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

Division of the State Architect
Underwriters Laboratories Inc.

Minutes of a Public Meeting held on:
Tuesday, October 11, 2005

1102 Q Street, 3rd Floor Conference Rooms
Sacramento, California

MEETING ATTENDANCE – DAY ONE
ON TUESDAY, OCTOBER 11, 2005

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

Committee Members Absent
Doug Hensel
Tom Whisler

DSA Staff Present
Derek Shaw
M. Mankin

UL Staff Present
Jeff Barnes
Esther Espinoza
Andre Miron

Others Present
Regina Baak, Tactile Guideways
Ron Baak, Tactile Guideways
Joe Dunnigan, ADA Solutions
Francis Hamele, Wausau Tile
Mark Heimlich, Armor-Tile
Jon Julnes, Vanguard ADA Systems Of America
Russ Klug, ADA Concrete Domes
Jeff Koenig, Detectable Warning Systems Inc.
Chris Orme, Neenah Foundry Company
Jeff Patterson, Muller Construction Supply
Ed Vodegel, Flint Trading, Inc.
Lex Zuber, Norsestar Construction

OCTOBER 11, 2005

***General** – A meeting of the Evaluation of the Detectable Warnings/Directional Surfaces Advisory Committee (EDWAC) was held October 11-12, 2005 at the California Community Colleges Building in Sacramento, California. The purpose of the meeting was to 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 fifth meeting of the advisory committee for detectable warnings and directional surfaces to order at 10:16 a.m.

2. Review of Meeting Protocol [Jeff Barnes/UL]

Jeff Barnes noted that the meeting protocol continues to follow Roberts Rule of Order at this and subsequent meetings.

3. EDWAC Member Introductions/Roll Call [Jeff Barnes/UL]

EDWAC members, UL and DSA staff members, manufacturers, and general public, each took a turn introducing themselves. Two EDWAC members were not in attendance.

4. Review/Adopt Minutes of October 11 – 12, 2005 Meeting [Jeff Barnes/UL]

Jeff asked if any committee members had questions or comments concerning the October 11-12, 2005 meeting minutes. There were no questions or comments.

Richard Skaff made a motion to adopt the October meeting minutes. Gene Lozano seconds the motion. There were no objections, so the meeting minutes were adopted.

Vote Results: 9 yes votes, 0 no votes

5/6. Research Design – Detectable Warnings/Directional Surfaces and Manufacturer/Public Comments [Jeffrey Barnes/UL]

Topics:

a) Status of Research Design Schedule

b) Detectable Warning Sample Specifications

a) Status of Research Design Schedule – Jeff Barnes reported that the original goals of conducting the research design was to test the proposed resiliency test method and confirm the measurement values proposed in the draft standard. Secondly, to establish a level of resiliency that an individual can reliably detect for those installations and detectable warning systems that rely on resiliency for the primary means of detection. However, the there has been a recent delay in implementing this research project when the research design-contractor suddenly became unavailable, due to other higher priority project work. Two options are under consideration for the committee to review.

Options 1 – Is to move the research design to late November or early December, although the weather would be unpredictable during these time periods, and rain could cause unwanted complications to the project.

Option 2 – Instead of conducting the research design, we could consider measuring and collecting data from previously installed samples around the state. UL would work to establish the resilience measurement in relation to performance criteria. UL could base this research from data collected from installed products through out the state, using test equipment from the lab. If the product degrades over time, UL could substantiate the required test data for that.

Floor Discussion

- Richard Skaff does not recommend collection of data from around the state (Option 2) since there is no consistent method of tracking the installation method by all the contractors, nor is there a method to verify that the contractors have followed the manufacturers installation instructions during installation of the product. A more scientific, stable method of collecting data would be to use one test site, and install multiple products using only one experienced contractor to install all the test samples. The contractor would follow the installation instructions provided by the manufacturers of the test products. Richard suggests pursuing the research design project by finding another contractor. Richard further recommends contacting representatives at CALTRANS, County of Marin, County/City of San Francisco or other cities, for a list of experienced contractors that would be willing to participate in the research design project.
- Gene Lozano agreed with Richard, and suggests using an experienced researcher with proper credentials to coordinate and process the collected data from the research design project.
- Michael Paravagna proposes using a tarp over the test areas, so that rain is not a factor during the research design testing.
- Paula Reyes-Garcia reports that she contacted the engineering department at UC Davis, and although the college was interested in building such a test site at their school, they would be unable to accept the test site before next summer.
- David Cordova volunteers to provide a list of contractors for the research design project, although notes that this may be costly because of the short time frame. David will contact Jeff Barnes after the meeting to discuss this issue further.
- Jeff Barnes notes that the consensus at the meeting is to find a new contractor to assist with the research design project, using tarps or covers if needed for rain.

- Jon Julnes recommends purchasing tarps at discount stores, which would be less expensive than renting tarp for the test site. Jeff Barnes agrees that this is a good idea, and would look into this matter.

b) Detectable Warning Sample Specifications – Jeff Barnes plans to send out sample specification information directly to manufacturers, by email.

7. National Cooperative Highway Research Program [Andre Miron/UL]

Andre Miron notes that it was brought to UL's attention at the previous meeting that there is another research program on a federal scale on detectable warnings, which started officially on March 2005. This project has not actually begun testing yet, and will officially start on March 2006. The project is a continuation of the research report on Detectable Warning Products Installation, Maintenance, and Durability Considerations, developed by the National Cooperative Highway Transportation Research Association. However, it should be noted that the EDWAC project is near completion, and will be completed before the other project actually begins. There is a description of the project and project objectives on their website, under NCHRP Project 4-33. Their planned research will include looking at various test conditions and re-examining all failure modes noted in their previous reports. Basically the project hasn't started yet, and therefore there are no proposed tests yet for the EDWAC to review.

Richard Skaff reports that research on "color: may already have started. Richard requests that Jeff Holms from FHWA looks into this project and provides a status update to the committee.

Gene Lozano also mentions that the Federal Highway Admin. (FHWA) unit that deals with traffic control devices has a grant, involving persons with low vision, which will consist of examining color selection and patterns. Gene has requested additional information from researchers.

Jeff Holm has not received information on this directly from headquarters since that office hasn't released any information yet. Jeff will contact his office to look into this, and provide the committee with an update, as soon as information becomes available. In the meantime, Jeff Holm continues to provide EDWAC updates to the FHWA and the ACCESS board whenever possible.

8. Manufacturer/Public Comments [Jeffrey Barnes/UL]

No comments.

9/10. Test Sequence, Minimization of Samples (Exhibit A) and Manufacturer/Public Comments [Andre Miron/UL]

Andre Miron has received several requests from individuals, asking for the approximate cost of conducting testing on detectable warning products. The current proposed cost for product testing would be high, however a reason for that is because the proposed test procedures has not yet been finalized, and because the number and size of test samples are still under consideration. A current review of standards, current and proposed test conditions/procedures would likely require a very high number of samples to be submitted for testing. To lower these costs, a test lab would need to conduct repeat testing on some samples, when appropriate, so that the number of required samples needed for testing can be decreased. For example, a good approach would be to reuse undamaged test samples

for other tests whenever possible, and also to reduce the number of required samples used in some of the tests and instead conduct those tests in cycles or in series. It may also be possible to waive certain tests, based on general material types. Andre identified the following major test issues.

1. Test Conditioning – Originally, UL planned to test a set of samples for each proposed condition. This would not be practical because this method would require too many samples, and there are limits to the number of samples that can be tested in the test chamber due to lack of space. The test lab would be required to conduct a large of number of tests using numerous test samples, one at a time, and this would take too long to test all the samples in a timely manner.
2. Series Type Testing – Andre also spoke about conducting conditioning tests on selected samples in a series, starting with the nondestructive sample testing. Several research studies have suggested conditioning the tests in a repeating cycle, to best simulate the interaction of conditions. UL is considering proposing either a super cycle with all conditions tested repeatedly using only one set of samples, or consider splitting the tests into smaller cycles, with several sets of samples. This would cost less because fewer samples are needed, however it would take longer because some of the tests are conducted in series.
3. Tests Options – Some manufacturers might prefer the option of not conducting series type testing. This process is more costly, and sometimes manufacturers are willing to choose the higher priced investigation project, if the project can be completed sooner.

<u>Floor Discussions</u>

- David Cordova agreed that there is a general concern by manufacturers over the time and potential cost of product investigations. David suggested that when the test

agencies conducts evaluations, they should also consider permitting product evaluations only in the lab, with the option of having the tests conducted by the manufacturer or by a certified laboratory. This is a similar process already done by CALTRANS, and puts the burden of providing test data on the manufacturer.

- Richard Skaff notes that whole point of the certification program is to have a centralized control point, with consistency of the test process. The test laboratories should be experienced and provide some quality control, and should thoroughly understand all the test procedures, and the implications of the standard testing as discussed during the development of the requirements. Many labs will not have this experience of the test process and procedures. Therefore the “initial” testing of products should be conducted by UL.
- Jeff Barnes reported that this type of testing is already part of the regular process of developing standards. UL is currently conducting a series of small batch testing on samples sent in to UL for this kind of initial product testing. Certification type testing, and lab selection will be determined by DSA at a future date, after review and adoption of the proposed test procedures. However, the committee has the option of making additional recommendations in this matter, in the appendix of the draft standard.
- Andre Miron announced that he has conducted lots of different tests on various types of products from a large number of manufacturers. Andre has spent quite a bit of time for several months, validating the proposed tests and test data. Once the draft standard has been completed, Andre will request additional samples so that he can run these test specimens through the entire test program. Andre hopes that some of the test specimens submitted for testing, already have some field history, so that a correlation can be developed between the products, test results and its field history.

- Jeff Barnes notes that the key thing is to collect enough data from the tests; to make certain that there are some differential data for the samples. UL needs to develop a proper balance of testing. Requirements should be elevated to address reported problems out in the field.
- Andre Miron reports that as he develops new tests, he will also develop acceptance criteria, and set threshold values whenever possible. Andre states that he will also look at performance values when developing acceptance criteria.
- Richard Skaff mentioned that it is difficult to believe that requirements can be developed without testing all types of available products. In addition, many products constructed of plastic material looks all the same, but may react very differently during testing.
- Andre Miron replied that once tests procedures are developed, he plans to review various published reports that contains performance data already available. Andre will compare the UL tests results to other published research data, to develop and analyze all the test data. This information will help to establish test thresholds. It's important to not simply adopt a value/number from research data, without looking at each test carefully to examine how it relates to detectable warnings. What are the real concerns? What makes sense for the situation and the product? All products should not easily pass all tests, and certainly the product should not be held to a better standard than the concrete around the products. Decisions should be made based on real world knowledge, and correlated to the collected test data. UL is looking for real world performance to use in the lab to evaluate and test products.
- Richard Skaff pointed out that since the committee started, new products have been manufactured. Richard asked how would new sample constructions be viewed and tested?

- Andre Miron replied that unless something is very unusual, the standard should cover this. However, it is possible that a new type of construction would need to be tested carefully, and maybe the requirements revised to reflect the new science in the detectable warning industry. It might be possible to group material and construction types, to anticipate tests needed. For example, some tests could be waived based on type of construction, although a product like concrete which would be affected by the salt spray and snow, would require testing. Tests could be added or excluded based on scientific analysis of the product types.
- Jeff Barnes states that any time a standard is developed, especially a first edition, the document will naturally be subject to future changes. It's a living document, and changing real life situations will result in regular revisions to the standard.
- Richard Skaff suggested that the process of maintaining the draft requirements be specified as a recommendation to DSA. Jeff Barnes agreed that the committee should consider proper maintenance of the standard as a possible recommendation to DSA.
- David Cordova recommends proposing an appeal process. If a new product does not fit all of the test requirements, it should be reasonable to have an appeal process available if necessary.
- Several committee members are concerned about waiving any tests in the proposed standard. David Cordova notes that new products come along regularly, and not every product needs to be subjected to every test. It's the intent of the legislature to have the test entities responsible for making these decisions. That is why DSA made the choice to find an independent test entity, with the experience for making these types of decisions.
- Gene Lozano responded by noting that the intent was to have a standard that any independent body could follow. It was not the intent to have anyone make judgment

calls on submitted samples. He recommends evaluation procedures that are more black and white, more concrete. There should be no subjective decisions made for new products.

- Jeff Barnes notes that tests requirements will be provided in specific proposals, which will be made very clear, and subject to committee approval. Andre is working to keep the test and test samples as short as possible.
- David Cordova emphasized that there is not enough information available yet to judge the proposed test process. When using physics, concrete facts, and history of product data, would be a waste of time and money to automatically conduct all tests. There are independent entities checking to verify that products are doing what they need to do. There is a long history of testing done on different types of products, so that we should know what to do with the submitted products.
- Jane Vogel asked what happened to all the other products already installed, after the certification program starts. Will they be removed? And are there field reports of samples that are working well now that can be used now for guidance?
- Andre Miron replied that there are lots of reports available, but the date and method of install is usually not available, and in addition, real world installation may have affected the product wear. There is a need to be cautious about judging this type of product without full details. Andre plans to invite manufacturers to send to his attention, data of working concrete if within driving distance. Derek Shaw adds that in general, previously installed products are not required to meet new published requirements. However, replacement products and newly installed products need to be in compliance with the new requirements.
- Jon Julnes is concerned that in trying to meet real life testing, there may be a product that does well in snow removal conditions, and another product that doesn't that the cost of being close to the criteria could be a major consideration. Should consider

the cost of complying with certain requirements, and should note that the process of testing should not be a huge financial burden. Missing by a small margin should be possible for some tests.

- Andre Miron reviewed test concerns once more. Proposed tests fits generally into 3 types.
    1) Destructive tests,
    2) Non-destructive tests, and
    3) Shaped or Conditioning tests.

Shaped or conditioning tests are looked at for confirmation after testing. They are set as conditions, which allows comparison to the other conditioning tests. Abrasion and water absorption tests for example, are conditioning test, rather than a regular test. This type of testing helps reveal worse case combinations in accordance with real world water and abrasion conditions. The non-destructive tests could possibly be done on the same samples, since in theory they are not destructive. Tests would be waived only if reasonable for the type and construction of the product. Andre is looking at sample sizes to determine if any can be sized down, but keep in mind that real world conditions are likely to use larger samples. After moving to the new UL facility, Andre plans to continue conducting tests on multiple types of samples, whenever possible. Research and testing has shown that domes have lower impact strength than field areas, and that it is likely directional bars will also have less impact strength. Small areas, if it has a defect, will amplify the affect. If domes are worse case situations, it's possible that only domes need to be tested, and will represent both field and dome areas. In addition, should testing be conducted on assorted domes, or on the same domes only? Andre notes that other tests may need further modification. For example, the UV testing may need to be conducted only on surface layers of products.

11/12. Strength Tests (Exhibit A) and Manufacturer/Public Comments [Andre Miron/UL]

Topics:

a) Impact Strength Test

b) Shear Strength Test

c) *Compressive Strength test.*

a) Impact and b) Compressive Strength Test

After conducting extensive research, Andre Miron determined that domes are weaker than fields in a homogenous surface, so this may result in a change to the standard, noting that testing of fields is not needed if the dome is tested. Research notes that typically snow clearing and snowplows cause the largest amount of dome failure. Research material from New Hampshire, Dept of Transportation, specifies that this can be tested by applying snow and plowing over the detectable warning product in a repeating cycle. During the break Andre sent the following links for research reports to all meeting attendees.

1) NHCRP Project 4-33:

http://www4.nationalacademies.org/trb/crp.nsf/06b9849e1b250cee8525673600663c80/9ab78ce4ea1f1c3085257084005d6d7a?OpenDocument

2) NCHRP Project 20-07:

http://www4.trb.org/trb/crp.nsf/reference/boilerplate/Attachments/$file/20-07(177)_FR.pdf

3) Testing Truncated Domes

http://www.tfhrc.gov/pubrds/04sep/10.htm

4) New Hampshire DOT Evaluation of Durability of Truncated Dome Systems (Snow Clearing): http://docs.trb.org/00942591.pdf

5) Actual ADA Position on Slip Resistance: http://safety-engineer.com/adasurfaces.htm

6) Bird Study:

http://www.birds.cornell.edu/brp/

Most of the reports made note that snow-clearing testing was important. In one report, the test included a 5000 lb plow, with a free-floating blade, at a particular angle, traveling at 2 or 3 miles per mile. Andre is considering how to recreate this movement, using the collected data as a resource. Andre has ordered new test fixtures that will apply a blade at a specified angle, on a detectable warning arranged in a particular angle. Andre plans to conduct the test in a cold area, with snow flurries possibly, and will look for worse case situations using adjustable free-floating blades. Andre intends to conduct some product testing, and evaluate the data and correlate it with the type of information available with the New Hampshire research study.

Richard Skaff suggested that for related information, Andre should contact the ADA coordinator with the State of Alaska who is part of the public right of way committee. This representative probably has some ice/ freeze, snowplow, ice built-up information. The ADA coordinator has been a consistent contributor to FHWA website BLOG for persons with questions like these currently under discussion. There is a website BLOG for FHWA that allows for questions like this and right of way issues, detectable warnings, etc. Richard Skaff will send an email with this information to Andre.

David Cordova added that he attended a conference recently where this website information was made available. David suggests that Andre contacts Derek Shaw to obtain this website address.

Andre Miron mentions that snowplow tests conducted on directional bars will need to be done in both directions.

c) Compressive Strength Test

Andre Miron reports that in reviewing feed back from the committee, and considering the materials being used, it became clear that some domes would flatten or crack under pressure. Testing will be needed to address this and the tests should consider the heavy loads moved over detectable warning products on a regular basis.

Richard Skaff notes that compressive pressure on domes is a definite problem. The City of San Francisco for example, has a situation where forklifts move lots of heavy loads over detectable warning surfaces, and some of the forklifts are constructed with hard plastic wheels that cause additional damage to domes. Curb ramps are often used as a transition route between areas, and are used by many for moving heavy materials, instead of building new ramps for that purpose. Michael Paravagna adds that pallet jacks can also cause problems. Pallet jacks are used over truncated domes all day long in some areas.

Andre Miron reports that he has tested individual domes; to determine how much pressure the dome could withstand on only one dome. This was preliminary testing done on assorted types of constructions/materials. A 5000-pound weight was applied on one dome at a time. Andre tested several polymeric samples, and measured load amounts and noted displacement of movement. Results really varied, and there were different failure modes.

One material handled 5000 lbs with very little displacement (0.036 inches). Most materials had a range withstanding 2000 – 4000 lbs, some with minimal damage, or with different failure modes such as broken concrete or crushed domes. It's obvious that there would be different results with most of the samples tested. Andre measured and recorded results whenever there was a distinct change of results.

Richard Skaff asked whether applying pressure straight down, provides the data needed for real life situations, when most weight usually comes from the sides. Does the shape of the dome influence application of weight pressure?

Andre Miron notes that creating real life type tests for snowplows will be difficult. However, Andre plans to take measurements of sample data when they pass or fail performance testing, and collect all available data and use this information as needed for determining new test procedures. Andre intends to create a downward/horizontal test combination for the test procedure. Andre notes that additional weight can be handled over several domes, which is more likely in real life situations. Once the impact tester arrives, Andre plans to look at correlation of compressive test combinations. Types of test apparatus will be also based on real life hazards, such as small hard wheels, which are used for skateboards. Andre adds that it's not possible to duplicate field situations exactly. However, standards can be built soundly, so that the standard will allow some tolerances. Applying good engineering principles, and creating a stable standard with tolerances should be possible with proper research and test data analysis.

Arfaraz Khambatta suggested that when considering impact resistance testing, should keep in mind that placing a product on a flat surface, may result in an unintentional air gap in the tiles, which may cause additional test failures.

Andre Miron replied that this would be addressed by conducting tests on products in its intended installation pattern. Andre adds that sometimes an air gap may actually cause better test results, when compressive pressure is applied and absorbed more readily in the air gap, resulting in less damage to the product. Andre asked whether tests should be conducted on unattached materials, or on areas with air gaps (intentional) already built in?

David Cordova suggested that DSA consider providing a disclaimer to the list of approved products, noting that the products should operate properly if following certain locations, applications, and other conditions of acceptability (list of assumptions).

Andre Miron notes that he is considering using the compressive strength test, with a smaller load cell, to detect the amount of elasticity in domes, and determine if there is a correlation to the coefficient of restitution.

Mark Heimlich reminds Andre that widely spaced domes may affect test results.

Andre Miron explained that this is why he tested only one dome, which is a worst-case scenario. These tests were only for preliminary collection of data for now. Andre plans to collect additional test data for hand trucks, forklifts, and other equipment, to set up a test procedure for these types of products. Andre notes that he still needs to conduct additional research to determine the best test method, and in order to create a threshold. Wider spacings could have an affect, but with the tolerances built in, may not be affected to a large extent. Will need to consider further, on a test-by-test basis. Andre will consider specifying that testing should be done on the widest spaced samples, or smallest spaced samples, depending on the test situation, to test common worst-case situations. Shape and

conformation requirements are referenced in the code, and could be affected by the changed requirements. A disclaimer may be needed; noting distance of domes during testing may affect test results.

David Cordova recommends that independent entities involved later in the certification process, should consider committee recommendations, and should be part of the consideration for other independent entities.

Jon Julnes suggests that if a product doesn't meet the conformation test then the test agency should contact the manufacturer to determine if the test can be terminated immediately and not continue with the other tests. This would permit the manufacturer to save money, if done early in the investigation prior to conducting other tests. However, if authorized by the manufacturer, the test agency could continue to proceed with the testing, if the manufacturers are interested in saving time, and plan to resubmit their products soon for retesting of all failed tests.

Andre Miron notes that if UL were handling an investigation of a product failing the Conformation tests (which would be designated as one of the earliest tests to be conducted), the project would continue if the manufacturer had requested that the project proceed, or the project could be terminated. There should be communication between UL and the manufacturer to determine the best approach for the project.

Gene Lozano explained for everyone's benefit, that after DSA receives the standard there is an entire process of review and public postings for public comments, which must be followed before requirements can be adopted. The document first is submitted to the California Building Standards Commission, and subjected to their review process, which

includes at least 2 public comment periods. The next step is for the standard to be forwarded to the internal ACCESS code committee (Gene is a member of this committee), so that the committee can review the standard and makes recommendations, then the standard is forwarded to state agencies that accepts or doesn't accept the recommendations, and at this point it may be subject to another public comment period, followed by a review by the building code commissioners who have a public hearing, and finally decides whether to adopt the requirements or not.

13/14. Field Manufactured Detectable Warning Systems and Manufacturer/Public Comments [Jeffrey Barnes/UL]

Jeff Barnes reports that these products would include field manufactured detectable warning systems like stamped concrete products. These products are difficult to test because samples are installed and manufactured in the field, and there may not be much consistency among the domes construction because of this. The difficulty of maintaining quality control for these products needs to be discussed. The testing should follow the current test design for consistency. Conformation will be difficult for this type of product, and this is a quality control issue. The committee will need to consider if evaluating field-assembled products should be required during the certification process, with the installation process witnessed by a test lab? Also may need to consider requiring certified installers, so that the installers are qualified to install these types of products.

David Cordova proposes requiring a sample be submitted, that was created in the field, should be cast in place, stamped, and of a prefabricated types. Could also ask for random samples to be submitted for evaluation by the test lab. And the manufacturer should be required to pour the samples, the same as the others, which are poured in the field.

Gene Lozano adds that determining consistency could be best determined by requesting the correct sample size. A large test specimen provides a more realistic indication of the product's quality.

Richard Skaff is concerned that the proposal to get a sample from the field into the lab will not work. Because the sample may not be reflective of an actual sample used in the field.

Jeff Barnes responds that if a test method can be created that verifies that this product can be consistent, than why not create a certification test? How do we ensure conformance? Witness installation in the field? How do we verify conformation? And should installers be certified, and have continued periodic training or re-certification, as needed? To ensure consistency, the installer should be responsible for verifying that the product is a clean install. These are all issues that need to be considered by the committee.

David Cordova is supportive of certifying contractors who install these types of products. Installers should demonstrate that they have the ability to properly install the product. If the product is too specialized, the buyer may not want this product after all.

Jeff Barnes clarifies that as part of the proposed certification process that the manufacturer must use a qualified installer, have repeatable products, and the actual install must be compliant with the code. To obtain certification, they must agree to all of these conditions.

Richard Skaff states that this type of product is typically unreliable, and local entities do not have the ability to check all the products.

David Cordova notes that if the committee feels that there are too many hazards in these types of products, the committee could advise excluding certification of these types of products.

Arfaraz Khambatta emphasizes the need to specify controls, since it is very important to install these products correctly in the field.

David Cordova notes that there are hundreds of products in the real world that uses field-manufactured products. May need to provide some wording on every product using field-manufactured products that further investigation is required. How else can you check these products in the field?

Paula Reyes-Garcia suggests that DSA should require that manufacturers maintain general information, such as the date of installations, names of installers, and track complaints, in case DSA wants to review this data, and maybe DSA may require that they need to do retesting.

Gene Lozano recommends that all manufacturers of all products, should have such a website. There should be the same installation requirements for all contractors. The test labs should ask for large sample sizes, to check for consistency. And the substrate should be of the same material and construction as those provided out on the field.

Richard Skaff is concerned with these types of products. Too inconsistent. During mixes, may result in different test results. Maybe a template or form is needed to verify consistency. And the material type is still not easily verified.

Jon Julnes agreed that all components should be treated the same. Many field samples may not reflect samples submitted for testing.

Richard Skaff notes that it's the issue of assurance that the product will perform as needed. If checking randomly, should be able to find consistency among the products. This is difficult because every dome may be different, and testing of all products is not possible. Most cities cannot afford all this.

Jon Julnes replies that this has happened in the past, and wants to make certain that the committee allows for the concept of field-installed products to be considered, and not just discounted automatically. Jon understands that this is an important issue for stamped products. The committee should not discount similar systems, because it is similar to a system that may not work consistently. Jon has a new system that uses a reverse mold, using a super strong adhesive. Jon states that his company has established a quality product using reliable system out in the field. The committee should look at the installation procedure, and if it provides consistency, should be acceptable for additional testing.

Andre Miron notes that could be an option that rather than submit the product, submit the test procedure instead, and test this by having various lab technicians follow the test procedures to determine if products can be reproduced consistently in the lab.

David Cordova states that the building code permits stamped and cast in place tiles.

Jeff Barnes notes that he has several concerns, which include consistency of the domes, and is it structurally the same as the field products? Maybe need to consider that the manufacturer should also be part of the inspection process, and testing a large amount of

the product may be necessary. Secondly, is the product technology the same as that of the product submitted? The surface applied product may be easier to consider. The main issue is to address the consistency concerns. Then consider the strength of the material installed at that time. Consistency may be possible, by reviewing strength and construction of the products.

Richard Skaff proposes that these types of concrete products should only be used on existing curb ramps, not on any new curb ramps being constructed. Many factors to consider include if surfaces are clean when installed, etc. Not comfortable with the testing process for these products.

Lex Zuber disagrees with the cast in place products rather than retrofit. Easier to replace the products in 5 years, rather than rip all of the tiles up. Should provide the same warranty of 5 years, but likely there will be more success with retrofits.

Andre Miron notes that the 90 percent degradation issue needs to be discussed. However, there will be specific recommendations made for minimum performance. Is there an installation guide or installation instructions available for Jon's product? Would assume that there are recommended substrates provided in the guidelines. How do we test Jon's materials? It would seem that as long as there are clear written instructions provided, that we shouldn't have a problem with testing. Should consider what are the worst-case conditions that should be considered when evaluating Jon's product. For example, installing right after rain, pressure washing, etc.

Andre Miron adds that the committee still needs to consider certifying the installers, and determining if the test process is set up correctly. If the product is being misused, is the

manufacture at fault, if the product had proper written instructions provided? Stamped concrete, is likely to result in low performances, although should still consider that there may be some workable products out there. So well documented products, although simple in construction, may not be a problem.

Jane Vogel expressed her concern for adhesives, and isn't this a factor for many different types of conditions and test results?

Andre Miron replies that adhesives are a concern and are currently being tested and researched. Will consider adhesives further, when developing worse case conditions for products to be tested under. First order of business is to set up the test program.

Derek Shaw notes that the issue is the difference between site and non site-assembled products. One issue is the consistency of the product. Inspectors expect pre-fabricated products to be consistent, and site-assembled products are not expected to be consistent. Derek agreed that sending the field-installed samples to the lab for testing.

Minh Nguyen points out that particular material thickness may be needed in the field, so how do you verify this measurement?

Andre Miron replies that this is actually a common issue handled by all safety organizations, where thickness dictates performance results. Usually the agency conducts testing with samples using minimum thickness. This is generally considered as a worse case test set-up.

Jeff Barnes notes that for the next meeting, will take all these comments, and try to propose an overall solution that meets all or most of these issues. It's not the role of the committee to readily discount any products or types of products without thorough research and additional discussions.

15. Slip Resistance (Exhibit A) [Andre Miron/UL]

After examining various reports, and different equipment, Andre Miron decided that the James machine looked more appealing for the proposed tests than other types of equipment. The other machine (Brungraber Mach 1) would jam and was more suitable for smooth flat surface materials. The James machine was also designed for use on walkways. Other UL offices have these machines, and utilize longer feet testers. However Andre needs to determine if using smaller samples can be used for slip resistance testing. Testing can be conducted in accordance with UL 410, which recommends 0.5 COF values.

Richard Skaff asked if the Brungraber machine could be used in the field areas around the domes. Richard suggested testing field areas and edges of domes, not just the top of domes. In addition he notes that some wheels do not always fit between dome spaces.

Andre Miron notes that the profile of the dome can be difficult to test. For test purposes, his idea is to create a modified shoe that fits over domes. The shoe can be cut so that it contacts only certain parts of the domes. Using a sander, the lab technician can remove texture but this may also not be practical. Billie Bentzen's research notes that dome height could be an issue. The 5 mm or less height may not be detectable, and if too high may trips those wearing high heels.

Richard points out that heels and wheels on wheel chairs may slip on the domes if there are any unstable and/or slippery areas.

Andre Miron states that there are two issues to consider. First of all, most persons do not intend to walk on these types of surfaces for long. These areas usually measure 2 or 3 feet, and most persons will cross this area in two or three steps. An issue to consider is if a person has stopped in this area, how difficult is it to continue to cross the area? Upper body strength may be another issue to consider for those individuals using wheel chairs.

Gene Lozano adds that field spacing is a factor, and will affect slip resistance. Would like to see slip resistance testing in wet conditions too. Testing a dirty product would maybe be a good idea.

Andre Miron replied that conducting tests after dirt is applied to the sample is already part of the proposed test program. Tests will be conducted after the conditioning and abrasion tests too.

Andre Miron volunteers to send an email report of slip resistance data to all meeting attendees.

16. First Day Meeting Evaluation [Jeff Barnes/UL]

There were no comments on the meeting format from manufacturers or public representatives.

Jeff Barnes announced that there would be additional two (2-day) meetings scheduled for December 2005. The next EDWAC meeting is proposed for December 1 – 2, 2005 in

Sacramento California. This date is tentative, and subject to change until it has been confirmed by Jeff Barnes.

17. Adjourn

Jeff Barnes adjourns meeting at 5:00 pm.