturers and the public to provide comments periodically throughout the meeting, rather than only at the end of day, or at midday. The new method appears beneficial to all parties.

**Quorum Status**

Doug Hensel arrived at the meeting. EDWAC now has a quorum.

**Adoption of Previous Meeting Minutes**

Jeff Barnes submits the minutes of November 10, 2004 meeting for adoption. There were no objections to adopting the minutes, so the meeting minutes are adopted

**Vote Results: 9 yes votes 0 no votes**

**Discussion on New Quorum Format**

Jeff requested that the EDWAC re-address the quorum policy for the committee, which was established at the previous meeting. A change in quorum was needed in order to avoid the morning's situation, in which there was no quorum formed since several members were not in attendance. It was also noted that John Paul Scott was no longer a member of the EDWAC, nor had Mr. Scott participated at the previous meeting. Jeff proposes establishing a quorum with a smaller member number than nine members from the total count of twelve members. Jeff asked for suggestions from the committee.

Michael Parvagna proposed having a quorum that consists of 50 percent members of the EDWAC, plus one. Gene Lozano seconded this motion.

There were no comments or objections.

**Votes Results: 9 yes votes, 0 no votes**

**Pending Business from the Morning of February 17, 2005**

Jeff Barnes submitted the following definitions for final voting:

*1) DETECTABLE WARNING is a standardized surface or feature, consisting of truncated domes and the field surface between and surrounding the truncated domes, that is built into or applied to walking surfaces or other elements to warn visually impaired persons of hazards in the path of travel.*

**A motion was made to adopt the revised definition by Richard Skaff, and seconded by Michael Paravagna.**

**Vote Results: 9 yes votes, 0 no votes.**

*2) DIRECTIONAL SURFACE is a standardized surface or feature, consisting of raised bars and the field surface between and surrounding the raised bars, that is built into or applied to walking surfaces to guide visually impaired persons along the path of travel.*

**A motion was made to adopt this definition by Richard Skaff, and seconded by Gene Lozano.**

**Vote Results: 9 yes votes, 0 no votes.**

*3) SHAPE is the ability of the detectable warning/directional surface material, and in particular the surface features (truncated domes and raised bars) of the material, to retain its original shape when subjected to varying degrees of temperature, moisture, pressure, or other stress.*

**A motion was made to adopt this definition by Richard Skaff, and seconded by Jane Vogel.**

**Vote Results: 8 yes votes, 1 no votes.**

Minh voted no since when discussing height of textures earlier, there were issues raised on how to identify the height of texture, and if the height of texture is used, then should consider adding texture requirements to the shape definition.

Jeff Barnes responded that considering texture for slip resistance would require that the committee look to expand the scope of group to address this issue if it applies to durability.  The one undefined issue from this morning was defining the height of a dome, and how would the height of the dome be measured.  Resolving this issue does not depend on the committee providing a definition for shape. This is an application guideline and will be presented as part of Section 5 in the proposed requirements at the next meeting.  In terms of stating the conformation process, Section 5 will be used to provide information on how to apply the requirements in the code.

Minh asked if changing his vote would affect the discussions on texture being addressed later, and whether texture information should be added to the definition of shape.

Jeff replied that the proposed draft provides a test proposal for texture.  The committee will look at putting that forward, although it is important to remember that the real scope of the group is to deal with the performance durability of a product.  The texture is not specially required by code, unless Derek has information that indicates otherwise.

Derek stated that the only requirements that are referenced on slip resistance in relation to texture are in the California Building Code and in the ADA, Standard for Accessible Design.  Section 1124B, Ground and Floor Surfaces.  Basically these documents have text noting that surfaces should be stable, firm, slip resistant, and should comply with the statue.  There were no hard measurements for slip resistance.

Minh commented that the building code does have a standard coefficient of friction value.

Derek Shaw replied that the standard coefficient code is not in the California Building Code. The text within the ADA Standard has text on slip resistance similar to the CBC, Section 1124B. In the appendix for ADA Standards, a lengthy discussion of slip resistance, ground and floor surfaces is available.

Richard Skaff stated that the issue of texture relating to durability and slip resistance is an issue, although its not defined except in the appendix of the ADA guidelines. This information was placed in the appendix because there were numerous questions as to how the testing should be done, and whether the specified test was valid or not. The words “slip resistance” is in the California Building Code, and Richard describes this as a durability issue, related to the surface and the texture, and whether the slip resistance will continue for the life of the product, at least for five years or more. Richard proposes creating requirements for slip resistance.

Jeff Barnes announced that based on the majority interest of the committee on the slip resistance issue, UL will bring to the next meeting a test criteria for slip resistance using some of the coefficient of friction values outlined in the appendix.

Richard Skaff advised not using the same numbers in the ADA appendix. These values were based on company numbers, and may not be correct, or set a proper standard. In addition, the ACCESS board has not adopted the values, since the numbers have not been confirmed as valid.

Jeff Barnes replied that UL prepare a proposal to define slip resistance and have discussions on how to determine these numbers at the next meeting.

Michelle Courier supported having a slip resistance definition added as a separate definition, since it has no relevance to the definition of shape.

**This definition re-voted based on the discussions above.**

**Vote Results: 9 yes votes, 0 no votes.**

*4) CONFORMATION is the process of confirming that the detectable warning/directional surface meets dimensional specifications of the truncated domes and raised bars as specified in the California Building Code, California Code of Regulations, Title 24, Part 2 and the California Referenced Standards Code, California Code of Regulations, Title 24, Part 12.*

**A motion was made to adopt this definition by Richard Skaff, and seconded by Gene Lozano.**

**Vote Results: 9 yes votes, 0 no votes.**

*5) ACOUSTIC QUALITY is the ability of a material to retain its original sound characteristics when impacted by an object.*

The committee decided that discussions and voting for this definition should be tabled until after the proposed requirements for resilience are discussed on the second day of the meeting and after Beezy makes her presentation.

*6) ATTACHMENT is the ability of a material to maintain a durable mechanical bond with a substrate when installed in accordance with manufacturers' installation instructions.*

**A motion was made to adopt this definition by Richard Skaff, and seconded by Gene Lozano.**

**Vote Results: 9 yes votes, 0 no votes.**

*7) COLOR FASTNESS is the ability of the material or coating to retain its original color without substantial fading or changing when exposed to environmental conditions."*

Michelle proposed using the word "significant" in place of "substantial", since the building code uses this term, and it's important to be consistent whenever possible.

Jeff Barnes confirmed that the text of California Bill No. 685, does use the words "significant" as noted in a reference for detectable warning which states, ". Shall not degrade significantly for at least five years…"

The definition for color fastness was revised as follows:

*COLOR FASTNESS is the ability of the material or coating to retain its original color without significant fading or changing when exposed to environmental conditions."*

**A motion was made to adopt this definition by Richard Skaff, and seconded by Gene Lozano.**

**Vote Results: 9 yes votes, 0 no votes.**

*8) RESILIENCE is the ability of the material to absorb energy when deformed elastically without creating a permanent deformation.*

The committee decided that discussion and voting for this definition should be tabled until the proposed requirements for resilience are discussed on the second day of the meeting and after Beezy makes her presentation.

**8. Proposed Requirements for Detectable Warnings and Directional Surfaces – format overview (Exhibit B) – Andre Miron/Michelle Courier**

Andre presented the general format of standard. The proposed draft standard consists of parts and sections. Several main areas are titled Introduction, Construction, Performance and Appendix A.

a) Introduction, Sections 1 thru 4 – The main area has several sections, starting with four sections for Introduction, which has a Scope (Section 1), Units of Measurement (Section 2), References (Section 3), and Definitions (Section 4). The first four sections in the draft standard cover typical standard information.

b) Construction, General, Section 5 – The next part has Construction, with Section 5 provided for general construction information. General conformation requirements will be part of General, Section 5. The preview of a given product is provided here when a product is first evaluated. This is where construction is checked to make sure it meets certain requirements, before proceeding with the evaluation of the product. For example: Checking dimensions, dome height, confirming integral color requirements, etc.

c) Test Preparation, General, Section 6 – The General Section includes information applicable to the rest of the standard. These would include selection and preparation of samples, and other pertinent information. For example, if a material is likely to break if used in a certain way, then the samples should be tested in the worst possible method. In cases where a material is directional in nature, that is, it is more likely to fail along one axis than another, the sample should be constructed such that the force applied will cause failure on the axis more likely to fail. Also noted in this section are standard treatments prior to test, test conditions which are applied when no specific conditions are specified in a given test method. Because specific test conditions are being specified for most tests, these will typically not be used in the test program. This general information is provided, so that if not specifically provided elsewhere, then by default this information would be available for use. Also the section defines test apparatus, and requires that the test apparatus be calibrated and accurate. The general section also provides information on test results, and how they are to be evaluated, and the elimination of outliers, etc.

d) Test Conditions, Sections 7 and 8 – Section 7 is the Test Program Overview. Tables 7.1, 7.2 and 7.3 detail actual test methods, with requirements provided for each test method. This is where we would note as-received values, 90 percent value requirements, and minimum performance specification information. Section 8, is titled Environmental Conditioning, where the different conditions are defined. Test specimens will be exposed to these conditions prior to being subjected to the tests described in Section 7.

e) Testing for Shape, Resilience, Attachment, Color Fastness, Acoustic Quality, and Testing for Acoustic Quality (Sections 9 – 18) – The remainder of the standard, specifically describes the various tests referenced in Section 7. Other tests can be easily added to the standard.

f) Summary: The draft standard has been prepared in a modular format that is easily revised. The draft standard is a living document, subject to many revisions and additions. Extensive changes are to be expected as the committee addresses many of the construction and testing requirements as a result of input collected during this and/or future meetings. This document is just a skeleton of the standard that will be filled in with the contributions from the committee and from input collected from manufacturing and public representatives.

Paula Reyes-Garcia offered her thanks to UL for creating the proposed draft document. Paula noted that it was much easier to view the written conditions and tests of the products being discussed in the meeting. Paula suggested that in Section 7 be revised to add the materials (masonry, metal, concrete, plastics, etc) that would be subject to the tests listed in Tables 7.1, 7.2 and 7.3.

Andre Miron pointed out that Paula is essentially correct, that materials suitable for each test could be supplied in Tables 7.1 – 7,3. However, unlike the many ASTM titles that references specific materials for specific tests, the current plan is to have the same tests used for all materials. Eventually, since there are substantial differences between stamped concrete and surface overlays, the committee may decide to add a column indicating that the tests are applicable for specific materials. At this point we are looking at tests for all materials, to ensure that each test criteria is met. Our goal is to establish the minimum performance criteria, which needs to be met, regardless of the material used.

Arfaraz Khambatta pointed out that in Table 7.3, Item D, Acoustic Quality, that the requirement indicates, “Sound fingerprint shall remain easily distinguishable from a standard concrete sound fingerprint following conditioning." Arfaraz noted in the case of concrete tile, there wouldn't be much of a distinction.

Andre Miron replied that most discussions on acoustics and resilience would be held on Friday, February 18, 2005. Andre reminded the committee that the proposed draft was still very much a draft document, when information missing, especially if it states "TBD." The information provided in Table 7.3 was temporary filler. The idea of the sound for acoustic quality was to ensure that as it is being stepped on, tapped or stuck, that the difference could be detected between the detectable warning and the surrounding area.

Gene noted that the code does not state "acoustics" but does state, "sound contrasting resiliency "or sound in contact from the adjoining walking surfaces". So there should be an actual comparison. And that would be one example of why actual installation in the lab is needed in order to measure the sound. This requirement is for the boarding platforms, vehicular ways, although curb ramps for HCD and DSA do not have this requirement

Paula Reyes-Garcia stated that at the last meeting when the committee discussed acoustic quality is when this discussion originally came up. The decision made at that time was to test the quality of the product against itself, and not to the surrounding area. Paula suggests that whatever decision is made, be reflected in the definition. Or could be confusing.

Jeff Barnes agreed that of the items to be discussed on Friday, that these two issues would be possibly the most challenging to resolve.

Minh Nguyen thanked UL for creating the skeleton standard.  Minh recommended that the committee obtain spreadsheet to track tests and related ASTM tests, noting which tests would be used to determine which properties. This information would be useful, and more organized than flipping back and forth between draft pages.

Jeff Barnes noted that for future meeting agendas, UL would look into providing an attachment with a spreadsheet providing this specific information.

Jeff Barnes requested that everyone quickly view Appendix A in the draft standard. This appendix has a list of ASTM standards that consist of Standards currently being looked at in developing the proposed requirements.  However, the final Appendix A will have only those ASTM standards that have been referenced in the final version of the proposed standard.

**9. Proposed Requirements for Detectable Warnings and Directional Surfaces – Environmental Conditioning (Exhibit B) –Andre Miron/Michelle Courier**

Andre Miron presented information on environmental conditioning, covered in Section 8 of the draft standard.  The committee should assume for now, that all testing will be done in a laboratory, and should keep this in mind as various conditions are described below.

In looking at conditions that these type of materials are exposed to there were a number of factors to be concerned about such as the weathering factors, which include exposure to ultraviolet light, in most cases sunlight, exposure to rain, moisture, exposure to freezing and thawing, exposure to chemical reagents like detergents, acids, fuel, solvents, exposure to corrosion from salt environments such as coastal environments, or ice removals. Andre is looking at several conditioning tests to represent these. These include the following conditions:

a) Freeze-Thaw Cycling, ASTM C1262 – This test exposes specimens to full cycles of freezing and thawing, of approximately four or five hours of a freezing cycle followed by minimum 2 hours of full thawing, and not more than 96 hours of thawing. The point is to wait for a full thaw, and than a full freeze. The method of handling this conditioning is to place the specimens into sealable plastic containers. Water is provided at the bottom of the container to help determine if freezing has actually occurred. Then the sample is run through the freeze-thaw cycle. One of the questions that need to be answered is how many cycles should the specimens be subjected to. Based on initial research, 20 cycles (based on four cycles a year, times five years) seems a reasonable number.

b) Salt Spray Exposure (Salt Fog), ASTM B 117 – This is a simple procedure where the samples are placed in a chamber with a salt fog, for 200 hours of exposure. UL will continue to research these time frames. This time frame is based on other aging programs with similar type materials.

c) Chemical Resistance Exposure, ASTM D 543 – This is a 7-day exposure test. Only some of the chemical reagents provided in the ASTM standard will be used. This standard allows for conditioning by immersion, or by wet patch application, which is accomplished by using soaked cheesecloth that is placed on the product, and kept wet for a specified time period. Currently UL is reviewing various reagents. The list provided in the proposed draft will likely change, after more research has been conducted and input collected. Under consideration is a plan to use a low concentration of hydrochloric acid to look at acidic reagents, ammonia hydroxide or typical ammonia for heavy cleaning solutions, soap solution for lighter cleaning solutions, turpentine to represent solvents, urea to represent urine (for train stations or other public areas). This is not an all-inclusive list, and UL is requesting suggestions on what to add or delete from this list.

Richard Skaff referred to Clause 8.4.1 of the draft standard that makes reference to an ASTM standard that describes evaluating the resistance of plastics to chemical reagents. Richard asked how does this relate to concrete, since all materials will be subjected to the same chemicals on all detectable warning surfaces? Will the chemical reagents have a different effect on concrete to the color and structure of the materials than on plastics?

Andre Miron replied that it is important to make note, that in some of the references in the standard, references are made to the name of the standard, and is not intended to indicate that the testing will be done only as described in the standard title. Until further notice, we are assuming that these conditioning tests are to be conducted on all materials.

Richard Skaff asked if there where any ASTM standards that evaluates concrete on chemical reagents, similar to ASTM D 543.

Jeff Barnes reported that there are hundreds of ASTM standards that were developed for very specific tests. The goal for now is to establish a uniform set of test criteria that can be used to compare all products. UL is presently reviewing comparison tests to assist in these efforts, and to see how these products fare over an aging process, from its initial design phase to its final state in five years.

Richard Skaff questioned whether using an ASTM standard developed for evaluating a plastic product would provide the committee with the correct analysis? Is the test as valid for concrete, as it is for plastics?

Andre responded that the ASTM standard doesn't provide a pass/fail criterion, or even a test method but rather an exposure method. The exposure method is likely as valid for concrete, as it is for plastics. Whether using the immersion test or cheesecloth method the end result remains the same, which is to expose surface materials to reagents, and allowing the products to react the specified temperatures.

Paula Reyes-Garcia recommended preparing a list, noting what is measured for each listed test. For example in ASTM D 543, on page 5, it describes that the weight and dimension of the product is being measured. The next procedure specifies that the mechanical property changes be measured.

Andre Miron noted that test methods would be specified in subsequent sections. Information will be added to Section 7, in a grid that shows exposures and test method information. Andre appreciates Paula pointing this out because it is important to understand that bits and pieces are being pulled from the ASTM standards. Not all tests in the standard will be conducted, such as the mechanical strain test, or mass loss. The committee will probably review the overall dimensions of the product, once conditioning has been completed, to confirm that the product still meets the construction requirements.

Jeff Barnes takes the opportunity to publicly thank ASTM, for permitting the EDWAC to use their ASTM standards while the committee develops requirements for detectable warnings and directional surfaces. For clarification purposes, the committee is authorized to provide references to ASTM standards in the proposed document. The committee is not authorized to use the text of the standard to be duplicated in our draft document. UL plans to reference specifics so that it can be clearly noted in the front of the standard, explaining what the different ASTM standards references are in this document, and that if used, specific parts will be identified. All parts shall be applicable to all products, unless specifically noted otherwise, regardless of the title of the ASTM standard.

d) Xenon Arc Exposure (8.5 Accelerated Weathering), ASTM G151 – This test operates for 3000 hours under xenon arc exposure, which includes a water spray. Consists of a circular rotating chamber, which rotates around a xenon light source in which you can hang specimens facing the xenon light source. It has a program cycle of 120 minutes where the light shines on the specimens for 102 minutes by itself, and there is also 18 minutes where a water spray is added to the light exposure. This test permits testing with a light water spray as well as well as UV light, which simulate sunlight. After some research, reviewing various exposure times, it was determined that 3000 hours of exposure is close to an equivalent five years outdoor exposure representing the harsher areas in California. Values between 2500 to 4000 hours of xenon arc exposure were considered as possible values however 3000 hours, was considered the most appropriate time frame for this test.

Gene asked whether the water spray described in the test represent humidity, rain and fog?

Andre replied that the water spray did represent humidity, rain, fog and dew. This is done to verify that the combined effect of water and sun does not causing problems with the integrity of the material. Therefore, a water spray is included as part of the weather meter exposure.

Doug Hensel asked what is the effect on metallic material, if the test is designed for non-metallic materials?

Andre Miron noted that for metallic material consideration might be made to waive the test designed for non-metallic materials. However, color may still be an issue, since its possible that the color may fade. From a mechanical standpoint subjecting the metal to UV radiation would not make a difference. Once again, it should be noted that at this time, the plan is to exposure all materials to the same test. Eventually the decision may be made to waive some of the tests for some of the materials, but for now, all the same conditioning tests will be conducted for all materials.

Doug Hensel recommended that the EDWAC not limit the manufacturers, by driving them to a test that is prohibitive of the product that they are developing. For example, they might be forced to use a different material. It's important to maintain a level playing field for all manufacturers.

Jeff Barnes responded that this is the basis for having one set of tests for all materials. While conducting a conditioning test, such as the xenon light test (which represents sunlight over the course of five years) it shouldn't matter which material is tested? The testing process for all products should be consistent, should all be installed in the same type of environment.

Andre Miron reported noted that there had been some discussion previously about Indoor vs. Outdoor installations. The EDWAC also questioned whether indoor installation should have different requirements from outdoor installation? As far as xenon arc test is concerned, the committee should probably consider lowering the xenon arc exposure, to 1000 hours from 3000 hours. 1000 hours of xenon arc exposure is the requirement for marking and labeling systems as well as other products concerned with color fading when exposed to UV radiation from florescent lighting. In addition, indoor installation would not need freeze-thaw exposure. The EDWAC should consider having different requirements for indoor and outdoor products. Presently, only the xenon-arc conditioning portion of the standard makes reference to indoor installation. Lastly, UL is considering subjecting separate sets of samples to be subjected to each conditioning exposure. EDWAC may want to consider exposing the same set of specimens to all the conditions in an assembly line method. Suggestions are welcome.

Jeff Barnes advised the EDWAC to evaluate whether all the proposed conditions are suitable testing (Freeze-Thaw, Salt Spray, Chemical resistance and Accelerating Weathering) and meet the aging criteria for detectable warning products?

EDWAC members recommended the following tests be added to the list of chemical reagents to be used for the conditioning tests.

1) Diesel fuel,

2) Chewing gum,

3) Cigarette butts, ashes, and other environmental factors,

4) Red clay,

5) Soil, and other similar debris,

6) Vegetation

7) Leaves and berries

8) Tree sap,

9) Fertilizer,

10) Shoe marks (rubber marks)

11) Motor oil,

12) Gasoline,

13) Salt,

14) Sulfate,

15) Calcium Chloride,

16) Accelerators,

17) Plasticizers, and

18) Anti-Freeze.

Gene Lozano was concerned mainly more with transit boarding platforms than with curb ramps. Some curb ramps will have built up of debris, including soil of clay that stains. There is a lot of debris, and soil, especially after the raining season, and some soil causes extensive staining. Street cleaning may not be done frequently enough to address this.

Paula Reyes-Garcia asked if under the accelerated weathering tests, whether the hot temperatures covered by Xenon Arc testing, represented the hotter climates from summers in California (Mojave Desert, Fresno, etc.)? This was mentioned at the last meeting.

Andre Miron responded by noting that the high temperatures are part of the testing, but will look into determining if these higher temperatures cover the hot climate temperatures. It should be noted that most of the materials would not have a problem with the higher temperatures, although the adhesions might present a problem if not properly rated for the higher temperatures. Most of the non-metallic materials are probably rated 50°C already. The Relative Thermal Index, for plastics, automatically starts at 50° C (122 F) rating. Andre will consider conducting elevated temperature tests on products. Elevated temperatures tests are usually set to higher temperatures, for a short period of time. Subjecting plastic products to the Freeze-Thaw tests might become a problem. Andre is requesting adhesion specifications from manufacturers so as to determine if additional temperature testing would be needed.

Arfaraz asked if materials tested in desert climates would heat up over 50°C and the ambient measures over 50°C. Wouldn't you have extreme temperatures in the afternoon, on asphalt?

Andre replied that yes, depending on color it would be possible, and we would need to investigate this further. Andre will research into determining typical hot temperatures in the hotter areas. Heating as a result of absorption of solar energy vs. heating as a result of ambient temperatures are issues to consider. Ambient temperatures are not likely to heat materials to temperatures higher than 50C. It would be possible to simulate a five-year exposure to these temperatures. In addition, products would not be exposed to these hot temperatures year round. Research has show that elevated temperatures were not part of the main issues that caused detectable warning products to fail.

Arfaraz warned that the attachment is likely to fail in hot climates. In the deserts you have climates with extreme temperatures, hot in the day (120°F), cold at night (40°F). Will the freeze-thaw test include testing at similar temperatures of 120°F and 140°F?

Andre Miron said that when you examine the “freeze-thaw test”, and compare it to the “hot and cold test“ where hot is very hot, and cold is before freezing; then its likely that the freeze-thaw test will give you a worse case scenario, unless you look at adhesives that softens at higher temperatures.

Jeff Barnes suggested that UL conduct research to develop a “heat cool test” to simulate some desert conditions, and provide a recommendation for specific tests to be conducted when appropriate. Perhaps the tests could be used in the attachment tests. Jeff is requesting that manufacturers provide specifications for the types of adhesives used in the field, so we can research the effect heat will have on the adhesion.

Gene remembered seeing some products had adhesions with gas bubbling in the material, trapped when the temperatures are hot, and the material may become flat.

Jeff Barnes noted that this would be a good rationale for conducting “heat cool tests.” In preparation for the next meeting, we’ll prepare an opinion paper on each test and as to why it applies to the scope for detectable warning products, for consideration by the committee. So at that point we can finalize and adopt these tests as necessary, or change directions. We will consider the addition of an elevated temperature (heat) test to the test program.

Richard Skaff asked if was acceptable with ASTM that we borrow portions of the ASTM standards?

Jeff Barnes confirmed that adding references to the ASTM standards and tests in our draft document is acceptable. It is in fact to their advantage, because to reference their tests would require users of the standards, to purchase their own standards. However, it would not be acceptable for the EDWAC to duplicate the text of ASTM standards. This would be a copyright infringement.

Jeff Holm suggested that the time frame of specific tests should be addressed. Jeff questions if the number of cycles for freeze thaw cycling of only 20 cycles is correct, since some areas see lots more freeze-thaws per year. Jeff suggested a higher number than 20 cycles, but is not sure how much more.

Minh asked if the committee could collect weather data from the more extreme cities?

Jeff Barnes replied that the city with a freezing has to have a freeze down to a substantial area. Requested suggestions on how to get hard facts on freezing.

Andre Miron said to keep in mind that in the test, a part of the sample is immersed in water that is freezing. This is so freezing effect can be seen. We are looking at a deep freeze situation. The surface of material for most thermoplastics would not likely change in the structure, if they had lower temperatures that are below the 0 degree point.  There would be little change, and probably is not brittle enough to break. However, there is a concern if the water freezes all the way through the adhesives, at the interface.  We are very concerned with the interface and what is happening there. Concrete absorbs water and freezes, so this might be a concern if it expands while frozen.

Richard Skaff asked if there were any national concrete standards for freezing and thawing available?  There should be an industry standard somewhere.

Andre Miron was not aware of such a national standard.   Although, Michelle believes that such a standard may be available.

Gene Lozano suggested connecting the freeze-thaw temperature tests with the impact test, using a steel ball to determine if there is cracking, followed by freezing, using the same sample.

Jeff Barnes suggested going through the rest of the proposals, before considering modifying the sequence of aging tests. Eventually we will need to determine if the aging tests should be conducted individually, followed by performance testing, or do we conduct all the aging tests on the same samples, then proceed with testing.

Richard replied that determining the series of tests to be conducted on samples should probably be a laboratory decision.  Lab could decide whether to test in a linear or parallel method.  The group needs to determine if either method makes a difference or not on product results.

Andre Miron stated that for clarity purposes, the proposed standard should have a table noting the time of evaluation and the time that the test should be conducted. Should it be done right after freezing, or after it thaws? UL is continuing to collect data, and conduct research to find out if it makes a difference when the product is tested.

Minh Nguyen recommended contacting the national weather service when determining the number of cycles for the freeze-thaw test.

Jeff Holm suggested checking with David Cordova on Friday, because CALTRANS conducts freeze-thaw testing for pavement, and maybe the committee can correlate with their data.

Arfaraz Khambatta agreed with Andre that plastic materials probably won't be affected by most cold or hot temperatures, but could be affected by attachment materials, which could become brittle, and break off because of snow removal equipment.

<u>Salt Spray Topic:</u>

Richard Skaff recommended conducting the drop ball impact test in a freeze state. More research will be necessary.

Minh Nguyen questioned the number of exposed hours selected, and is interested in the basis for the numbers proposed in the test.

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Jeff Barnes notes that he will collect reference information to show supporting rationale.

<u>Chemical Resistance Topic:</u>

Minh Nguyen asked if the seven days exposure test was run continuously for the chemical resistance test?  Standard ASTM D 547 specifies approximately 150 exposures.  Minh asked if the committee could choose exposures from the list, or add on other tests?

Andre Miron replied that yes, the chemical resistance tests are continuous, and can be done by immersion or wet patch method.  Exposures can be chosen from the list, and additional conditions can also be added.

Richard Skaff mentioned that excessive debris; vegetation (leaves and berries) could stain the product, and change it permanently.

Jeff Barnes asked Derek Shaw if DSA had a position on staining?

Derek Shaw replied that he was not aware of a DSA position on staining, unless staining affects the usability of the product.

Michael Paravagna warned that staining may impact slip resistance, and noted that adhesion wears out.

Andre stated that the committee would need to select worst-case situations of staining on surfaces, and develop a standard selection of stains to use for testing.  We can look for a standard that deals with staining test methods.

Derek Shaw confirmed that fertilizers and other debris are washed up to curbs and gutters, which causes staining.

Jeff Barnes suggested adding tree sap, and rubber from shoe marks to the conditioning list.  May need to search for possible national standards on this topic.

Jeff Holm pointed out that regulations of local agencies should be addressing this. It wouldn't be fair to hold the manufacturers responsible for maintaining clean curb ramps, transit stops, etc.

Both Doug Hensel and Richard Skaff agreed with Jeff Holm that the manufacturer should not be responsible for the public agencies not handling their responsibilities.

In addition, Arfaraz noted that all these tests would increase the price of detectable warning products   Price would be too high; cities won't be able to afford this. Cities already don't want to install domes.

**10. Manufacturer/Public Comments (Jeff Barnes/UL)**

Paul Hanz Comments:

Environmental testing is important and necessary.  Should be careful which ASTM Standards are used, since not always applicable for all products.   For example, there is a standard for concrete products, ASTM C140, which is defined as 50 cycles, warm freeze cycles.  We may wish to modify the test or develop our own test, which would be suitable for California.  The committee may want to consider other ASTM standards for concrete, which may achieve same results as the standards for plastics.

Mike Stenko Comments:

a) Concerned that UL is considering running groups of tests, one after the other on specimens. Some of the tests were never designed to run one test after another, one at a time. Tests are usually specified in ASTM standards as well as ACI, and other organizations. All samples can be conditioned for the same tests, prior to running tests. Samples shouldn't be subjected to tests, fail a test, and then proceed with freeze-thaw and other tests. Mike supports running individual tests on samples.

Jeff Barnes replies that clarification is needed. The committee was reviewing the environmental conditioning tests, not the impact test, which is a performance test. Prior to the impact test, there are two options, which are to subject five different samples to five different environmental conditions, then conduct the impact test five different times, or do we run the tests in series, and then run one impact test on one sample.

Richard Skaff asked if the plan is to create a test that has all the environmental conditions done first? Richard recommends having one specimen tested under all the conditioning tests. It's important to view how multiple conditions affect the tested product.

Jeff noted that at the next meeting, the conditioning process for the products would be finalized.

<u>Mike Stenko Comments Continued:</u>

b) Need to be very careful with the staining issue, nearly every item causes staining. Who is liable for this, if the color is no longer unstained? This is a very touchy subject. What about the cleaning issue, can they be cleaned, and how will the cleaning be done?

Dustin Upgren Comments:

Concerned with staining issue. Manufacturer shouldn't be held responsible for this issue. Dustin also suggests that the committee consider the cleaning issue.

Ed Vodegel Comments:

a) Ed has a background in road marking industry. His company has a standard for skid resistance, which is similar to slip resistance for dome products. The higher the slide resistance means it's more likely to attract dirt, debris, and have staining.

b) Regarding accelerated weathering, the committee appears to be looking mainly at durability issue? Are we also factoring appearance as far as increased freeze thaw cycle of the product? Will the appearance change with the freeze-thaw?

Richard Skaff suggested that the committee should research the Skid Resistance Standard, which uses a yellow ladder for crosswalks. Might be possible to use this standard to establish a comparative analysis to see if it would be usable.

Ed Vodegel Comments Continued:

The committee may wish to evaluate the British pendulum number, which swings a pendulum across material to see how far it skids the material. This test might be usable by the committee. Not sure if the title is correct, Ed will provide Esther with this reference information.

Jeff Barnes plans to ask David Cordova for reference information, in case he is aware of this standard.

Mark Heimlich Comments:

Mark recently reviewed the Scope of EDWAC. The scope notes the committee will develop proposed testing standards for durability, etc. Mark notes that every product will have test failures, and a range of failure based on extensive testing needs to be provided. It is important to establish a range of performance results, and should develop a balance between passing and failure. With this data, a criterion can be established. This logic can be taken to examine staining and color fastness, which are closely related. Part of the committee's responsibility is to see if the product retains its color fastness. Fire resistance and slip resistance should be included as recommended in the scope of the project. Part of the scope of the committee is to meet the safety and accessibility needs of the blind, and having flammable material underground is a safety issue.

**11. Proposed Requirements for Detectable Warnings and Directional Surfaces – Testing for Shape (Section 9-11) – Andre Miron/Michelle Courier**

Andre made a brief presentation on Sections 9 to 11. These tests are to be conducted on samples that have been preconditioned.

a) Abrasion Resistance, Section 9:

These tests simulate worst-case condition. Abrasion in the field will be mainly due to pedestrian traffic and street cleaning, which will affect the entire surface, including the domes and the valley between the domes. A stiff wire brush to abrade the surface, at a downward vertical flow, will simulate regular abrasion. ASTM D 4977 appears to be applicable for this type of product. The product would be measured before and after abrasion. How many cycles would be enough? 50 cycles was proposed, but may need to be changed.

Jeff Barnes notes that the proposal proposes to use a stiff wire brush to abrade the surface, at a downward vertical flow, which will simulate regular abrasion. We need to determine the appropriateness of using a stiff wire brush, where to start the brush, and the correct number of cycles.

Andre Miron suggests that the committee should keep in mind that a 5 lb force is being applying in a smaller area than a person's foot. The brush in question consists of wires, with a 5 pound-force, exerting downward pressure. It might be useful to check into pressure applied by snow machines.

Gene Lozano agreed that the committee needs to use a specific value for a starting point. Gene has concerns about the heavy mass vehicles (trucks) causing lots of wear on domes. Especially if they cut corners, this causes more wear.

Minh Nguyen asked if sandpaper had been considered for the abrasion test, since foot traffic wears unevenly.

Andre Miron pointed out that the Taber abraser works like sand paper. The stiff wire brush causes a good abrasion on domes and on the areas between the domes. Sand paper would be uneven because it is not flexible, and easily breaks.

Paula Reyes-Garcia asked if the committee should contact ASTM and asks why the wire brush is used to conduct the ASTM test?

Jeff Barnes replied that we can attempt to do this, but it could be difficult to locate the original source since this type of information may not be documented. In addition, the document was published approximately 35 years ago. The committee might want to consider using the Taber abrasion, to simulate foot traffic.

Andre Miron stated that he would bring his technical notes to work on Friday, February 18, 2005. Although most often the product will wear out on the dome, the committee should consider the wear on the field area. If enough abrasion is observed between the domes, concrete and/or adhesive may become exposed. Maybe a combination of Taber abrasion and wire brush is needed.

Michelle Courier recalled that one of the reasons brushes was chosen were because brushes could provide abrasion on both the domes and the fields around the dome.

Andre Miron remembered the other reason for selecting a metal brush. Some products have small extensions provided for slip resistance. The Taber abrasion is likely to remove the extensions. However if we apply the Taber abraser, we will wear out the extensions.

Minh Nguyen notes that applying a 5 lb force on the top of the dome would result in less pressure in the valley.

Andre Miron described the metal brush as having 5 lb pressure on top of the wire brush. The brush is made of 22 holes containing metal bristles made of 0.012 inches-diameter tempered steel wire, 40 wires per hole, set with epoxy. The brush would be moved brush back and forth. The wires will not stay straight up and down. The wires coming across the top of the dome will have more pressure, with a bending force of the wire. You will have 5 lbs at the bottom, and more than five pounds at the top, because of the pressure on top plus the bending spring force of the wire.

Minh Nguyen recommended viewing additional ASTM specifications that focus on the floor industries.

Michelle Courier replied that Taber abrasers are used in a lot of the ASTM standards. In addition, the ASTM standards for flooring do have domes.

Andre Miron reminded everyone that along with considering foot traffic, the committee should also consider trucks, street sweepers, ice, wheel chairs, etc.

Jeff Barnes notes that two different types of conditioning may be needed.

Jeff Holm made a request for an explanation as to why sand blasters were considered too harsh. Jeff notes that sand blasters more consistent application, and that the pressure of the sandblaster is adjustable.

Both Michelle Courier and Andre Miron considered sand blasters too harsh. Andre plans to examine the various pressures available. Sand blasters may be worth a second look, although wire brushes seemed like a happy medium.

Michelle Courier found that wire brushes seemed more reflective of what it would see in service, rather than using sandblasting.

b) <u>Impact Resistance, Section 10:</u>

Andre made a brief presentation on impact resistance. The EDWAC will need to consider if there is a minimum impact value on incoming samples. Andre suggested the Garner type impact. Which consist of a tall guide tower, with a mechanism for raising a metal dart, 4-pound weight. Which can be dropped from various heights in order to determine mean failure energy of an as received specimen set of samples. The current intent of the standard is to determine the mean failure energy of an as received set of specimens. We would take 20 specimens, and use the method described in the ASTM to determine the mean failure energy of that set of specimens. We would than calculate 90 percent of the energy and the other specimens would be conditioned, such as UV, salt spray, chemicals, etc. Then we would subject each of those specimens to 90 percent of the mean failure energy that was determined earlier. Any failure would be a noncompliance because we are now reducing the mean failure energy by 10 percent to meet the requirements, and dropping that impact force on to the specimen. We need to think about if there is a minimum impact value that is acceptable in the as received condition. The reason we say this is because if we have a specimen that has a low impact value to begin with, and then you take 90 percent of the impact value, you are still taking 90 percent of a very small impact value, if you want your material to meet a certain minimum criteria, we may have to set a minimum value. This will require some research. We also meet to consider that 90 percent retention of this property may not be a viable expectation. This is because impact tests tend to behave more erratic than other tests. It might be best to pick 70 or 80 percent retention for this particular test, if we can set a minimum impact value. Testing should be done on valleys and peaks to get a good representation of tests.

Andre Miron described the device as a blunt object.  A dart, which is a weight with a rounded tip, and designed to use GE configuration.

Minh Nguyen noted that the force for blunt and sharp objects is different.  Minh asked if there a test planned to use a sharp object? Specimen calls for a one inch backing. This does not represent the field.

Andre Miron replied that he is considering using an application of a blade at a 45-degree angle to represent testing with a sharp object.  Andre proposed one inch backing for convenience, however a two-inch backing can be used if so determined by the committee.

c) <u>Water Absorption, Section 11:</u>

Andre Miron noted that the intent of the water absorption test is to determine how much water the material absorbs, and whether there is a dimensional change as a result of the water.  The tests are conducted in order to determine any lasting effects of water exposure to the material.  This test represents flooded transit ramps and curb ramps. We need to make sure that there is no cracking or breaking as a result of water absorption.

Jeff points out that with immersion, the 90 percent criteria doesn’t make sense if the product is swelling extensively.

Minh Nguyen asked if there was a test for adhesion, where water effects the adhesion?

Andre Miron replied by stating that the adhesion test is covered in the freeze-thaw conditioning test.

Jeff Barnes notes that the force of street sweepers should be checked.

Jeff Holm mentions that using the wire brush is an extreme case scenario, which means it is suitable for use on the test specimens. Jeff reminds the committee that it is important to develop consistency in testing.   Critical part of the equation is to have consistency for the samples.   Establishing an initial value to start could be tricky.

Gene asked if blunt vs. right angle impact are tests that deal with the side force of wheelchairs hitting the sides of the domes.

Andre Miron replied that if side horizontal impact testing is needed, this can be considered in developing impact tests.

**12.  Manufacturer/Public Comments – Jeff Barnes**

Topics: Impact, Abrasion, Water Absorption, and Shape Tests

Dustin Upgren Comments:

Notes that the committee may not get consistent results.  All materials should be set to the same test criteria.

Mike Stenko Comments:

Compressive failures are the result of excessive truck traffic. See Western Underground Utilities Association for test data. Need to consider a minimum value strength set, and maintained no matter the retention change.

<u>Mark Heimlich Comments:</u>

Agreed with Mike Stenko's comments. Five years from now, how will the testing be done?

Derek Shaw replies that there will need to be an independent testing lab, to test to the requirements. This will be determined later. The goal for now is to allow certification for all products tested and certified by an independent lab, and to provide the list of certified manufacturers on the website.

<u>Mark Heimlich Comments Continued:</u>

Water absorption test is important, indicates staining, graffiti, etc. May consider testing with colored water (i.e. Red) to determine staining.

<u>Paul Hanz Comments:</u>

Shouldn't domes be aligned in a specific pattern? Wear ability, rubber matting with twisting action, is a good idea. Should note that conducting impact test is important.

Derek Shaw notes that it is important to focus on non-dimensional qualities of the product. The pattern of domes is not an issue at this time.

<u>Ed Vodegel Comments:</u>

Ed asked if the abrasion, water absorption, and impact criteria had been set yet?

Jeff Barnes replied that it had not yet been set.

Michelle Courier added, that the committee needs to set minimum requirements for a five-year time frame. Information is needed from the committee and industry. We need to do worst case scenario, with out exceeding reasonable baselines.

**13. Adjourn**

Jeff Barnes adjourns the meeting at 5:00 pm.