Unresolved issued – 7-1-12 (a.k.a Agenda Item 35.3)

. **Summary**

Proposal 7-1-12 has over its life seen different versions. The most recent version was included in the Third Public Review Draft. It received 4 public comments. Agenda Item #35.3 was a request to overturn the committee's previous approval of this item and change to the standard and requested disapproval. The committee did not agree to this disapproval at the meeting in November. IN the following set of boxes is the committee's reason for disapproval.

Agenda Item #35.3
Committee Action on Agenda Item #35.3 – comment number 7-1-12/3.1 – PC 3.3 **Disapproved** **Reason:** One again the committee heard from experts on both sides of this issue. While there are concerns that the LRV is an inadequate measure of contrast, there is a reasonable cost device which is available for the measurement. Supporters again acknowledged that contrast isn't the only measure of a sign's clarity and readability, it is appropriate to consider and include in the standard. This provision would only be in the A117.1 standard and therefore only apply to the limited number of signs addressed in Section 1111 of the International Building Code. The concern that it would have wider application to other signs regulated under ADA was dismissed because this isn't being adopted into the ADAAG. The Committee has felt for years that the 'light on dark or dark on light' provisions found in the current standard are inadequate, therefore the Committee once again confirmed is approval of the LRV measurement and reference to the BS8493 standard.

Each action on the standard must be confirmed by written ballot by 2/3 of those returning their ballots. In this case those supporting disapproval of this item were less than 2/3, but not enough to change it to approval. Thus the issue is unresolved.

Ballot Comments on this item 35.3.

HLAA – Sharon Toji
Affirmative Ballot with Comment
Comment:
1. The LRV is the virtually universal acceptable standard of measurement for lightness and darkness.

2. There has been significant research done on contrast, including research in the UK that included signs in transportation venues. We heard from two experts that contrast was the most important element in the ability of persons with a variety of vision impairments to discern sign characters from their backgrounds.

3. The British Standard of Test can be used to test many materials that are used to fabricate signs, including plastics and woods, with various finishes.

4. The major consideration, according to the research that we heard about, is the amount of difference between the LRV of the characters to the background, and our choice of 45 as the lowest LRV allowable for the lighter color, provides for a difference of at least 40 from the darkest color, which is considered minimum contrast for persons with a range of vision impairments

5. The standard we are approving "does no harm" and provides a benchmark that will aid many persons. It is a building block for further research and refinement, and more stringent regulation, if desired.

John Salmen – individual member
Negative Ballot
Comment: There is not yet sufficiently clear and convincing information supporting a change from the text we have used for years. Therefore the text from previous versions should continue to be used until such information is available.

AEMA – Scott Cleary
Negative Ballot
Comment: More work needs to be done.

AIA – David Collins
Negative Ballot
Comment: Research in this area can help us install appropriate standards that will serve those in need of appropriate devices to use them. Until we are clear on what and how to identify them and use them it is inappropriate to require this be applied.

APSP– John Caden
Negative Ballot
Comment: I agree with the argument presented by Dr. Arditi.

BOMA- Steve Orlowski
Negative Ballot
Comment: Having listened to both sides of the debate and having had an opportunity to reflect on those discussions, BOMA will be voting against the committee's action on this item. Based on discussions during the meeting, it is clear that the debate of using the 70% contrast value has not reached consensus amongst the experts in this field and there is still a great deal of additional research needed to justify the proposed values. It is our opinion that the inclusion of the British Standard should not be moved forward at this time and that the Signage Task Group should work on finding a compromise between now and the next cycle of the standard.

CSI – Dennis Hall
Negative Ballot
Comment: Not persuaded that this is the right solution.

ICC – Kim Paarlberg
Negative Ballot
Comment: The ICC A117.1 committee discussed Item 35.2 after this proposal. If the same issues had been discussed first, I feel the committee might have voted to disapprove the original proposal in favor of a more investigation.

- Several concerns were brought up about terms used, such as ordinary material and multi-colored surfaces. "Ordinary materials" is not a definition, but rather a definition of what is not ordinary material. The term "multi-colored surface" is too interpretive. The terms are defined in the standard, but were not in the code, so interpretation of what this meant would be too broad.
- The scope of the standard is repeated in the text, so this is a copy write issue.
- When looking at the scope, the committee was not sure if "including those" was intended to be limiting or examples. How items 1 through 5 addresses this question is inconsistent, so it is unclear and confusing. Items 6 and 7 use the defined terms – but only Item 7 refers you to the standard for what this means.
- There is also the question about how this could be uniformly enforced in the field, or should rather be a listing required for a sign.

ISA – Teresa Cox
Negative Ballot
Comment: ISA is in favor of making changes to the standard when they are supported by empirical evidence and research. Independent, empirical research on signs is needed.

During our meeting last month, Dr. Aries Arditi presented the beginnings of a paper that will be peer reviewed and published in the public domain. We are very close to a more consistent, more rational, and clearer solution to address signage and low vision accessibility. We have identified potential funding sources, independent of the sign industry, for a research project to test some of the ideas in his paper. If we can hold off just a bit longer, we will have a proposal based on science that can achieve a broad consensus on the committee.

We disagree with the committee action on this proposal for many reasons. The British Standard cited by the proponent pertains to contrast with other architectural elements (stairway striping, doors, carpets, and walls), not to contrast between characters and their background on signs. This proposal includes a minimum LRV of 45 for the lighter of the two colors; however each of the three LRV measuring devices shown at our meeting last month (for measuring LRVs in the field) had different readings for the same color. What would happen if the sign manufacturer's measuring device registered an LRV of 45 and the inspector's device measured 44.8? Clearly, more work needs to be done on this proposal before we change the standard.

Several of us, on both sides of this issue, are interested in serving on a **Signage Task Group to develop proposals for consideration during the next cycle.** We are very concerned about the precedent that will be set if a requirement for 70% contrast on signs -- without an empirical basis to support this as the threshold value nor consideration of factors that affect legibility of signs such as illumination levels -- is published in our standard.

NACS – M. Bradley Gaskins
Negative Ballot
Comment: I believe the committee made an ill-advised decision at this time and further research is necessary before placing something in the standards that is possibly not attainable or necessary.

NAHB– Dan Buuck
Negative Ballot
Comment: I believe the committee made an ill-advised decision at this time and further research is necessary before placing something in the standards that is possibly not attainable or necessary.

NATO – Gene Boecker
Negative Ballot
Comment: The information is not quite ready to be included into the standard as the 'proper' methodology. Yes, it is necessary to have something included that is more definitive than the subjective language that is provided currently. But the comments by the committee and Dr. Arditti clearly indicates that the matter is not resolved yet and that broad consensus can be achieved if we wait.

NCOSFM– Laurel Wright
Negative Ballot
Comment: This is an issue that requires continued discussion prior to making a final decision. The printing date of this standard, potentially delayed, is coupled with the fact that it may not even be referenced by a model code for another cycle or so. This means that if we do not make a better effort to address the issue in a more substantive way, it may be entirely too long before the next standard would be in place to resolve the issue.

RESNA – Edward Steinfeld
Negative Ballot
Comment: RESNA believes that this issue is still not well resolved by the proposed change. We were moved by Dr. Arditi's testimony because we know he is a well-respected scientist with deep knowledge of low vision. We would not only like to continue the discussion on LRV but also expand it to other related issues related to low vision and involve other experts, especially from the building science community in which there is great knowledge of illumination in buildings. We think this discussion is most appropriate to hold in the next cycle, unless this cycle is extended for some other reason..

SEGD – Dave Miller
Negative Ballot
Comment: I believe that the additional research that was proposed will allow for a more comprehensive solution and will facilitate a more broad consensus within our group in a way that will allow for improved access to the built environment.

TARGET – Tom Phillips
Negative Ballot
Comment: Critical that we create good criteria. Passing this just to have something makes no sense and is a slippery slope.

Ballots revised during recirculation period:

Alan Gettelman – Individual Member
Negative Ballot
Comment: I feel more research and discussion is needed to develop an effective standard that is based on more than the LRV factor.

NEII – Kevin Brinkman
Negative Ballot
Comment: After reading through the comments from the original ballot and reflecting on the discussion at the meeting, I am sympathetic to the need, but I am also concerned that we do not have consensus and may be putting something into the standard just to show progress. Both sides provided many arguments for their position, but even the experts we heard from are not in agreement on what requirements are needed. Contrast appears to be one component to improve readability of signs, but there were also other mentioned. I would be in favor of creating a Signage Task group as one person recommended and having both sides work together to recommend requirements that both sides can agree on for the next cycle.

NMHC – Ron Nickson
Negative Ballot
Comment: Based on previously submitted negative ballots and specifically the reason supplied by BOMA.

PMI – Matt Sigler
Negative Ballot
Comment: After reviewing all of the comments that were submitted, it is apparent that consensus has not been reached amongst industry experts. Therefore, I believe it is premature to include this item in the standard until such time when consensus can be achieved.

SMA – David Cooper
Negative Ballot
Comment: Having been unable to attend the recent meeting, with further review of the issue and the ballot comments It is now clear that the issues related to this change are yet unresolved and it would be of most benefit to deter changing the standard.

Revised and Final Ballot Results – Agenda Item #35.3
52 Number eligible to vote
47 Number of members casting a vote.
26 - Affirmative (Uphold the Committee Recommendation)
1 - Affirmative with Comment - HLAA
20 - Negative (Disagree with the Committee Recommendation) Gettelman, Salmen, AEMA, AIA, APSP, BOMA, CSI, ICC, ISA, NACS, NAHB, NATO, NCOSFM, NEII, NMHC, PMI, RESNA, SEGD, SMA, Target
0 - Abstain (from Voting)
5 - Not Returned – AHLA, ASID, IAAPA, NFPA, WID

Agenda Item 35.3
Submitted by Teresa Cox
International Sign Association

Delete standard as follows:

~~**106.2.3 Light reflectance value (LRV) of a surface**. Method of Test. BS 8493:2008 + A1: 2010 (British Standards Institution, 389 Chiswick High Road, London W4 4AL, United Kingdom).~~

Further revise as follows

~~**701.1.2 Light Reflectance Value**. The light reflectance value (LRV) of surfaces shall be determined in accordance with BS 8493 for the following surface types:~~

~~1. Opaque paint coatings and paint systems, including those that cause extreme angular dependences of reflected light and those that have a surface texture of less than 2 mm.~~

~~2. Opaque coverings including those that cause extreme angular dependences of reflected light, and those that have an unyielding texture of less than 2 mm.~~

~~3. Opaque coverings with a yielding pile, e.g. carpet.~~

~~4. Opaque materials, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm, e.g. finished metals.~~

~~5. Opaque materials coated with non-opaque coatings or coverings, e.g. timber door coated with a woodstain, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm.~~

~~6. Multi-colored surfaces.~~

~~7. Ordinary materials as defined in Section 3. Terms and Definitions, subsection 3.3 in BS 8493 listed in Section 106.2.3.~~

~~**701.1.2.1 Other Surfaces.** Other surfaces shall comply with Section 703.1.3.1.~~

~~**701.1.3 Contrast Value**. The contrast between the LRVs of adjacent surfaces required by Sections 703.2.1.2, 703.5.3.2, 703.6.3.2 and 705.3 shall be determined by Equation 7-1,~~

~~Contrast = [(B1-B2)/B1] x 100 percent Equation 7-1~~

~~Where~~
~~B1 = light reflectance value (LRV) of the lighter surface,~~
~~B2 = light reflectance value (LRV) of the darker surface.~~

~~**701.1.3.1 Other Surfaces.** Surfaces not within the scope of BS 8493 shall provide contrast between adjacent surfaces that are either light on dark or dark on light.~~

703.2 Visual Characters.

703.2.1 General. Visual characters shall comply with the following:
(Balance of section is not changed)

703.2.1.1 Nonglare Finish. The glare from coverings, the finish of characters and their background shall not exceed 19 as measured on a 60-degree gloss meter.

~~**703.2.1.2 Contrast.** The Light Reflectance Value (LRV) of characters and their background shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.~~

703.2.10 Contrast. Characters and their background shall have a non-glare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

703.5.3 Finish and Contrast. Pictograms and their fields shall comply with Sections 703.5.3.1 and ~~703.5.3.2~~ have a nonglare finish. Pictograms shall contrast with their fields, with either light pictograms on a dark field, or dark pictograms on a light field.

703.5.3.1 Nonglare Finish. The glare from coverings and the finish of pictograms and their fields shall not exceed 19 as measured on a 60-degree gloss meter.

703.5.3.2 Contrast. ~~The Light Reflectance Value (LRV) of pictograms and their fields shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.~~ Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background~~.~~

703.6.2 Finish and Contrast. Symbols of accessibility and their backgrounds shall comply with Sections 703.6.2.1 and ~~703.6.2.2~~ have a non-glare finish. Symbols of accessibility shall contrast with their backgrounds with either a light symbol on a dark background or a dark symbol on a light background.

703.6.2.1 Nonglare Finish. The glare from coverings and the finish of symbols of accessibility and their backgrounds shall not exceed 19 as measured on a 60-degree gloss meter.

~~**703.6.2.2 Contrast**. The Light Reflectance Value (LRV) of symbols of accessibility and their backgrounds shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.~~

705.3 Contrast. ~~Detectable warning surfaces shall contrast visually with adjacent surfaces, either light-on-dark or dark-on-light.~~ The Light Reflectance Value (LRV) of the surfaces shall contrast 70 percent minimum, as determined in accordance with Equation ~~7-1~~ 7-5. The lighter surface shall have a LRV of not less than 45.

705.3.1 Contrast Value. The contrast between the LRVs of adjacent surfaces required by Section 705.3 shall be determined by Equation 7-5,

Contrast = [(B1-B2)/B1] x 100 percent Equation 7-5

Where

B1 = light reflectance value (LRV) of the lighter surface,

B2 = light reflectance value (LRV) of the darker surface.

Reason: ISA supports changes to the standard when those proposed changes are backed by empirical evidence and research. Very little research has been done on what makes signs legible and accessible.

We disagree with the committee action on this proposal for many reasons. The British Standard cited by the proponent pertains to contrast with other architectural elements (stairway striping, doors, carpets, and walls), not to contrast on signs.

Independent, empirical research is needed. ISA is working to identify potential funding sources for a scientific study to provide the Committee with a firm basis to change the standard.

7-1– 12
Original Proposal

504.5.1, 701.1.2 (NEW), 703.2.1.1 (New), 703.2.1.2 (New), 703.5.3.1 (New), 703.5.3.2 (New), 703.6.3.1 (New), 703.6.3.2 (New), 705.3

Proponent: Sharon Toji, Access Communication, representing self

Add the following new section

701.1.2 Contrast and Light Reflectance Value. The contrast of surfaces shall be determined in accordance with Equation 7-1.

Contrast = [(B1-B2)/B1] x 100 percent **Equation 7-1**

Where

B1 = light reflectance value (LRV) of the lighter surface,
B2 = light reflectance value (LRV) of the darker surface.

Light Reflectance Value (LRV) shall be determined in accordance with British Standard BS 8493:2008 + A1: 2010 "Light reflectance value (LRV) of a surface. Method of Test."

Revise as follows

703.2.1 General. Visual characters shall comply with the following:

(Balance of section is not changed)

703.2.1.1 Nonglare Finish. Gloss on the finish of characters and their background shall not exceed 19 as measured on a 45-degree gloss meter.

703.2.1.2 Contrast. The Light Reflectance Value (LRV) of characters and their background shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.5.3 Finish and Contrast. Pictograms and their fields shall have a nonglare finish. Pictograms shall contrast with their fields, with either light pictograms on a dark field, or dark pictograms on a light field.

703.5.3.1 Nonglare Finish. Gloss on the finish of pictograms and their fields shall not exceed 19 as measured on a 45-degree gloss meter.

703.5.3.2 Contrast. The Light Reflectance Value (LRV) of pictograms and their fields shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.6.2 Finish and Contrast. Symbols of accessibility and their backgrounds shall have non-glare finish. Symbols of accessibility shall contrast with their backgrounds with either a light symbol on a dark background or a dark symbol on a light background.

703.6.3.1 Nonglare Finish. Gloss on the finish of symbols of accessibility and their backgrounds shall not exceed 19 as measured on a 45-degree gloss meter.

703.6.3.2 Contrast. The Light Reflectance Value (LRV) of symbols of accessibility and their backgrounds shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

705.3 Contrast. Detectable warning surfaces shall contrast visually with adjacent surfaces, either light-on-dark or dark-on-light.

The Light Reflectance Value (LRV) of the surfaces shall contrast 70 percent minimum, as determined in accordance with Equation 7-1r. The lighter surface shall have a LRV of not less than 45.

504.5.1 Visual Contrast. The leading 2 inches (51 mm) of the tread shall have visual contrast of dark-on-light or light-on-dark from the remainder of the tread.

The Light Reflectance Value (LRV) of the 2-inch stripe and tread shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

Reason: Glare: Glare is a very important issue to many people with vision impairments. It is a particular problem to older people, who are often developing cataracts, and who form a very large group of persons with age related vision impairments, in addition to others with vision impairments developed at a much younger age. Glare on sign surfaces makes them virtually unreadable in many cases. Because brushed metals are such a popular architectural material, and there is no measurable standard for glare or gloss, they are used frequently for signs. Unfortunately, such surfaces are almost never non-glare according to the standard previously given in the ADAAG Appendix.

The original ADAAG did have an appendix item that gave a measurement for what is called, technically, in paints, “eggshell” finish, which was one of the suggested terms for non-glare finishes. That finish is measured with a gloss meter, and measures between 9 and 19.

The ANSI Sign Committee, working on the 1998 changes, decided to abandon the term “eggshell” because it is also the name of a color, and usually applies only to paint finishes. It had been confusing to some graphic designers. However, the maximum amount of allowed gloss, 19, is an appropriate limit for gloss or glare for all sign finishes that must be accessible. Manufacturers of various materials and finishes can easily supply the gloss meter reading of their materials, and these readings tend to be made by manufacturers, because they are required for many architectural purposes. Therefore, architects, designers and fabricators can obtain the gloss reading for materials they are specifying, and submit them with their plans.

I am therefore proposing that ANSI add a measurable standard for glare or gloss to standards that have to do with sign surfaces. Because I am proposing a maximum amount of glare, and not tying it to “eggshell” paint, I have omitted the lower number, because I do not believe it is relevant to many sign surfaces, including some non-glare paint finishes.

Contrast: During the last ANSI cycle, a subcommittee composed of individuals, some of whom were acknowledged vision or color experts, worked for a substantial period of time on a specific measurement proposal for contrast. This is a contentious topic, because many designers understandably worry that they will be denied the opportunity to choose from a large array of colors. However, the ANSI A117.1 standard as it now reads, as well as the ADA Standard for Accessible Design, make it very clear that “color,” (known more scientifically as “hue,”) is not the issue when we are dealing with vision impairment. The reason that only “dark” and “light” are to be considered is that many people with an entire range of vision impairments do not see color, or see only limited colors. Even those individuals that we speak of as “red-green color blind” — perhaps as many as 10 percent of the male population — become visually impaired when they are confronted with black or green contrasted with red or brown, or many shades of those colors in between. These colors appear to them as barely contrasting shades of gray. Older people also often find various colors more difficult to discern as their vision deteriorates. For anyone with impaired color vision — and that is a large percentage of people who are defined as legally blind, and therefore disabled — colors with similar “darkness” or “lightness,” often make signs unreadable.

The contrast standard introduced in the last cycle suffered from the fact that we did not have a recognizable method of measurement that was effective for various material finishes. This was a major objection on the part of the SEGD and ISA. They were concerned about being able to use wood finishes, for instance, since the measurement standard was very limited as to surface type. However, that has now changed, and I think it provides us with the scientific support we need to reintroduce a measurable standard for contrast with a way to measure it uniformly.

The British Standards Institute has done the work we need, and has developed a standard for the measurement of the Light Reflective Values (LRVs) of a variety of architectural finishes. This standard is actually used by another ANSI Committee’s standards, and is available in the ANSI Standards Store, so it is part of an accepted ANSI standard. The standard was developed to use for all kinds of architectural elements where contrast is an issue.

In the United Kingdom, there was been much more research on the needs of vision impaired individuals for dark/light contrast in the environment, than has taken place in this country. An important study called the “Rainbow Project” determined that many architectural elements, such as door handles, and doors on buses and trains, needed to contrast with their surrounding materials.

Just as we proposed in the last cycle, the British Standards uses Light Reflectance Value, or LRV, as the standard of measurement. They turned the 70 percent standard that is normally used, into a requirement for a difference in LRV numbers of 30. I have attached a paper written by an industry member about the standard, and its development.

However, just as with the 70 percent formula, there is an unfortunate flaw caused by the fact that the distances between the points on the scale of 100, used for LRV measurements, are not equal. The “visual” difference between a finish with an LRV of 4 and one of 8 is quite noticeable, whereas the difference between a finish with an LRV of 90 and 94 is barely noticeable. Therefore, if you use the formula and compare two dark finishes, they will show a large percentage of difference, whereas two lighter colors, even though far apart numerically, will fail the percentage test.

Nevertheless, there appears to be general agreement that the LRV is the proper measurement to use if one is comparing darkness and lightness of various surface colors, since it is independent of hue. It remains only to determine a reasonable minimum that will allow the use of a reasonable choice of colors, and still meet the needs of a large group of people who have impaired, though usable vision. Seventy percent minimum contrast appears to be well established, and already is used in some building codes in the United States, including for detectable warning surfaces and the Cleaner Air Symbol, in California.

Our committee agreed with the conclusion drawn by the individuals who prepared a study on contrast in detectable warning surfaces prepared for the Access Board, and cited in the last cycle's attempt, that the formula included in the original ADAAG Appendix, and some building codes, could only be used successfully if a minimum LRV was established for the lighter of the two numbers. A scientist working at NIST on the light and dark comparison of colored electrical wires for aircraft came to the same conclusion. Accordingly, after much studying of color graphs and formulas, the contrast committee determined on a minimum number of 45.

The contention of the color specialist who spoke on behalf of the SEGD and ISA against the proposed standard during one of the final meetings of the last cycle, that the standard is meaningless without a reference to hue, goes against the entire intent of the accessibility standards not only in the United States, but also other countries that adopt contrast standards for the built environment, and accept the LRV as the standard unit of measurement.

A bright red and white sign was circulated as a sample of a sign that would fail the percentage formula the committee proposed. This was understandably disturbing to committee members. However, it appeared that assessment was actually based on a completely different measurement standard, one that included hue, which would produce different numbers. During the recess, the sign was checked with a Spectrometer that measures LRV and the reading showed a contrast, using the formula, significantly greater than 70 percent. The vote was called before this could be demonstrated to the Committee. Color is admittedly a complicated issue, and it is indeed difficult, particularly among people with adequate color vision, to separate the concept of hue out from the other attributes that make up what we refer to collectively as "color." I am attaching a document that gives a clear explanation of color terminology.

In preparation for resubmitting a measurable standard for contrast, I went to a single swatch book of just one popular paint manufacturer, Dunn Edwards, and sorted all the colors by LRV. I am attaching the list. I then counted the number of swatches that measure the most extreme, or minimum (darkest) "light" color, LRV 45, and found there were 10 of them. I found that, in order to get a minimum percentage of 70, I needed to choose a dark color with an LRV of 13. There were actually 199 swatches that ranged from 4 (black) up to various shades that measured 13. That means that using the least possible contrast range, and only matching colors in this one swatch book, the designer has 1990 different colors or shades of hues with which to work. It is difficult to imagine the designer who could not be creative within that range. Of course, as lighter colors with higher LRVs are used, different choices are available. If you choose DE "white," which has an LRV of 93, you can use all the shades with an LRV of 27 or less for the darker color. Note that there are decimals for the LRV measurements, so using the exact numbers, not rounded, may give you slightly different choices.

Unfortunately, I did not have a budget to purchase the actual British Standard, but am attaching the abstract. It should be readily available through ANSI. I believe the abstract along with the discussion in the attached document about the standard makes it clear that it is the appropriate one.

I urge the ANSI A117.1 Committee to give us another opportunity to pass a measurable standard. Code officials do not feel secure in checking contrast and glare, because they have no definition at all of what these terms mean. In some cases, we see signs with "dark" that is only a shade or two darker than "light."

Contrast may possibly be the issue that affects the largest group of persons with a variety of vision disabilities. Admittedly, we do not yet have a scientific instrument that would be affordable and convenient for every inspector to carry onto a site. However, there are many elements of construction that are important, such as certification of hidden welds or the composition of concretes and adhesives, that are certified by the designer and required to be stated for plan checkers. There is no way for inspectors to check them on site, even though they are vital to the building structure. There is no reason why the measurements for gloss (glare) and dark/light contrast — items with no structural importance — cannot be listed in the specifications and plans by designers. Then, if there appear to be signs during the actual site check that have too much glare or insufficient contrast, swatches of the materials used can be requested and checked to be sure that they have been provided in compliance with those specifications and plans. I have no doubt that it is only a matter of time before a device can be invented that will measure those attributes on site.

I plan to submit additional materials to support the standard as I am able to gather them. Several people, such as a professor I met who does research on light, have recently expressed interest in the topic. It may even be possible to get some focus groups together of individuals with impaired color vision, who can look at some of the combinations from specific distances to determine if they are visible. Attachments will be provided as separate pdf documents.

7-1– 12

(This represents the language approved by the committee for the First Public Review Draft)

Add new text as follows:

105.2.13 Light reflectance value (LRV) of a surface. Method of Test. BS 8493:2008 + A1: 2010 (British Standards Institution, 389 Chiswick High Road, London W4 4AL, United Kingdom).

701.1.2 Light Reflectance Value. The light reflectance value (LRV) of surfaces shall be determined in accordance with BS 8493 for the following surface types:

1. Opaque paint coatings and paint systems, including those that cause extreme angular dependences of reflected light and those that have a surface texture of less than 2 mm;

2. Opaque coverings including those that cause extreme angular dependences of reflected light, and those that have an unyielding texture of less than 2 mm;

3. Opaque coverings with a yielding pile, e.g. carpet;

4. Opaque materials, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm, e.g. finished metals;

5. Opaque materials coated with non-opaque coatings or coverings, e.g. timber door coated with a woodstain, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm;

6. Multi-colored surfaces;

701.1.2.1 Other Surfaces. Other surfaces shall comply with Section 703.1.3.1.

701.1.3 Contrast Value. The contrast between the LRVs of adjacent surfaces required by Sections 703.2.1.2, 703.5.3.2, 703.6.3.2, 705.3, and 504.5.1 shall be determined by Equation 7-1,

Contrast = [(B1-B2)/B1] x 100 percent **Equation 7-1**

Where

B1 = light reflectance value (LRV) of the lighter surface,
B2 = light reflectance value (LRV) of the darker surface.

701.1.3.1 Other Surfaces. Surfaces not within the scope of BS 8493 shall provide contrast between adjacent surfaces that are either light on dark or dark on light.

Revise as follows

703.2.1 General. Visual characters shall comply with the following:

(Balance of section is not changed)

703.2.1.1 Nonglare Finish. The glare from coverings, the finish of characters and their background shall not exceed 19 as measured on a 60-degree gloss meter.

703.2.1.2 Contrast. The Light Reflectance Value (LRV) of characters and their background shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.5.3 Finish and Contrast. Pictograms and their fields shall have a nonglare finish. Pictograms shall contrast with their fields, with either light pictograms on a dark field, or dark pictograms on a light field.

703.5.3.1 Nonglare Finish. The glare from coverings and the finish of pictograms and their fields shall not exceed 19 as measured on a 60-degree gloss meter.

703.5.3.2 Contrast. The Light Reflectance Value (LRV) of pictograms and their fields shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.6.2 Finish and Contrast. Symbols of accessibility and their backgrounds shall have non-glare finish. Symbols of accessibility shall contrast with their backgrounds with either a light symbol on a dark background or a dark symbol on a light background.

703.6.3.1 Nonglare Finish. The glare from coverings and the finish of symbols of accessibility and their backgrounds shall not exceed 19 as measured on a 60-degree gloss meter.

703.6.3.2 Contrast. The Light Reflectance Value (LRV) of symbols of accessibility and their backgrounds shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

705.3 Contrast. Detectable warning surfaces shall contrast visually with adjacent surfaces, either light-on-dark or dark-on-light.

The Light Reflectance Value (LRV) of the surfaces shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

504.5.1 Visual Contrast. The leading 2 inches (51 mm) of the tread shall have visual contrast of dark-on-light or light-on-dark from the remainder of the tread.

The Light Reflectance Value (LRV) of the 2-inch (51 mm) stripe and tread shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

7-1-12 PC3

Teresa E. Cox, representing International Sign Association

Delete and substitute as follows:

~~**105.2.13 Light reflectance value (LRV) of a surface. Method of Test.** BS 8493:2008 + A1: 2010 (British Standards Institution, 389 Chiswick High Road, London W4 4AL, United Kingdom).~~

~~**701.1.2 Light Reflectance Value**. The light reflectance value (LRV) of surfaces shall be determined in accordance with BS 8493 for the following surface types:~~

~~1. Opaque paint coatings and paint systems, including those that cause extreme angular dependences of reflected light and those that have a surface texture of less than 2 mm;~~

~~2. Opaque coverings including those that cause extreme angular dependences of reflected light, and those that have an unyielding texture of less than 2 mm;~~

~~3. Opaque coverings with a yielding pile, e.g. carpet;~~

~~4. Opaque materials, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm, e.g. finished metals;~~

~~5. Opaque materials coated with non-opaque coatings or coverings, e.g. timber door coated with a woodstain, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm;~~

~~6. Multi-colored surfaces;~~

~~**701.1.2.1 Other Surfaces.** Other surfaces shall comply with Section 703.1.3.1.~~

~~**701.1.3 Contrast Value.** The contrast between the LRVs of adjacent surfaces required by Sections 703.2.1.2, 703.5.3.2, 703.6.3.2, 705.3, and 504.5.1 shall be determined by Equation 7-1,~~

~~Contrast = [(B1-B2)/B1] x 100 percent **Equation 7-1**~~

Where

B1 = light reflectance value (LRV) of the lighter surface,
B2 = light reflectance value (LRV) of the darker surface.

701.1.3.1 Other Surfaces. Surfaces not within the scope of BS 8493 shall provide contrast between adjacent surfaces that are either light on dark or dark on light.

Revise as follows

703.2.1 General. Visual characters shall comply with the following:

(Balance of section is not changed)

703.2.1.1 Nonglare Finish. The glare from coverings, the finish of characters and their background shall not exceed 19 as measured on a 60-degree gloss meter.

703.2.1.2 Contrast. The Light Reflectance Value (LRV) of characters and their background shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.5.3 Finish and Contrast. Pictograms and their fields shall have a nonglare finish. Pictograms shall contrast with their fields, with either light pictograms on a dark field, or dark pictograms on a light field.

703.5.3.1 Nonglare Finish. The glare from coverings and the finish of pictograms and their fields shall not exceed 19 as measured on a 60-degree gloss meter.

703.5.3.2 Contrast. The Light Reflectance Value (LRV) of pictograms and their fields shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.6.2 Finish and Contrast. Symbols of accessibility and their backgrounds shall have non-glare finish. Symbols of accessibility shall contrast with their backgrounds with either a light symbol on a dark background or a dark symbol on a light background.

703.6.3.1 Nonglare Finish. The glare from coverings and the finish of symbols of accessibility and their backgrounds shall not exceed 19 as measured on a 60-degree gloss meter.

703.6.3.2 Contrast. The Light Reflectance Value (LRV) of symbols of accessibility and their backgrounds shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

705.3 Contrast. Detectable warning surfaces shall contrast visually with adjacent surfaces, either light-on-dark or dark-on-light.

The Light Reflectance Value (LRV) of the surfaces shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

504.5.1 Visual Contrast. The leading 2 inches (51 mm) of the tread shall have visual contrast of dark-on-light or light-on-dark from the remainder of the tread.

The Light Reflectance Value (LRV) of the 2-inch (51 mm) stripe and tread shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

703.2.1 General. Visual characters shall comply with the following:

(Balance of section is not changed)

703.2.1.1 Nonglare Finish. The glare from coverings, the finish of characters and their background shall not exceed 19 as measured on a 60-degree gloss meter.

703.2.10 Contrast. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

703.5.3.1 Nonglare Finish. The glare from coverings and the finish of pictograms and their fields shall not exceed 19 as measured on a 60-degree gloss meter.

703.5.3.2 Contrast. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

703.6.2 Finish and Contrast. Symbols of accessibility and their backgrounds shall have non-glare finish. Symbols of accessibility shall contrast with their backgrounds with either a light symbol on a dark background or a dark symbol on a light background.

703.6.3.1 Nonglare Finish. The glare from coverings and the finish of symbols of accessibility and their backgrounds shall not exceed 19 as measured on a 60-degree gloss meter.

705.3 Contrast. Detectable warning surfaces shall contrast visually with adjacent surfaces, either light-on-dark or dark-on-light.

504.5.1 Visual Contrast. The leading 2 inches (51 mm) of the tread shall have visual contrast of dark-on-light or light-on-dark from the remainder of the tread.

Reason: 1. The LRV's of many standard sign materials cannot be measured using the British Standard Method of Test.

2. Site conditions, particularly the type and intensity of lighting, have great impact on perceived contrast. Following the formula without considering site conditions, would allow combinations that do not have enough contrast, and prohibit others that are perfectly legible when appropriate lighting is provided.

3. The British Standard states in part "The method described in this standard is not appropriate for making on-site measurements. Therefore it is recommended that published LRV data, determined in accordance with this standard, are used for the determination of visual contrast." Relying on the British Standard (BS) establishes a design standard that lacks a corresponding field method to accurately calculate conforming color contrast of signs installed on-site.

4. The BS is referenced by a British government accessibility standard, Approved Document M (ADM 2010, with 2013 amendments), in association with measuring the difference in LRV's of adjacent building elements. Consistent with this application, the BS specifies sample sizes ranging from 450 mm x 450 mm (appx. 17.7 inches x 17.7 inches) to 25 mm x 25 mm (appx. 1 inch x 1 inch). But there appears to be no supporting evidence that the BS's LRV difference measurements are predictive of legibility for any population with special visual needs (e.g. elders, those with mild low vision), and the BS does not provide a means to measure for conformance, under actual field conditions, the LRV's of small graphic elements, especially text or visual symbols.

5. This proposal is really no different than proposals that have been defeated numerous times for multiple reasons, except for the addition of a new standard of questionable utility. The mere addition of any new standard, though, does not in any way support the adoption of 70% as a threshold value. In fact, the 70% figure is not mentioned in the BS.

6. Research is sorely needed to provide a rational basis for a signage contrast standard that can be applied simply, and prior to final site installation, whose conformance is predictive of legibility under typical if not actual field conditions.

Committee action on 7-1-12 PC3

Approve Public Comment 7-1-12 PC3.

Reason: The Committee concluded that the was insufficient information for the standard to use the contrast analysis methods and testing included in 7-1-12. They wish for the discussions and research to continue, and by making this amendment, the issue appears in the next public review draft and is avialble for comment. The glare provisions are appropriate to maintain going into the next edition of the standard.

Public Comment on Second Public Review Draft	
Agenda Item #35	
Comment No: **7-1-12 PC3.1**	**Submitted by:** **Sharon Toji – HLAA** **Eugene Lozano, Jr. – California Council of the Blind** **Billie Lousie (Beezy) Bentzen – Accessible Design for the Blind on behalf of AERBVI**
	Revise as follows: **106.2.XX Light reflectance value (LRV) of a surface**. Method of Test. BS 8493:2008 + A1: 2010 (British Standards Institution, 389 Chiswick High Road, London W4 4AL, United Kingdom). **504.5.1 Visual Contrast**. ~~The leading 2 inches (51 mm) of the tread shall have visual contrast of dark-on-light or light-on-dark from the remainder of the tread.~~ The Light Reflectance Value (LRV) of the 2-inch (51 mm) stripe and tread shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45. **701.1.2 Light Reflectance Value**. The light reflectance value (LRV) of surfaces shall be determined in accordance with BS 8493 for the following surface types: 1. Opaque paint coatings and paint systems, including those that cause extreme angular dependences of reflected light and those that have a surface texture of less than 2 mm; 2. Opaque coverings including those that cause extreme angular dependences of reflected light, and those that have an unyielding texture of less than 2 mm; 3. Opaque coverings with a yielding pile, e.g. carpet; 4. Opaque materials, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm, e.g. finished metals; 5. Opaque materials coated with non-opaque coatings or coverings, e.g. timber door coated with a woodstain, including those that cause extreme angular dependences of reflected light, and those that have a texture of less than 2 mm; 6. Multi-colored surfaces; 7. Ordinary materials as defined in 3. Terms and Definitions, 3.3, by BS 8493:2008 + A1: 2010; **701.1.2.1 Other Surfaces.** Other surfaces shall comply with Section 703.1.3.1. **701.1.3 Contrast Value**. The contrast between the LRVs of adjacent surfaces required by Sections 703.2.1.2, 703.5.3.2, 703.6.3.2, 705.3, and 504.5.1 shall be determined by Equation 7-1, Contrast = [(B1-B2)/B1] x 100 percent Equation 7-1 Where B1 = light reflectance value (LRV) of the lighter surface, B2 = light reflectance value (LRV) of the darker surface. **701.1.3.1 Other Surfaces.** Surfaces not within the scope of BS 8493 shall provide contrast between adjacent surfaces that are either light on dark or dark on light. **703.2.1 General**. Visual characters shall comply with the following:

	(Balance of section is not changed) **703.2.1.1 Nonglare Finish**. The glare from coverings, the finish of characters and their background shall not exceed 19 as measured on a 60-degree gloss meter. **703.2.1.2 Contrast.** The Light Reflectance Value (LRV) of characters and their background shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45. ~~**703.2.10 Contrast.** Characters and their background shall have a non-glare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.~~ ~~**703.5.3 Finish and Contrast.** Pictograms and their fields shall have a nonglare finish. Pictograms shall contrast with their fields, with either light pictograms on a dark field, or dark pictograms on a light field.~~ **703.5.3.1 Nonglare Finish**. The glare from coverings and the finish of pictograms and their fields shall not exceed 19 as measured on a 60-degree gloss meter. **703.5.3.2 Contrast**. The Light Reflectance Value (LRV) of pictograms and their fields shall contrast 70 percent minimum as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background. ~~**703.6.2 Finish and Contrast**. Symbols of accessibility and their backgrounds shall have non-glare finish. Symbols of accessibility shall contrast with their backgrounds with either a light symbol on a dark background or a dark symbol on a light background.~~ **703.6.3.1 Nonglare Finish**. The glare from coverings and the finish of symbols of accessibility and their backgrounds shall not exceed 19 as measured on a 60-degree gloss meter. **703.6.3.2 Contrast**. The Light Reflectance Value (LRV) of symbols of accessibility and their backgrounds shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45. ~~**705.3 Contrast**. Detectable warning surfaces shall contrast visually with adjacent surfaces, either light-on-dark or dark-on-light.~~ The Light Reflectance Value (LRV) of the surfaces shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.

Reasons:

Reasons and documentation supplied by Sharon Toji:

Reasons why we need a measurable standard for contrast in the ANSI A117.1 Standard

I can cite many anecdotal incidents where contrast for signs covered by the ANSI standards and the ADA SAD have insufficient contrast. These are signs that are sometimes very consequential in safely and efficiently gaining access to public buildings.

In one such anecdote, a building inspector wrote in my LinkedIn group that he was in a high rise hotel during a fire. He went down the corridor to what he thought was an appropriate exit, only to find that the sign adjacent to the door stated that the stair did not actually lead to the public way, so he had to travel back a distance to a different stair. He blamed a non-contrasting sign, and said "I would have liked to get my hands on the inspector who passed that sign as having adequate contrast.

Hospitals often have non-contrasting signs on walls because the colors are left to designers, and pale silver on off-white walls are particularly popular. Elevator floor indicators and informational signs in transit venues such as airports and rail stations often use red characters on black backgrounds, virtually invisible to a large number of people with common "color blindness."

I believe that if we had a standard, it would serve as a guide for designers and sign companies, and we would get much better understanding of the requirement for light/dark contrast that is part of the ANSI standard as well

as the Americans with Disabilities Act Design Standards.

Such a standard would, I believe, prompt manufacturers of measurement devices to come out with many more useful devices that could be used in the field. Already, there is one such device out, and it costs less than $250 for a device that can measure a color stroke as small as 3 MM in width. There is no doubt that more companies would enter the field with such devices if a standard were in place. Already, there are many devices that do measure color on computer screens as well as colors on walls and furniture, but other than the above device, I don't know of any that have such a small aperture, so they don't work for small sign character strokes. The fact that the devices exist, however, shows that the ability is there to adapt them for sign use.

We also have, thanks to the British Standards Institute, a "Standard of Test" for LRVs that applies to the great majority of the materials used for the kinds of signs that are covered by the ADA design standards, as well as materials used for stair striping and detectable warning surfaces. Because of the availability of this standard, LRV measurements are being adopted internationally as a standard for measuring contrast in the built environment. If you read the British Standard carefully, you will see that about the only surfaces that cannot be measured are those that change color when exposed to light (such as photo luminescent materials) and materials that would have to be measured on curved surfaces. That appears to be a minor consideration in light of the number of signs that could be tested, even on site. Also, just as with braille, once you have determined that one sign fabricated of particular materials is compliant, there is no need to measure all the remainder of the signs made of identical materials, even if some of those are displayed on curved surfaces.

In my opinion, we are holding up a much higher standard of research for this one item than we usually do for many other issues that come before the committee. Virtually all the measurements that we deal with are compromise measurements. They all strive to affect the majority of persons with various types of disabilities, but can never be considered the one and only perfect measurement for all. Vision is especially difficult to calibrate in this way, because it is so complex, and one person can have a combination of vision issues, all of which are subject to change. Finding the perfect "sample population" would be virtually impossible. The purpose of the figure we chose (i.e. 45 LRV) as the minimum lighter color merely gets us to a point where we are forcing the designer to choose at least one of the colors from the lighter end of the spectrum. Otherwise, they are free to choose two colors from the darker end, and the formula flaw then becomes obvious.

There are instances going back many years, during the history of the 70 percent contrast ratio, where reports suggested that the way to correct the flaw in the formula, which tends to give contrast preference to dark colors, due to the mathematical curve created because of the uneven intervals between LRV points, would be to require a minimum light color. That is why the work group on Contrast took that direction.

Establishing this dividing line where light colors are divided from dark colors is important for two reasons: First, many people still think we are talking about color (or hue) when we talk about contrast. Without the LRV standard, that belief persists and color choices are made accordingly. Second, there is a tendency to interpret the code as "darker colors versus lighter colors," or vice versa. When I ask architects or inspectors why certain choices were made, or two obviously non-contrasting colors were passed, I'm told "this color is darker than this color, so it complies." In one case some years ago, which some Committee members might remember, the two colors were white and ivory. I just saw another new college building with a complete system of signs with white characters on very light beige backgrounds, barely better than the white on ivory example.

How did we choose 45? After a lot of study of various reports and charts, and viewing of different combinations, we saw this was the area that was the rational point to divide light from dark. We obviously could have chosen 46 or 44. Numbers in the standard are almost always somewhat arbitrary. Why is a reach range 48 and not 47 or 49? We chose 45 instead because we often count or measure by fives, just as 48 was chosen because it represents 4 feet.

The British approach contrast in a slightly different manner, by dictating the difference between LRV figures. For some elements, such as doors and hardware, they chose 30 points. However, unless they choose a very high number, they end up with a flaw as well. Thirty points of difference between darker colors is much different than it is between lighter colors. For signs, they solved the problem by stating that the two LRV numbers for sign characters and background must be 70 points apart. This restricts the number of hues for signs to relatively few, only the very darkest and lightest colors. Our method, requiring that the lighter color have a number of 45 or higher, allows designers much more latitude, so we think it is a better way to correct the flaw, and one that allows for more creativity and will encourage much more compliance.

In other words, we are not trying to find a "perfect" number at which everyone with a vision impairment, but with usable vision, will be able to detect the difference between the characters and background of a sign. This is a minimum, and it is a compromise that will not serve every person, although it will be fine for many as well. We are merely giving the designer a boundary, and saying, we are going to call colors with an LRV of 45 or higher "light colors," and those below that numbers "dark colors." Then we are going to require that the contrast be 70 percent, by applying a formula to those two numbers. And, we are referring to the British standard of test in case there is a question about the correctness of the LRV number assigned to a material. That means that the LRV can be determined in a laboratory environment using an instrument that conforms to certain specifications, following a specific procedure.

Since most colored materials are already tested using similar procedures for consistency reasons, or for

architects who want to use the latest "green" design standards, only custom materials will need special testing. An architectural materials company in the UK has reported that they set up the material and trained their personnel to do the testing, and have added this to their services with great success. I have been told by employees of UL that they would be willing to add the service as well, although I think some large design and sign firms and architects might invest in it for in-house use.

There are literally hundreds of combinations of colors that will be available to designers, and a great variety of materials, including wood, painted surfaces, plastics, metals, and even carpet if they care to use them for signs, by using this standard and method of test. And, there are many different brands of scientific instruments that can correctly measure the LRV, as well as at least one device currently available for a modest price that an inspector could use for a site measurement. There is even an "ap" available for many phones and tablets that will instantly calculate the 70 percent formula. Measurement only takes seconds using this device and application, and does not depend on ambient light.

Another argument of opponents was that contrast does not affect many people. I think those people are forgetting that, in addition to the significant number of people who have a variety of vision impairments, but still use their vision, color deficiencies are a serious problem for many people with otherwise normal vision. About 8 percent of the male population has the most common form of "color blindness" and for those people, some signs might as well be invisible if they do not have sufficient light/dark contrast. I have read statements that, if we also include women, and those with vision conditions that also include certain color deficiencies, the percentage of the population could be as high as 12 percent. Aging affects the color vision of most people, and there are increasing number of elderly people who are living longer and who remain active to a more advanced age so they are also accessing public buildings.

Color deficient vision is of such importance to science and industry, that there are entire firms, including firms for both research and testing, devoted to it. NASA has also done significant research on the topic, and has reports on their site. I have received letters in support of the need for contrast from some of their staff, as well as from others in the defense department. Most people are not aware of the number of crucial professions that rely on adequate color vision, These institutions are concerned about the numbers of people who do not have normal color vision, and are trying to solve those problems. One possible solution for some problems is obviously determining contrast standards, and being able to substitute materials of varied darkness and lightness. In one study, NIST was investigating the colors of electrical wires in aircraft to determine contrast.

Another issue is lighting. Of course adequate lighting influences vision. However, at this time we have few lighting standards, and even if we did, it would be difficult to control, on a day to day basis, whether or not a specific sign is lighted sufficiently. What we can control, is that the sign comes from the manufacturer with enough contrast that it can be read under normal lighting conditions in most public buildings.

Another point to consider is that the National Institute of Building Sciences has been dealing with many of the same questions under the auspices of a committee studying the needs of the low vision community. This is a topic that is getting increasing attention, as we think beyond the needs of those with the most significant life-long disabilities, and the discrimination they have lived with, to the needs of others in the population as they access the built environment, and particularly older people, who will represent a major part of the population. Here is the link to the most recent draft version of their report: http://www.nibs.org/?page=lvdc_guidelines

It is long past time for us to have a measurable standard since this is a very far reaching problem, affecting not only those who are classified as blind, but anyone who is deaf or hard of hearing, those with mobility impairments, or those who cannot speak or be understood by others when they ask directions. Being able to read the signs that direct us around facilities, give us important safety information, travel information, rules and regulations for using buildings, or even inform us during disasters, is crucial.

We need to put this proposed standard in perspective: Like many of our standards, there is more to be learned on the condition that prompts the standard. New technology will emerge that will make all or some parts of our standards obsolete. Because of digital advances, new wayfinding possibilities, including for those with vision impairments, are emerging monthly. This is a simple attempt to provide a reasonable divide between light and dark colors, so that a contrast ratio long in existence can be used in a reasonably consistent manner. The use of light reflectance values to establish contrast is based on solid research on contrast by respected individuals in the UK, most of it already in use in Europe and other countries as they establish international standards. Why are we resisting such a step forward for people who need to be able to read signs in order to get around and use public services in a safe and efficient manner?

Areas of Particular Interest from the NIBS Report

These are some excerpts from the National Institute of Building Sciences report, which states that lighting and contrast are the two biggest influences on use of buildings by people with low vision.

2.8 Wayfinding (pages 21-22)

Tactile wayfinding aids (braille) are generally not familiar to older adults and persons with low vision , but all wayfinding aids should comply with the following:

Information displays, lettering styles, spacing and other features should comply with ADA Standards 703.2 (30), and as follows:

- ♣ Signs are more legible for people with low vision when characters contrast with their background with a Light Reflectance Value (LRV) as recommended in Table 4C-2.
- ♣ Lettering and other graphics should be monochromatic white information on black field because many persons with low vision have some degree of color blindness and difficulty with low contrast. See also Table 4C-2.
- ♣ Raised or incised lettering not contrasting in color or value with the surrounding field is not recommended for use by persons with low vision. Shadows may confuse rather than enhance visibility.

Wayfinding surface illumination should be uniform and as recommended in Table 5C-1, Ref. 4, in daylight and after dark and the sign surfaces should be shielded from the light source to avoid reflected glare.

Internally illuminated or backlit signs may be difficult for persons with low vision due to glare.

Variable message signs may be suitable with the following recommendations (28):

- ♣ Use left-justified text a minimum of 22 mm (7/8 in.) high but not less than 1 percent of the distance at which the sign is to be read.
- ♣ Use sans-serif fonts with upper and lower-case in simple sentences without abbreviations.
- ♣ Space characters about ¼ of the font width, and space words more than characters.
- ♣ Space lines apart 50 percent of text height where multiple lines are needed, but avoid fewer than 3 lines.
- ♣ Do not use multiple colors or flashing messages.

Liquid crystal displays may be difficult for persons with low vision, especially where they may be subject to direct sunlight or strong shadows. LED and other internally illuminated displays are preferable.

3.3.2 Wayfinding Aids (page 31)

Directional and wayfinding graphic aids are important for all buildings used by the public, especially for people visiting for the first time. In addition to the guidance provided for signs in ADA Standards 703 (30), the following is recommended to accommodate persons with low vision:

- Persons with low vision may not be proficient in interpreting braille. Therefore, visual aids are more appropriate, and should be placed as close to the main entrance doors as possible to be readable before entering the lobby without having to search for the reception desk, security facilities, etc.
- All graphics must be adequately illuminated at all hours, and should have high-contrasts between figures or text and background field. See introductory discussion to this chapter and Table 4C-2 for additional guidance.

3.5.9 Wayfinding Aids (page 34)

Wherever possible, wayfinding aids should be placed facing the direction of travel rather than on walls and doors along the corridor sides. Signage placed across corridors at the ceilings may be difficult to see for some people with low vision to see and may be difficult to illuminate properly.

- All wayfinding aids must be in high contrast with the surrounding fields in color and value. See Table 4C-2.
- All wayfinding aids require electric lighting illumination that does not result in glare from reflections off the signage or adjacent surfaces (34).

3.6 Stairways

3.6.1 Surface Finishes (page 35)

- Stair risers should contrast with treads to aid in visibility to persons ascending the stairs.
- Stair tread nosings should be in high contrast colors and values from stair treads and should be 50

mm (2 in.) wide so that the edge of each tread is highly visible to the user descending.

- Stringers or skirting should be darker and have a strong value contrast with treads and risers to enhance their visibility.
- Highly figured or patterned materials should be avoided, as they may be confusing to those with low vision. Continuous carpeted stair runners with such designs may camouflage the edge of the tread and create a fall hazard.
- The sloping undersides of stairs and escalators could become a head-bumping hazard, so spaces under the stairs or escalators must be enclosed or otherwise protected to prevent access below a height of 2030 mm (80 in) See also ADA Standards 307.4 (30).
    - See Table 4C-2 for further guidance.

3.10.6 Other Design Considerations (pages 40-41)

Menus may be a reading challenge for many people with low vision due to small font size. Menu boards mounted on the wall behind preparation areas of cafeteria stations and short order counters may be difficult for many people to read, especially when the menu selection is large and restrictive space dictates using small font size. At tables in dining areas with wait staff, printed menus may be hard to read due to low lighting. Some options to be considered to address this issue follow (28):

- If space is available at the beginning of the cafeteria line or short order counters, task-lit menu boards and other information may be located there. Labels of food and beverage selections located at the place of display or point of sale such as at the steam table or dessert case may also be helpful.
- Hand-out paper menus in large font size, with contrasting print on a matte finish, at the beginning of the cafeteria line or short-order counter may be a simple way to accommodate low-vision customers.
- Task lighting luminaires at tables can help diners read traditional menus and see their food and dishes in otherwise low ambient light.
- Video and touchscreens may also be useful tools for presenting menus and other information.

Note: the Chart referenced shows the familiar 70 percent contrast ratio as required for signs, and gives the formula, but does not mention the need for a minimum lighter color or the flaw in the formula. For other types of surfaces, such as stair striping, they recommend a minimum number of points. For stair striping, a minimum difference of 50 points is recommended. Depending on what colors were used, a 50 point difference could mean anything from a high of 89 percent to a low of 54 percent. It would depend on whether you were comparing a black stripe with a medium color step, or a white stripe with a medium-light color step.

Dr Geoff Cook's research was used prominently by the committee, according to two of the members with whom I met to discuss the report.

Material in Support of Contrast Standard

The following two page document is an excerpt from the British Standard of Test for Light Reflectance Values.

I maintain that the adopted amendment to my original proposal has omitted a very significant category of material types, which I believe has the result of greatly reducing the effectiveness of the proposed standard.

The implication of comments made by some committee members was that the list of materials that could be tested according to the British Standard of Test is very restrictive. I have included two pages that refer to these comments, and I believe show the fallacy of that conclusion.

As a matter of fact, I maintain that a careful and correct reading of the standard details shows that the method of test can be used for a very broad array of materials that are commonly used for signs, in addition to their use for other architectural elements, such as stair striping, that are also covered by this proposal.

I have highlighted the sections that I believe demonstrate this, so they are easy to locate.

First, under Section 1 Scope, there is a list of materials that the method of test applies to. The text emphasizes, with the use of the word “including” in the descriptions of the materials, that not only is the test applicable, for example, to “opaque paint coatings and paint systems,” but it also includes what might be considered an unusual material, “those that cause extreme angular dependences of reflected light and those that have a surface texture of less than 2 mm.” So, it isn’t confined to such materials, but includes them in addition to all the more usual

opaque paint coatings and paint systems.

The proponents of the amended text also left out a very important item on the list, the term “ordinary materials.”

Perhaps they thought the term was too general to include, but as a matter of fact, it is a fairly carefully defined term in the standard, and should be included in the list.

Skipping to 3 Terms and Definitions, 3.3 ordinary materials, we see all materials that are not considered “ordinary materials.” That would mean that most of the plastics, for instance, that are used for signs could be tested. We already have a very inclusive list of other materials that can be tested.

Then, to give us even more specificity, the scope goes on to list the surfaces that cannot be tested: thermochromic, photochromic, retroreflecting, fluorescent, phosphorescent, those involving electrical power, and self-luminous, or composed of free-standing, curved non-opaque materials such as curved glass or clear plastic.

Those who actually design and fabricate the types of architectural signs that must comply with accessibility standards will ascertain, I believe, that very few of these materials are used for such signs. Photoluminescent material used for exit signs, for instance, would be one exception. Many of these materials cannot be tested because they actually change color with temperature or light change. I have also been informed by Geoff Cook, who was the lead for this standard, that a material that is fabricated in its flat state, such as a piece of plastic that has the graphics applied to it while flat, can be accurately tested, even though later it may be forced into a extrusion that will cause it to be curved. You cannot, however, test a curved surface.

The question of opaque materials coated or covered with non-opaque coatings or coverings are covered in the highlighted area on the second page. Dr Cook has ascertained that if each material is tested individually with its coating or covering, the LRV will be valid. For instance, even though both materials would be otherwise identical, if they are different colors, and each is coated or covered, each would have to be tested. You cannot assume that the difference in the LRV caused by deflection will be identical.

I propose, therefore, that the materials called “ordinary materials” be included on the list that can be tested. This will greatly reduce the materials that will revert to the vague “light on dark or dark on light” standard.

Reason provided by Eugene Lozano, Jr.:

The California Council of the Blind, Inc. (CCB) is a statewide membership organization. Its members are blind, visually impaired and fully sighted individuals who are concerned about the dignity and well-being of blind and visually impaired people throughout the state. Formed in 1934, the Council has become the largest organization of people who are blind or visually impaired in the state of California, with over 40 chapters and special interest affiliates and a membership of over 2,000.

Through a variety of programs and services, CCB enables people who are blind and visually impaired to live and work independently and to participate in their own communities. The Council has influenced change in such areas and issues as civil rights, employment, rehabilitation, transportation, environmental access, travel, recreation, Social Security, and other benefits. To strengthen advocacy efforts, the Council often works in coalition with other state disability groups.

The CCB is in support of reinstating Proposal 7-1-12, which cover Sections 105.2, 504.5.1, 701.1.2, 701.1.3, 701.2.1, 701.2.1.2, 703.2.10, 703.5.3, 703.5.3.2, 703.6.3.2, and 705.3. The reinstatement of the Proposal and the adoption of these sections will make the difference in having effective and useable visual cues for detectable warning surfaces, stair-striping for the edge of stair trends, signage, and other applications which will increase the safety and access for persons with low vision.

We are in full agreement with the supporting documentation which has been submitted by Sharon Toji, Access Communications, on behalf of Hearing Loss Association of America. Her comments are based on independent and scientifically-based research from the Reading University in the UK, which eventually became an officially recognized standard.

The CCB feels additional research is unnecessary at this time and that the ANSI A117.1 committee should adopt the British standard to establish a method for measuring contrast between foreground and background. Also it is important there be at least a 70% contrast between adjoining surfaces.

Reason provided by Billie Louise (Beezy) Bentzen:

The perfect has been the enemy of the good for far too long regarding standards for visual contrast and glare. Numerous other countries as well as the ISO have measureable, enforceable standards for visual contrast. The US standard of light-on-dark or dark-on-light is an embarrassment that serves no one well. It is totally subjective, not measureable, and serves no sign readers well. It is high time that ANSI A117 remedied this situation by adopting a standard that includes a well-researched formula and for which there are modestly priced and reasonably accurate measurement instruments that can be used in the field.

Establishing this standard can reasonably be expected to improve legibility of signs not only for people with impaired visual acuity or color vision, but for all people who sometimes need to read signs in low illumination.

Failure to establish this measurable, enforceable, research-based standard tells the world once again, that legibility of signs is not <u>really</u> important to US standards bodies. Perceived beauty, ease and expense of manufacturing trump the fundamental purpose of signs—to provide information that people can read and understand.

Committee Action of February 2015 regarding Agenda Item #35 – comment number 7-1-12 PC 3.1

Approved as modified:

Modification:

The full comment was approved with the exception of the change to Section 504.5.1. The existing text of 504.5.1 would be retained. The following shows as a revision to the comment which therefore retains existing text of the standard.

504.5.1 Visual Contrast. <u>The leading 2 inches (51 mm) of the tread shall have visual contrast of dark-on-light or light-on-dark from the remainder of the tread</u>~~. The Light Reflectance Value (LRV) of the 2-inch (51 mm) stripe and tread shall contrast 70 percent minimum, as determined in accordance with Equation 7-1. The lighter surface shall have a LRV of not less than 45.~~

Reason:

The Committee is not unanimous in its support of these provisions for measuring contrast. The topic is strongly debated each time it comes to the Committee's agenda. The conclusion at this time is that this referenced standard and the measurement of contrast is a good start for addressing the variety of factors affecting the readability of signs, pictograms and symbols of accessibility. While not all aspects are addressed, adding this specificity for this element improves accessibility. Concern was raised that this restricts the options of designers to provide other solutions. The other factors going into signs and other displays remain available for full flexibility. The final conclusion was that on balance these provisions need to be added to the A117.1 standard.

The provisions for of Section 504.5.1 were not included because other proposals have adequately addressed by other approved changes.