Scope of EDWAC

On September 15, 1999, California Assembly Bill No. 685 was signed into law and added Section 4460 to the Government Code of California. This law directs the Division of the State Architect (DSA) to create an independent entity evaluation and certification program for detectable warnings and directional surfaces. The program is to ensure that such products conform to the architectural design standards as set forth in the California Building Standards Code and meet durability and degradation criteria yet to be determined.

DSA has established an ad hoc Evaluation of Detectable Warnings Advisory Committee (EDWAC) to propose durability and degradation testing standards. Membership of this committee reflects a varied and diverse group of individuals with an interest in developing standard evaluation criteria; members include product users, persons with disabilities and disability organizations, architects and design professionals, public works departments, code enforcement departments, and other government agencies. The EDWAC members provide individual input and collectively accept and analyze existing research, technical data, and public input to develop the committee's proposed testing standards for product durability, shape, color fastness, confirmation, acoustic quality, resilience, and attachment.

DSA has also contracted with Underwriters Laboratories Inc. (UL) to provide technical expertise and facilitate the efforts of the committee. UL is an independent, not-for-profit organization that has evaluated products, materials, and systems in the interest of public safety for over 100 years. UL has developed more than 800 Standards for Safety, which are essential to promote public safety and confidence.

It is anticipated that the EDWAC will hold four to six meetings over the next ten months to develop the recommended testing standards. During this time, the committee will issue periodic draft recommendations for public and industry comment. Upon completion, the committee will issue a final report of recommendations that will be used by the DSA to develop the Standard Test Method for the Evaluation of Detectable Warning Products and Directional Surfaces.

California Assembly Bill No. 685

Overview:

The bill requires that all detectable warning products and directional surfaces installed after January 1, 2001, be approved by an independent entity selected by the Department of General Services, Division of the State Architect, in consultation with the Department of Housing and Community Development when the products and surfaces may be mandated for use in residential housing, and that the Division of the State Architect impose fees to recover administrative and code development costs, as necessary, to develop standards and administer the registration and approval program. The fees would be paid by manufacturers of detectable warning products and directional surfaces.

Text of AB 685:

SECTION 1. Section 4460 added to the Government Code, to read:

4460. (a) The Legislature finds and declares that it is essential that detectable warning and directional surfaces comply with the California Building Standards Code in order to ensure that those products are adequate to meet the safety and accessibility needs of the blind and visually impaired.

(b) All detectable warning products and directional surfaces installed after January 1, 2001, shall be evaluated by an independent entity, selected by the Department of General Services, Division of the State Architect, in consultation with the Department of Housing and Community Development when the products and surfaces may be mandated for use in residential housing, that shall issue and register a two-year product approval, renewable upon reevaluation at two-year intervals thereafter. The approval shall include conformation with architectural standards published in the California Building Standards Code as well as durability criteria appropriate for the type of installation, established by the Department of General Services, Division of the State Architect, in consultation with the Department of Housing and Community Development when the products and surfaces may be mandated for use in residential housing. The codes developed by the Department of General Services pursuant to this section shall ensure that shape, color fastness, confirmation, sound-on-cane acoustic

quality, resilience, and attachment will not degrade significantly for at least five years. The Department of General Services, Division of the State Architect, shall impose fees to recover administrative and code development costs, as necessary, to develop standards and administer the registration and approval program. The fees shall be paid by manufacturers of detectable warning products and directional surfaces. All fees shall be deposited in the Access for Handicap Account created pursuant to Section 4454 and may be expended for costs incurred by the Department of General Services, Division of the State Architect, in performance of the requirements of this section.

As used in this section, "significant degradation" means that the product maintains at least 90 percent of its approved design characteristics. The Department of General Services may provide exceptions to this section for justifiable cause pursuant to Section

(c) The independent entity selected by the Department of General Services, Division of the State Architect, shall be recognized as having appropriate expertise in determining whether products governed by this section comply with the California Building Standards Code.

Detectable Warnings/Directional Surfaces – Overview of Existing Technologies

Known Technologies:

I. Dimensional Pavers

A. Natural Stone and Stone Composites
B. Ceramic/Porcelain Tiles
C. Brick
D. Concrete Pavers
E. Precast Concrete/Polymer

Installation Method: Pavers recessed into the applicable substrate

II. Thin Tiles and Sheets

A. Rigid Polymer and Flexible Polyurethane Sheets and Tiles

1. Glass and Carbon Reinforced copolymer composite & Vitrified Polymer Composite (VPC)
2. Flexible Polyurethane

Installation Method: Tiles applied to the substrate with adhesive

a) Structural adhesive system (optional mechanical fasteners)
b) A few manufactures make tiles which are compromised of a thick composite shell that are filled with concrete and installed similar to a paver

III. On Site-Application

A. Molding or Stamping Fresh Concrete (Integral with Substrate)

Installation Method: Integral with Substrate

B. Surface Applied Rubber Truncated Domes attached to a Carrier Sheet

Installation Method: Polyurethane coating is applied to substrate, rubber truncated domes are applied on top of the coating with pressure. Additional coats of polyurethane are applied.

C. Surface Applied Latex Domes

Installation Method: Truncated Dome Mold is placed on applicable surface. Carboxylated Latex emulsion is injected into mold and allowed to cure. A latex vinyl copolymer may be applied to the field in between the domes.

Accelerated Aging

Purpose: Detectable Warnings/Directional Surfaces are subjected to extreme conditions in a climate controlled environment in order to speed up the natural aging process. Performance testing of the Detectable Warnings/Directional Surfaces is performed on both unconditioned (as received, no aging) and conditioned (aged) samples. The results of the unconditioned and conditioned samples are then compared to verify that the key performance criteria have not been significantly affected as a result of aging.

Accelerated Aging methods for consideration in the evaluation of Detectable Warnings/Directional Surfaces:

I. Freeze-Thaw Cycling: Resistance of a material to repeated cycles of freezing and thawing.

Test Method:

Sample is saturated with water and placed in a freezer. Freezing is followed by a thawing cycle with the specimens immersed in water. The number of tiles damaged after freezing and thawing for a determined number of cycles is determined by visual examination. Damage is defined as any visible surface flaws.

Applicable Test Standards:

- ASTM C 1026 Standard Test Method for Measuring the Resistance of Ceramic Tile to Freeze-Thaw Cycling
- ASTM C 902 Specifications for Pedestrian and Light Traffic Paving Brick (Freeze-Thaw)
- ASTM C 1262 Standard Test Method for Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units

II. Salt-Spray Exposure: Resistance of a material to a corrosive environment

Test Method:

Sample is placed in chamber maintained at 35ºC (95F). A salt water solution is continuously sprayed (atomized) at a specified rate onto the sample for a period of time as determined by the application. The sample is examined for any visual changes.

Applicable Test Standards:

- ASTM B 117 - Operating Salt Spray (Fog) Apparatus Salt Spray
- ASTM G 85 - Modified Salt Spray (Fog) Testing

III. Chemical Resistance: Effect of Chemical Reagents on a Material

Test Method:

Chemical Reagent is applied to surface of sample for a specified period of time. After exposure, reagent is washed off and sample is dried. The sample is then examined for any visual or physical affects of the reagent. Chemical reagents tested depends on exposure in end-product.

Applicable Test Standards:

- ASTM D 543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
- ASTM D 1308 Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes
- ASTM C 650 Standard Test Method for Resistance of Ceramic Tile to Chemical Substances

IV. Accelerated Weathering – Weathering effects on a material when exposed to sunlight and moisture.

Test Method:

Samples are exposed to repetitive cycles of light (Xenon Arc), moisture (water) and darkness. Various exposure cycles are described and may be chosen or modified based on end product environment.

Applicable Test Standards:

- ASTM G 151 Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources
- ASTM G 155 Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

Shape

Definition:

Ability of the material to retain its original shape when subjected to varying degrees of temperature, moisture, pressure, or other stress.

Test Methods for consideration in the evaluation of Detectable Warnings/ Directional Surfaces:

I. Abrasion Resistance: Measures the relative wear resistance of a material.

Sandblasting Method:

Sample is placed at a specified distance from the end of a sand blast apparatus, set to a specified air pressure and flow of abrasive. The surface of the sample is exposed to the sand blast for a period of one minute. This is repeated on at least eight different spots on the sample surface. The amount of material that is abraded is determined by pressing modeling clay into the holes made in the samples by abrasion and leveling the clay with a straight edge. The mass of the clay supply before and after the holes are filled is determined. The abrasion coefficient loss is calculated based on the volume of clay in the holes per the area of the surface subjected to abrasion.

Direct Abrasion Method:

Sample is conditioned in an oven for 48 hours to remove all moisture. Then are then weighed and placed in the abrasion testing apparatus. The abrasion wheel is lowered onto the surface of the samples and apply specified load. The abraser is run continuously for a specified number of cycles. The abrasive wear index is calculated based on the initial and final weight of the sample.

Applicable Test Standards:

- ASTM C 418 Standard Test Method for Abrasion Resistance of Concrete by Sandblasting
- ASTM C 501 Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
- ASTM C 241 Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
- ASTM C 1353 Standard Using the Taber Abraser for Abrasion Resistance of Dimensional Stone Subjected to Foot Traffic Test Method

II. Impact Resistance: The relative resistance of a material to fracture when subjected to an impact.

Falling Weight Method:

Samples are condition for 40 hours at specified temperature and humidity. The sample thickness is measured in the area of impact. Sample is then placed on the tester. A weight is dropped through a vertical tube and impacts a striker resting on top of the supported sample. The sample is removed and visually examined to check for failure. If failure is determined, the drop height is decreased. If there are no signs of failure the drop height is increased. This is repeated in incremental changes in height. Data is recorded for a specified number of samples. A mean failure energy is calculated from the data, which is defined as the energy required to produce 50% failures.

Applicable Test Standards:

- ASTM D 5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimens by Means of a Striker Impacted Falling Weight
- ASTM C 368 Standard Test Method for Impact Resistance of Ceramic Tableware

III. Water Absorption – Determines the relative rate of absorption of water of a material when immersed in water.

Test Method:

Samples are initially dried in an oven for 24 hours at 50ºC to remove any inherent moisture. They are then weighed and their dimensions are recorded. Samples are then completely immersed in water for a specified time and weighed immediately. The percentage increase in weight is recorded and any observations regarding the change of appearance of the samples is recorded.

Applicable Test Standards:

- ASTM C 642 Standard Test Method for Density, Absorption, and Voids in Hardened Concrete
- ASTM D 570 Standard Test Method for Water Absorption of Plastics
- ASTM C 373 Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products

IV. Compressive Strength: Maximum stress a material can sustain under compressive loading.

Test Method:

Cross-sectional area of sample is measured. Sample is then placed flat wise (the load is applied in the direction of the depth of the sample) in the center of the testing machine. A load is applied and is increased at a uniform rate until the sample yields or breaks. The maximum load the sample sustained during the test is recorded. The compressive strength is calculated by dividing the maximum load the specimen sustained by the original minimum cross-sectional area of the specimen.

Applicable Test Standards:

- ASTM D 695 Standard Test Method for Compressive Properties of Rigid Plastics
- ASTM C 67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile (Compressive Strength)
- ASTM C 241 Standard Test Method for Abrasion Resistance of Stone Subjected to Foot Traffic
- ISO 604 Plastics-Determination of Compressive Properties
- ASTM C 140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units (Compressive Strength)
- ASTM C 1194 Standard Test Method for Compressive Strength of Architectural Cast Stone

Resilience

Definition:

The ability of the material to absorb energy when deformed elastically without creating a permanent deformation.

Test Methods for consideration in the evaluation of Detectable Warnings/ Directional Surfaces:

I. Flexural Strength – A material's ability to resist deformation under a load.

Test Method:

Samples are conditioned at a specified temperature and humidity for 48 hours. The sample is then placed on two supports and a load is applied at the center. The load is applied at a constant rate until the breaking point. The average width and depth of the specimen at the fracture is then measured. The modulus of rupture or flexural strength is calculated based on the maximum applied load and the width and depth of the sample at the fracture area.

Applicable Test Standards:

- ASTM C 293 Standard Test Method for Flexural Strength of Concrete
- ASTM C 99 Standard Test Method for Modulus of Rupture of Dimensional Stone
- ASTM D 790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

II. Tensile Strength or ultimate tensile strength (UTS), is the maximum load the sample undergoes divided by the original cross-sectional area of the specimen.

Test Method:

Samples are conditioned at a specified temperature and humidity for 48 hours. The sample dimensions are measured and recorded. The sample is then placed between the two grips of the tensile testing machine. A tensile load is applied at a constant rate. Simultaneous measurements are made of the load and strain and are recorded until yield occurs. Tensile Strength is calculated by dividing the maximum load by the original cross sectional area of the sample. Modulus of Elasticity, which is a measure of the stiffness of the material, can also be calculated by the ratio of stress and corresponding strain within the yield point (or limit of elasticity). measured. The modulus of rupture or flexural strength is calculated

Applicable Test Standards:

- ASTM D 638 Standard Test Method for Tensile Properties of Plastics
- ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension
- ASTM D 3039 Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

Attachment

Definition:

The ability of a material to maintain a complete and durable mechanical bond with a substrate.

Test Methods for consideration in the evaluation of Detectable Warnings/ Directional Surfaces:

I. Bond Strength: Measurement of the force required to separate materials that are bonded together.

Test Method 1:

A sample is formed by drilling a shallow core into and perpendicular to the surface of the overlay material/substrate assembly. The core is left attached to the substrate. A steel disk is then bonded to surface of the core specimen and a tensile load is applied to the steel disk until failure occurs. The type of failure and the load at failure are recorded.

Test Method 2:

Sample is bonded to substrate. After appropriate curing time a load is applied to one edge of the sample. The load is increased at a defined rate until the bond between the sample and substrate is broken. The location of failure (ex: sample itself, between sample and adhesive, between adhesive and substrate or in substrate itself) and the maximum load at failure are recorded.

Applicable Test Standards:

- ASTM C 1026 Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)
- ASTM C 482 Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste

Acoustic Quality

Definition:

The ability of a material to retain its original sound characteristics when impacted by an object.

Test Methods for consideration in the evaluation of Detectable Warnings/ Directional Surfaces:

Test Method:

A sample is impacted at a specified rate by a standard impact device in an acoustical chamber. The resulting sound is measured using a Sound Spectrograph or sound meter. The samples sound 'fingerprint' is recorded and measured against a reference sample.

Applicable Test Standards:

- ASTM E 492 Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
- ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

Color Fastness

Definition:

The ability of the material or coating, to retain its original hue, without fading or changing when exposed to environmental conditions.

Test Methods for consideration in the evaluation of Detectable Warnings/ Directional Surfaces:

Test Method:

Using a colorimeter, determine the differences in color between a reference and a test sample.

Applicable Test Standards:

- ASTM D 805 Standard Practice Method for Identification of Instrumental Methods of Color or Color-Difference Measurement of Materials
- ASTM D 2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates