Proceedings of:

Workshop on Improving Building Design for Persons with Low Vision

Thomas Jefferson Memorial
Washington, D.C.

September 29 - 30, 2010
Foreword

This Workshop was the culmination of a long-standing commitment by Vijay K. Gupta to improve the performance of public and private buildings through excellence in design and operations. Until his retirement in January 2011, he was the Chief Mechanical Engineer in the Office of Design and Construction for the Public Buildings Service of the U.S. General Services Administration. This Workshop is one in a series of 18 that he conducted through the HVAC Excellence Program, which he initiated in 2002.

During the last 20 years, two strong driving forces have influenced the design and performance of these public buildings: 1) GSA's Design Excellence philosophy "to provide dramatic improvements in the design, preservation, and construction of federal buildings", which has resulted in substantial increases in daylighting and corresponding impact on thermal loads; and 2) the federal mandates to significantly reduce the consumption of energy in these buildings, which have lowered electrical power requirements and resulted in reductions in illumination levels. As discovered in Post-Occupancy Evaluations that were conducted under Vijay's supervision, these driving forces have resulted in less than expected improvements in occupant satisfaction with regard to perceptions of lighting, daylighting and accessibility. Although subsets of "low vision" occupants were not surveyed or interviewed during the POEs, Vijay's personal condition of "low vision" increased the awareness of the POE team members to glare, accessibility, and related design issues that must be addressed, especially in public spaces such as entrance lobbies, atriums, and corridors, to accommodate the visual requirements for safety and well-being of all persons in these environments.

The participants in this Workshop contributed a wealth of information, as will be seen in their prepared presentations and, maybe more importantly, during the lively discussion periods. I have edited the transcripts of the two days in an attempt to make the spoken words more readable, to highlight with headings and subheadings the major issues, and to link the words in the transcript with the slide presentations that are available on the FTP site for the Workshop (http://files.nibs.org; user name: lowvision; passcode: lowvision). We are looking forward to implementing the results of this Workshop.

Jim Woods, Editor

Acknowledgments

This Workshop was sponsored by the Office of Design and Construction for the Public Buildings Service of the U.S. General Services Administration (GSA), and by the National Institute of Building Sciences (NIBS) in Washington, DC.

The Project Manager from GSA was Vijay Gupta until his retirement in January 2011. Since then the new Project Manager from GSA has been Bose Thomas. The Project Manager from NIBS has been Earle Kennett.

An Organizing Committee for the Workshop was appointed by GSA and NIBS to scope the issues and the plan the two day agenda. Members of the Committee were: Vijay Gupta and Tom Williams from GSA; Earle Kennett and Stephanie Stubbs from NIBS; Stuart Knoop, Greg Knoop and Tom Sachs from Oudens Knoop Knoop+Sachs, Architects, Chevy Chase, MD; Marsha Mazz, U.S. Access Board, Washington, DC; and Jim Woods, Indoor Environment Consultant, Charlottesville, VA.

The Organizing Committee expresses its gratitude for the excellent staff support provided by Marion Ross and Kate Brennan from GSA.
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Executive Summary

In the United States of America there is a growing population of citizens with “low vision” and a growing need for inclusive design that will create a safer and more comfortable experience for all citizens within the built environment. “Low vision” is defined as “chronic visual impairments that cause functional limitations or disability.” The National Eye Institute (NEI) of the National Institutes of Health (NIH) estimates that, currently, more than 38 million Americans age 40 and older experience blindness, low vision, and eye diseases such as macular degeneration, cone rod dystrophy, glaucoma, diabetic retinopathy, and cataracts. This number is expected to grow to more than 50 million by year 2020. The question is how does this population negotiate the built environment and what kinds of codes, standards, and guidelines exist for designers of new construction and renovations. Although a great deal of consideration regarding codes, standards, and guidelines has been given for the blind, very little design guidance is available that provides for the requirements of the partially sighted.

On 29-30 September 2010, the National Institute of Building Sciences and the U.S. General Services Administration conducted a workshop in Washington, D.C. with participants from the fields of medicine (specialists in ophthalmology and low vision), architecture, engineering, interior design, lighting design, professional associations, government, academia, advocacy, research and development with the following objectives:

1. Identify existing guidance for design and obtain expert recommendations for new guidance for the following:
   i. Psycho-physiological definition of eye conditions that impact a person’s ability to navigate, interpret and use the built environment.
   ii. Mitigation of changes in lighting levels such as between the outdoors and the interior, from one level of interior illumination to another, and within spaces between one surface and another.
   iii. Mitigation of glare from daylight through windows and other openings, from artificial lighting fixtures, surface reflections, etc.
   iv. Mitigation of visual confusion due to poor contrasts of color and value in surfaces and forms, including wall finishes, work surfaces, furnishings, etc.
   v. Improvement in building spatial organization, cues, and signage to assist in way-finding by persons with low vision.
   vi. Enhancement of safety and ease of use by persons with low vision in areas such as toilet rooms, offices, doorways, corridors, stairs, elevators and escalators.
   vii. Enhancement of occupant performance and productivity in work spaces where reading accuracy (e.g., visual acuity) is important.

2. Identify research that would be useful in developing and advancing this guidance.

While federal laws and regulations regarding accessibility have been in place for 40 years, for the first time this interdisciplinary workshop focused on developing guidelines in building design that will greatly improve the work environment for persons with low vision. From the results of the workshop, it was intended that a plan of action would be proposed to develop draft guidance for GSA to consider for inclusion in its publication, Facilities Standards for the Public Buildings Service, and for the U.S. Access Board to consider for inclusion in the ADA/ABA Accessibility Guidelines.

The workshop began with introductory presentations with opening remarks from the GSA and NIBS, the U.S. Access Board, and the National Eye Institute, followed by a Synopsis of the Objectives of the Workshop, and a keynote address on the state of science and medical research.
for persons with low-vision. A series of expert panels followed which included presentations and discussions on patient care, design, research, and case studies. The panels focused on:

1. **Requirements and Accommodations for Persons with Low Vision**
2. **Existing Standards and Design Guidance**
3. **Impacts on Vision – Glare, Contrast, Color**
4. **Natural Lighting**
5. **Artificial Lighting**
6. **Interior Design**
7. **Next Steps and Guidelines**

Each day was concluded with a summary discussion.

Based on the results of the interdisciplinary participation in the workshop, several learning outcomes were expressed:

- Clinicians need a better understanding of lighting and accessibility exposures that “Low Vision” patients experience while in “designed environments.”
- Designers need a better understanding of the lighting and accessibility needs of “Low Vision” persons while in “designed environments.”
- A common vocabulary is needed for clinicians, design practitioners (e.g., architects, interior designers, engineers) and policy makers.
- There is a need to balance federal mandates for reduced energy consumption against the needs of all building occupants including people with low vision to have adequate illumination.

A proposed first task is to draft a document titled “Design Guidance for Persons with Low Vision.” This guideline would be based on available information (i.e., not dependent on future research) from clinicians and the design community.

- The purpose of the document would be to integrate the special lighting and accessibility requirements of persons with “low vision” (a defined clinical term) into current design practices.
- The major topics were identified in the workshop that should be the focus of this document: lighting, glare, color/texture, and accessibility through way-finding.
- The guideline should be directed primarily to the design practitioner but with focus also on the clinician, and written in a common vocabulary. It should address both buildings and sites.
- The guidance could be a stand-alone document that might inform changes to the GSA’s Facilities Standards for the Public Buildings Service (P-100), the Access Board’s Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines, and model building codes used by most state and local governments.

Another task is to begin development of a research proposal that would address basic scientific gaps, including:

- A quantitative measure of glare within the eye.
- A relationship between the measures of glare within the eye and within the built environment.
- A scientific foundation for improvements in guidance for patient care and for environmental design.

“The issue of accessibility is huge in federal buildings and GSA is committed to making federal facilities fully accessible to all people,” GSA Deputy Administrator Susan Brita said during her opening remarks. “Achieving accessibility is reflected in our commitment to make sure that new
buildings and those being retrofitted are designed with accessibility built-in, not added on. GSA is very aware of the needs of the disabled community, and fully committed to making sure that employees and visitors with disabilities are integrated in the workplace.” The participants set forth intent to continue collaboration on developing a structured way forward to better understand the needed accommodation, make editorial improvements to current guidelines, and to establish future guidelines, standards, or codes that assist in creating built environments that are more inclusive for people in our society.
Introduction to the Proceedings

On 29-30 September 2010, the National Institute of Building Sciences and the U.S. General Services Administration conducted this interdisciplinary Workshop in Washington, D.C. with participants from the fields of medicine (specialists in ophthalmology and low vision), architecture, engineering, interior design, lighting design, professional associations, government, academia, advocacy, and research and development.

The rationale and objectives of the Workshop are provided in Appendix A and the agenda for the two days is shown in Appendix B. A list of participants is given in Appendix C and biographical sketches are provided on the website (FTP site) that supports these Proceedings: [http://files.nibs.org/](http://files.nibs.org/); user name: lowvision; passcode: lowvision). A list of reference materials that were distributed to the participants during the Workshop is given in Appendix D; copies of these references are available on the FTP site.

These Proceedings are an edited version of the recorded transcripts of the Workshop. The transcripts have been edited for easier reading of the spoken presentations and discussions. However, care has been taken to preserve the intent of the content, as valuable information was shared during the discussions as well as during the presentations. Edits have also been made to link the presentations with the “slides”, which are available on the FTP site. Unfortunately, the recorders malfunctioned for Panels 2 and 3 and for one presentation in Panel 6. Through our handwritten notes, we have attempted to reconstruct these sessions and to link them to their slides.

The Table of Contents is an extensive outline of the Proceedings, with Headings 1 – 3 shown. Lower Headings will also be found in the body of the Proceedings. Also, these edited Proceedings have embedded 24 “Issues” that seemed to highlight the sessions; these Issues are listed in Appendix E. The notes that were made by Stephanie Stubbs from the Preface for Day 2, are included as Appendix F. A subsequent set of notes by Erin Schambureck are in Appendix G.

Welcome and Charge to Participants

Henry L. Green, Hon. AIA, President, National Institute of Building Sciences (NIBS)

Welcome to the National Institute of Building Sciences. It’s very, very peaceful here this morning. I think this is going to be an exciting project for a couple of different reasons. You know, as we age, we actually need other attributes to help us through life. And as a person who is growing older – and I hope to grow much older – I hope the built environment is more conducive to me.

And just a little bit of history from a personal perspective. I used to run a program in Michigan called the “Barrier-Free Design Program.” And it was about accessibility. I’d never thought at the age of 26 that it would affect me. I’m an able-bodied individual. I’ve played basketball when I was in college. I had a lot of fun, and I was very active. I played softball in the league, bowled, did all those things that a young 26-year-old would do until, one day, in playing in a basketball tournament, I fell down and I couldn’t get up. I ruptured my Achilles.

So from that point on, my life was changed. My life was changed from the standpoint of having to go through the surgery and then a year of rehabilitation and the doctor telling me you’ll never play basketball competitively again.

But, I got a real appreciation for different attributes in buildings at that point. And I think that’s what we all have to appreciate. It’s been said that everyone, at some point in their life, is going to have to have assistance in their life to continue a productive life.
So I think what we’re doing here today is just a phenomenal step toward the continuum of making sure that people have the things that they need to fulfill their life’s expectancy and to do the things that they want in life.

And our built environment has to adjust. It has to adjust from the standpoint of making sure that people can be productive and they can live lives that are very fulfilling.

So again, I think this is very exciting, and I’m happy we’re here today.

I have the distinct honor, though, of first of all, welcoming you here today to the institute and all the marvelous things that we’re doing here. This is one of them. And I also have the distinct honor today to introduce someone that I just met, someone who I had a nice, long conversation with. And it was a very good conversation.

Susan Brita was named the deputy administrator for the U.S. Department of Gen. Services Administration in 2010, a new appointment for her. But in her role over there, she works very closely with the senior management at GSA to provide guidance for GSA employees, to help develop policy and to provide services that provide services to other federal agencies.

Susan is no stranger to GSA broad spectrum of services where she has served as the chief of staff in a previous assignment in the administration of Terence Golden back in 1985 and 1988. She most recently served as deputy director for the House Transportation and Infrastructure Committee, and I think that was a unique role going from an administrative position to a legislative position. She’s got a good balance in terms of looking at this issue from different perspectives.

I think that’s wonderful because, if you just have a singular view, you don’t necessarily appreciate all the nuances that happen, and I think that’s great.

In that role, where she was at – she had a great portfolio of looking at different types of buildings which included the Kennedy Center, the Smithsonian and, also, worked with the Architect of the Capitol, so her vantage point of looking at the various types of federal buildings and how they operate and given the uniqueness of those buildings, particularly when working with an AOC and the legislature, that has got to be a unique challenge, specifically when you think about, every couple of years, there’s this kind of moving chairs around or moving offices.

Susan is very well respected and brings to us a great deal of knowledge and capability. And I just want to introduce to you Susan, who is going to make some opening comments this morning.

So Susan, thank you so much for coming in.

Susan Britta, Deputy Administrator, U.S. General Services Administration (GSA)

Let me just flesh out a few things. For those of you who have been around a long time, I have been in the government for 30 years. I spent 22 years on the Hill and then the rest of the time in the executive branch.

And I must say, as unusual as it sounds, handicapped issues and visually impaired issues have been a constant theme through my entire federal career.

When I was on the Hill working for Jim Oberstar, who was the chairman of the Transportation Committee, he was a strong advocate of employment for handicapped, accessibility for handicapped employees, particularly visually handicapped, and had a Lighthouse in his district. And every six months, we would go up to his office and have a meeting with the executives from the Lighthouse that would come in and talk to us about not only the building but the products that they were providing for the federal government.
When I was in GSA in the mid-‘80s, I had the distinct pleasure – I don’t know if anyone remembers Judge Suchanek. Leonard Suchanek was a pioneer in the field of providing accessibility for handicapped employees, particularly for computers. Len Suchanek was sort of this mythical figure that worked on the seventh floor of GSA. No one went up there because it was the board of contract appeals, and we didn’t want to look like we were trying to influence any decisions. Len was up there not only making decisions but working on behalf of handicapped employees.

He was visually impaired and was a strong advocate for providing – in those days, it was computers, you know, in the mid-‘80s – for the visually impaired. And when I went to the Hill, one of the first bills I worked on for Jack Brooks on the Government Reform Committee – which is where I spent my first two years – was a bill for handicapped employees, particularly for visually impaired providing purchasing computers and office equipment for the visually impaired.

And then when I went to the Transportation Committee and had jurisdiction over GSA, the issue of accessibility was huge in federal buildings, providing accessibility, retrofitting existing buildings, making sure that new buildings – this is where my colleague, Tom Williams, is so instrumental – making sure that new buildings are designed with accessibility built right into them, not added on, but built right into them.

So accessibility – and, as you know, in the energy bills, even though they talk about energy efficiency and energy savings, the very last line says “and accessibility.” So accessibility has been a theme and should be a theme. It’s a viable theme in the federal government, and we spent taxpayer dollars. It’s every taxpayer dollar is being spent. And so every taxpayer, whether you’re our employees in the building or a taxpayer going in to use a federal building, should have accessibility and should be, as we’re looking at now, a nuance of that is the low-vision issue and the ability to use federal buildings efficiently.

I don’t need to tell this group the statistics on handicapped people, visually impaired is very large. And the unemployment statistics associated with that category are very high.

GSA has had a long history of working with handicapped issues, and recently, the Federal Acquisition Service, which is the other large service that GSA provides, is working with AbilityOne to put together a workshop which we’re going to have at the end of October that will increase their ability to provide green products. So we’re taking a national theme of sustainability and green products and working it into one of our biggest suppliers, which is AbilityOne, and seeing how they can increase their green supply chain which, again, sort of a national.

So, all of these pieces are fitting together. The handicapped community is no longer something outside that we bring in when necessary. It’s being more fully integrated into all of the GSA activities. And the administration – when I say “administration,” not just GSA but the big administration, the Obama administration, is committed to the ideal of full integration. And we are very aware of the needs of the handicapped community. We’re committed to form a corporation into not only the PBS program but the FAS program.

I work with Tom on the access board. As you know, GSA is a statutory access board. So it’s sort of ingrained into the GSA DNA that this is one of our important, important functions. It may not always be visible, but it is something that we are always thinking about, particularly when we’re – now, we’re using AbilityOne and the handicapped community – business community – to use their products and services as we try to wean the supply chain, promote sustainability and make our federal buildings as efficient and as effective as possible for everyone, not just fully sighted employees, but employees that are visually impaired as well as the public.

People forget the public comes into these federal buildings, and they need the same kinds of added services, and they need the same kind of planning and attention to detail that the visually impaired do.
So it is one of these powers of small groups. What you’re doing will impact what GSA does. It’s important. It’s important work. I’m just glad to hear over the last week it’s not expensive. This can be built right in with regular planning and regular tenant fit-out. These are not things that require a lot of money. We’re going to do it anyway, so we might as well do it to get the biggest bang for the buck. And it’s an issue that is – it’s out there. It’s coming toward us. We might as well handle it now, and the work of this group will be very, very important and will be of great interest to GSA.

I would like to leave a few minutes for questions, if anyone has any questions that they’d like to ask about what we’re doing at the agency, what we’re doing in this regard. Otherwise, I just want to say I’m delighted to be here. Thank you for the invitation.

As I said, my colleague, Tom Williams is the point person on all these issues. What I know I really gleaned from Tom. And so I am delighted to have him as my colleague and a member of the board.

And thank you very much for inviting me. It’s a pleasure to be here. I look forward to the results of your workshop.

Discussion

Comment by Vijay Gupta: I have a comment to make. Thank you, Ms. Brita. I appreciate you coming.

Response by Susan Brita: This is an old colleague.

I tell you, I’m visually impaired, and my problem became more and more serious, so GSA has been very accommodating. I have had all the facilities they could have provided me. They provided me with a computer which talks – “Jaws” software, and I have been a support person for the last eight years, and now I work fulltime for GSA. It’s a great agency to work for, you know, for people who are visually impaired or any other problems.

But as a last note – then I’ll let anybody else ask any questions: the role of engineering should be kept high on the pyramid, because if you don’t have good engineering in the building, you’re going to lose the building. You’re going to lose the functionality. You’re going to lose energy. Clean energy benefits now, but in five years from now, you will find out it’s not going to work. So that’s one thing I will appreciate if you can keep in mind. It’s not only aesthetics. I like architecture but, unfortunately, [the] last decade [has resulted in building performance going] down, down, down.

So anyhow, that’s my comment. Anybody else?

Low Vision Accessibility as a Necessity

Question by [Participant]: Just wondering, has GSA looked at the costs and benefits of accommodating low-vision and other disabilities in terms of what’s lost if you don’t have them and what’s gained not only for the people with disabilities but for others in terms of enhanced?

Response by Susan Brita: I don’t know if they’ve specifically looked at the low-vision issue, but they are always conscious of the handicapped issue. And, quite frankly, because the law requires it, we don’t even demand a cost-benefit analysis because we’re going to do it regardless of what the cost is.

As Vijay said, one of the problems is, when you deal with high-end architecture – and Tom knows this firsthand – a lot of them don’t want to disturb the architecture of their buildings to provide handicapped access, particularly, exterior of these buildings let alone once you get inside, particularly. We are constantly reminding them that this is not a nice-to-have; this is a must-have. It’s going to be incorporated into the design the buildings.
And sometimes that’s a little push-and-shove. But the low-vision issue, not specifically. That’s why I think this workshop is important because I think you will be coming up with – and I, quite frankly, don’t think it’s going to be expensive. And even if it is, it’s an investment. It’s not a cost; it’s really an investment because there are productivity issues. And if your workers can’t work, then there’s no sense having them there if they can’t work.

And so the recommendations and the outcomes that come out of this workshop will be closely looked at inside GSA. When we talked last week, we did think that having contrasting carpet or having different kind of signage should not be expensive because we’re going to have it anyway. So we might as well do it right the first time. And it’s not just limited to visually impaired. Anyone will benefit from that kind of design element or those kinds of signs. So it’s not like we’re carving a little niche. It’s going to be there anyway.

So I don’t think it’s going to be a big issue. I really don’t. But even if it is some additional cost – which I don’t think there will be – it has to be absorbed anyway. So it’s not like you can say don’t do it because it’s a hundred dollars more. That’s not going into the decision.

But it’s a very iterative process. You know, you start with a concept. You get with the architects. They want to have it this way. You have a particular client. The judges are very, very difficult to deal with when it comes to designing courthouses, which is a huge public building that absolutely everyone ought to be able to get into and use efficiently. Sometimes judges are very stingy in their approach to their building: this is my courtroom. It’s not really yours and mine. It’s the taxpayers’, and everyone should have the same kind of access.

Question and Comment by [Participant]: In the ADA, in just scan reading it kind of preparing for this, I’ve got the impression that, if you’re totally blind, it’s covered. Low vision is not in the act.

Response by Susan Brita: It’s not defined. It’s not a defined term.

Memorandum of Understanding as a Possibility

Question and Comment by [Participant]: So, as we move forward in where we’re going today, do you have any comments that you’d like to make for us to address? How can we can [have] some influence on that?

Response by Susan Brita: Well, the way you’re doing things now – which I think is the right way to do when you settle voluntary complaints on the part of the agency that low vision is a nuance of not sighted. I never advocate – because I spent 22 years on the Hill – I never advocate people going to the Hill to try to get an amendment to it because it takes so long. You really never get what you want. You always get a version of what you want.

So if you can get the lead agencies to [sign] an MOU or a memorandum of understanding or a memorandum of agreement that low vision will be – and it is actually part of the Energy Act. So you can sort of work your way in that way.

Going back and amending those two statutes, while there may be a lot of public sentiment, can take forever. And as I said, you generally don’t get what you want. You need an advocate up on the Hill that would help you push a piece of legislation. And this is just an amendment, and it can be tough.

From a political point of view, if it’s an amendment that everyone thinks it’s a great idea, invariably, someone’s going to put something on it that’s a rotten idea to move forward, you know, some whacko idea, and your amendment will never go anywhere.
I always advise people think twice about going to the Hill because it is a difficult, long process. If you think you can get what you need to get done administratively through memorandums of agreement and understanding, I would try that first. If that doesn’t work, then you can always appeal to the GSA. There’s a great sentiment inside of the agency to be cooperative.

No one inside GSA is going to say we’re not going to do this. And that’s where your next focus would be is to go to the individual and, particularly, GSA and say, look, we need some help on this. We need more of an understanding. We need this to be incorporated more. And I’d be very surprised if the agency said, oh, we don’t have the statutory authority to do it. They have huge statutory authority to do it. So I don’t think that that would be the problem.

**Statutory Authority for Guidelines and Standards**

Comment by Marsha Mazz: In fact, we do have statutory authority. The Americans With Disabilities Act and the Architectural Barriers Act both speak to the board’s responsibility to establish guidelines that address the needs of people with disabilities. People of low vision are included among that very broad category of individuals with disabilities.

The problem, in fact, is that most of the historical research, most of the work has been, heretofore, to develop guidelines and standards for people with mobility limitations and, to a much lesser degree, people who are hard of hearing or deaf, low vision or blind.

And if you reflect on it, I think you’ll come to the conclusion that more accessibility and a built-in environment, the biggest barriers are and have been, over time, barriers to people with mobility impairments. They can’t even get in the building, yet people like myself – I’m low-vision; I’m legally blind – are impacted – Vijay is impacted by the quality – the acoustics in the building, by the lighting in a building, by the sign systems in a building, even the way the building is laid out which may impact your ability to find your way efficiently without having to depend on others.

And so it’s not that we don’t feel authorized to establish these guidelines and standards. It’s that we have very little information. And later on, we’ll talk about what federal law requires of us in terms of support for rulemaking. And so I think that’s our biggest barrier.

And I totally and completely agree with you. It doesn’t usually behoove people to run to the Hill and say write a special law for people who are blind or write a special law for people who are whatever because, in fact, the law is very, very broad and the pressure probably needs to be elsewhere to get the agencies that are already authorized to produce what’s needed.

Response by Susan Britta: A perfect point. It is not that you’re not fully authorized. It’s been lack of attention. But now this is your time. I mean, this is the time to bring up the issue, to get some attention focused on it. It is a legitimate issue. It should be focused on, and this is, you know – this is your time.

Comment by Thomas Williams: A number of years ago, our agency took a lead on an issue that affects all federal buildings across the whole array of the government, and that was entrances. And the standard, despite all the iterations of the standard over time, has never made any allowance for [the] opening force for doors, other than the width of the door and some threshold requirements and the accessible path going to the entrance door of a building.

There are not requirements for what you do with somebody who can’t pull the door open because there is prevailing wind, a force against the door, or the building is pressurized and so the amount of force you need to exert, if you are someone in a wheelchair or something who has got other problems with balance and so forth, is overwhelming. You can’t get in.

So when I started with accessibility about eight years ago, I was asked to run the program. Major issue. And the first thing I saw was countless complaints coming to our agency from
the access board addressing entrance issues because people couldn’t get in doors to brand-
new federal buildings.

Our monumental, beautiful courthouses with doors that are 10 feet tall, so heavy that an
average person would find too difficult to open the door. But suppose it’s located in an
environment like Chicago where you’ve got prevailing winds on that door and other issues.

So after dealing with countless complaints on that issue, I decided that the only way we could
remedy this was to encourage the leadership of the agency to accept a provision in the
facility standards, which is our guideline for the design of all of our federal buildings that
would require that entrances to our buildings be equipped with either a power-assist or
automatic doors in consonance with what was then the new standard that we had adopted.

We adopted it back in 2005 after the board published their guidelines in 2004, and I was able
to get leadership to agree to that. So we amended the facilities standards and put that
requirement in it. It’s in our 2005 facilities standards.

And actually, facilities standards was published before we technically had adopted the
architecture barriers and accessibility standard. We put it in there, and we were the first
agency to do so. And I believe it was the right thing to do, and I think it’s mitigated a lot of
complaints that would have occurred otherwise on a continuing basis in our buildings.

Marsha noticed that.

**Credible Data are a Necessity**

**Comment by Marsha Mazz:** We, at the Access Board were thrilled that GSA took this step.
And, while I have you as an audience, I’ll say that, if GSA can collect data on the
maintainability of the automatic door openers, the impacts on energy because those – that’s
the pushback we get. Anytime we suggest even that we might include a requirement for
automatic doors on ADA-covered buildings or even barriers act-covered buildings, the
pushback immediately is these things are impossible to maintain; they cost a lot to maintain;
and they will affect the energy efficiency of the building and the security of the building.

If GSA can begin to develop a body of data so that the next time we refresh this role, we’ll
have GSA’s data to support a requirement for other federal agencies and for ADA-covered
agencies, that would go a long way because, without that kind of data to refute the
naysayers, we’re stuck because we all have to deal with OMB.

**Response by Susan Brita:** I know they collect data on things like escalators because
there was a move during the energy-efficient days of, you know, like eight or nine years
ago, there was a move to stop all down escalators and make people walk down the stairs
[for energy savings]. Or when you step on them, they move. When you step off them,
they don’t move.

But the maintenance figures came back and said you break them so often when you do
that, you might as well just keep them running all the time. So if they can collect data like
that, I’m sure they’re going to be able to collect data on the push buttons at the door.

**Security and Accessibility**

But, the issue of security – people use security now for an excuse for the most ridiculous
things. And inside the agency now, we’re always in a tug-of-war between trying to have
an open kind of society where public buildings can be used versus everything’s got to be
shut; getting into these buildings is almost impossible; you have to almost give a blood
sample in order to get in. It’s a huge problem.

Security in federal buildings is enormously expensive. It’s exploded, certainly, since it
started after Oklahoma City but really exploded after 9/11. Everything’s got a bollard in
front of it now, and it’s just enormously expensive.
And that’s a static cost. The taxpayer gets nothing for that. That’s a sunk cost for the
taxpayer who virtually gets, other than you can say maybe your federal building is a little
bit safer because you’ve got a big, potted plant out front.

Security is used all the time. It’s like white noise. I really don’t pay attention to it until you
can actually prove that you’re investing in something that really is going to have a return.
So I don’t pay any attention to the, gee, it’s going to disturb security issues because it
usually doesn’t.

And most of the people that say that, quite frankly, if you go to any of these security
meetings, they’re all law enforcement types. So they’re all like super into law
enforcement and security and all of that. They’re not building managers. They’re not
users of the building. They’re all security types, and there’s no security – there’s nothing
you can invest that’s too expensive that they wouldn’t buy to secure a federal building.

And with limited resources, I will tell you, it’s a huge issue. When you’re trying to design
a federal building, it’s a huge issue because the tendency is to go to the security and not
to go on the handicapped issues. That’s where the tendency is.

GSA needs to be strong at heart and say that we need an appropriate balance and, quite
frankly, we have a legal requirement on the handicapped issues. We don’t have a legal
requirement on the security issues.

Comment by [Participant]: But there’s one thing that should be said about that. Those are not
mutually exclusive issues that can be designed into a building. I think the outgrowth of this
workshop should take into account those issues and address how, in fact, they can be
inclusive. That’s the beauty of putting together this kind of program, identifying the obstacles
and addressing them from the standpoint of how do we use our intellect to make these things
work.

Response by Susan Brita: Right. And demystifying the notion that these kinds of things
are expensive. They’re not. They’re not. If designed properly, they’re designed right into
the building, and they’re not add-ons. They’re perfectly appropriate and they’re not
expensive.

GSA Leadership

Comment by Tom Williams: I think our agency has an opportunity to take a lead on the issue
of the low-vision design environments. It’s a unique opportunity that we have and that we
have a leadership role in the federal government in terms of being advocates for the rights of
people with disabilities. Not everybody may agree internally within our agency. There are
those that think that design for the sake of design is all important, overwhelms everything
else, and these things are inconsequential to the greatness of designs that are produced.

But the bottom line is we should not be about being elitists or only concerned about getting
our buildings published in Architectural Record. We should be concerned about our buildings
working for the American taxpayers who are kind enough to give us the money to design and
build these buildings.

And that means all taxpayers. All citizens have the same rights. We have the same
treatment by federal government. No exclusivity. The built environment is our obligation to
do what we can to make it better, and that includes this low-vision issue and trying to amend
our facility standards. It’s one way we can take the leadership to put provisions in our facility
standards that will enable our designers to understand these requirements for low vision and
incorporate them by mandate in the facility standards so that we comply and do the right
thing. That would be a precedent to help the board at a later date because rulemaking is
lengthy. It’s years and years long. Getting any kind of changes made to accessibility
standards and guidelines is a forever thing. It’s a constantly evolving process.
The last time it took then 10 years to revise those guidelines. So it’s a lengthy, lengthy process, and whatever we can do to help the process along because of the uniqueness of our ability to do that with our agency is something we should and must do.

**Question by Henry Green:** Any other questions of Susan?

**Response by Susan Britta:** Thank you very much. Good luck in your workshop. We expect great things from you. And, as Tom said, these can be designed and incorporated at minimal or no cost. So don’t let anyone tell you it’s going to be expensive because it won’t be. And you have a committed agency. We look forward to the results of the convention.

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**Opening Remarks and Introductions**

**Earle Kennett, Senior Vice President and Chief Operating Officer, NIBS**

Hello. I’m Earle Kennett with the institute, and I have the distinct honor that I got from Vijay to facilitate this facility.

In a few minutes, we’re going to go around the room and get introductions from all you so we’ll know what organizations you’re with. But before we do that, I have just a couple of things. You’ve got an agenda package, and in it is the agenda, bios for all the people. I am not going to go through introductions except for one person.

Now, there was a team working on this over the last few months. This was really the brainchild of Vijay. I just wanted to introduce Stephanie. She’s with the institute, and she’s basically the one that’s done all the hard work for these people and put everything together. So I appreciate it, Stephanie.

The other folks on the committee that put it together were Jim Woods and Tom Sachs and then Marsha, who’s already introduced herself from the Access Board, and Tom Williams who’s out there making his points with Susan as the GSA disability advocate.

We’re all on that committee. Including one other person who really managed it, who really put together everything, invited everyone. And you probably saw his name on several e-mails and documents and then are wondering where he is, and that’s Stuart Knoop. And our thoughts and prayers are with Stuart. Stuart had to go into the hospital, not a life-threatening situation but certainly a medical situation with his neck just a few weeks ago and, actually, was really, really disappointed that he couldn’t be here to take advantage of all of the hard work he had done.

But he did enlist – Stuart and I and Vijay and Jim go back several decades, and Stuart was principal – at the time Oudens and Knoop, Associates. His son, Greg Knoop, has agreed to take over some of the panel moderation and work here as parts of that workshop. And so, as Stuart was laying in intensive care, I’m sure he had long conversations with Greg about this workshop and brought Greg up to speed.

So Greg, we appreciate it and, really, tell your father that we have a lot of concern for him and our thoughts and prayers are with him.

Well, this sort of – before our introductions, this leads me up to ask Vijay to say a few words. He’s the only person I’m going to introduce, really, but I want to introduce Vijay a little bit.

I go back with Vijay at least 20, maybe 30 years. Vijay has worked for GSA for, I guess, probably – see I can do this from memory – for about 40 years. He is the chief mechanical engineer for GSA. You run across people in the federal government in this huge bureaucracy that have large amounts of responsibility. And every so often, you run across someone who really – whose heart is truly in the right place and advocates for – and is an advocate for a number the issues even to their own professional detriment. Okay?
If there’s any organization out there – many you here are in the private sector – any organization out there that resembles the government – you know, and I’ve worked with the feds for over 30 years working with them – and they don’t like criticism. They don’t even like self-criticism. So when you stand up and say, you know, we can do it better, they tend to take it personally. And that won’t be a good route for your progression and movement into that agency. Okay?

I have seen that firsthand myself. And Vijay has been part of that. And Kurt Knight is the chief of quality control and assurance and, primarily, their chief engineer and mechanical engineer at VA, has been through those exercises. People like Vijay and a few others, they constantly pound their head against that brick wall. And, you see that brick wall over the years move just a little bit.

But the blood and the bruises that these guys and women have on them is just enormous. And so I have utmost respect for Vijay.

Vijay has his primary purpose over there, besides trying to enhance mechanical systems and energy engineering, to develop post-occupancy evaluations. And under their sometimes misguided belief that if you go out and you evaluate an existing building that’s been running for a couple of years, that the problems you learn from that building, including tenant and user concerns, is, in many ways, going to benefit the agency and show you that you probably shouldn’t redesign the same problems into all your future buildings.

That’s been a long, hard process for Vijay. And we have tried very hard – Patrick Fee, who will introduce himself, in charge of the property managers at GSA, has been the recipient of many of our tales on GSA buildings. You think that would be easy. It hasn’t been easy, and it isn’t easy. And Vijay has been a constant advocate for that.

He started initiating the HVAC Excellence Program at GSA. As I mentioned, he’s run a number of post-occupancy evaluations. He’s a fellow in ASHRAE. He’s been honored in ASHRAE. Not only is he a mechanical engineer but he’s – actually, his first degree, I believe, was in civil engineering. And he’s been a recipient of honors here at the institute. And he’s been – and I’ve traveled around the country with Stuart and Jim Woods and Vijay looking at numbers of GSA buildings.

I have seen his vision deteriorate over those years. And there’s a number of people in this room that have vision disabilities, and they just press on. And I saw the deterioration with Vijay over the years, [who was affected by] glare and contrast problems in these federal courthouses that are supposed to be open for the general public; problems as he’s made his way through these buildings and, over the years, needed more and more assistance from Jim and myself and Stuart.

So he’s been through this, and he’s fought the good fight. Vijay is going to be retiring at the end of this year, and this is his last swan song [that] he wants to leave with GSA.

Vijay, we really appreciate you and the effort that you’ve put in over the last four decades. So I’d ask you to say a little bit, and thanks a lot, Vijay.

Vijay Gupta, P.E., Fellow ASHRAE, Chief Mechanical Engineer, Office of Design and Construction Programs, Public Buildings Service, GSA

Well, thank you. It’s a great honor to be here. I’m in GSA 36 years by the way, not 40.

Response by Earle Kennett: Oh, okay.

[Before joining GSA, I worked] nine years in private sector. I’ve been through a lot of changes, a lot of reorganizations, a lot of things, a lot of lessons learned.

I came to GSA in ’74 when President Nixon was the president. My first day on the job, my boss called me. I said, do I have to go to orientation. He said no, no, no. We’ve got another task for you. I asked, “well, what is it?”. He said, we got a call from the White House, and
President Nixon cannot see the Washington Monument. And, my gosh, I mean, what can I do to fix [the view of the] monument from the Oval Office. So he said, well, the problem is there’s an obstruction between the monument and the Oval Office, and it’s your job to fix it by end of the day. The vision problem doesn’t have to be the physical eyes, but it could also be an obstruction in the way. So there was a big plume of steam, which was right in the smack – in the middle of the Ellipse. And he looked through the Ellipse to see the monument from the Oval Office, and the plume was like a hundred foot high. So my job was to stop the flume by end of the day.

Anyhow, to move forward, I’ve done a lot of engineering excellence workshops – about 18 of them – and this [low vision workshop]. Initially, I was diagnosed with macular degeneration in ’76. I went to Hopkins. Anyhow, then in 2000, I was diagnosed with rod/cone dystrophy, which made things a lot worse than macular degeneration. So for now, things have gone way down. Anyhow, so that’s why I’ve decided to retire. It’s about time.

But we’ve done a lot of good things, and I checked into [lighting needs that could be addressed] in 2007. I asked him, I said, well, Stuart, what’s in the [ABA] that makes the building more accessible, contrast, less glare and other issues. He said, well there’s nothing in [the ABA] which says that and nothing in ADA, which addresses that. So I [asked], well, what can we do with it? So he said, well, a lot of research, not much had been compiled or nothing much is in the law.

I started thinking about it. I talked to Tom. I said, well, Tom, what can we do to – he said, I don’t know. So I started thinking about six months ago, we initiated this task. So we appreciate all of you coming, and that’s where we are. We’ve been tasked to – [hold this Workshop]: Tom Williams, Tom Sachs and Earle Kennett – we all worked together. By the way, Kate and Marion also helped in preparing all these brochures.

That’s all. I think my time is probably up, but I’ll be talking more later on.

**Self-Introductions of Participants**

**Comment by Earle Kennett:** Well, now, your turn. We just want to go around the room and you tell us who are you are and what organization you’re from. And if you want to throw out a couple of sentences about your interest in this, you know, feel free to do so.

**Stephanie Stubbs,** who works here at the institute. She’s been the primary person that’s put this together with Kate and Marion.

**David Munson:** I started off [studying] lighting and design in 1975 in New York. Lived all over New York. I worked with Jim Knuckles, wrote a paper in 1973 on lighting for the aged, and I’d never thought I’d live to be old enough in years to use it. I spent 26 years at HOK in architecture as a lighting designer and vice president in the legal group. And I’ve got to tell you that working on a GSA building or a federal courthouse is the most complicated project in the world and tend to be the most expensive. Federal judges, I’ve got to tell you, I’ve got stories about federal judges. Anyway, glad to be here. Thank you.

**Marsha Mazz:** I’m the director of the Office of Technical and Information Services at the U.S. Access Board and will be talking more later about what the Access Board does and maybe doesn’t do.

**Mark Mazz:** I’m Marsha’s husband. I am an architect. I have my own business and I specialize in accessible design. I’ve done this for about 30 years.

**Priscilla Rogers:** Hi, everybody. I’m Pris Rogers. I work for the American Foundation for the Blind. Although we’re headquartered in New York, I work out of Dallas where we have built a national center on vision loss to show what kinds of design concepts can help people with low vision. So I’ve been asked to come today because of that project, I think. I also manage our website for seniors, which is called AFB Senior Site. We have a lot of design concepts on there to help people with low vision support. And can I get some help with the glare that’s
coming out of [the above lighting fixtures]? It’s about to drive me batty. I don’t know whether it’s better for me, but is it going to bother you? Thank you.

Jeanne Halloin: Hi, everybody. I’m from Michigan. I work with Harts Lighting Design. I also was a professor at Michigan State University. And when we lived in College Station, Texas, I worked with an architectural firm there. I joined IES when I started teaching lighting and got very involved in a committee that Eunice chaired at the time which involves lighting design for the elderly and partially sighted. And it’s just been a wonderful experience. I also have a sister that works for art education for the blind in New York City. So it’s been a good interest all the way around. But it certainly is an important topic, and I really would like to see it have some space.

Eunice Noell Waggoner: I’m the president of the Center of Design for an Aging Society in Portland, Oregon. Early in my career – I think I was like 26 – I was asked if I would design a home for a woman who is losing her sight. She’s going to be placed in a nursing home simply because she was losing her sight but she was just healthy as a horse. And I knew nothing about aging vision or low vision or lighting for that matter. So I had that challenge at an early age[, which] set me on this course to figure out for myself and work with it. And so having information in place where other people could access that information became a goal for me because I was tired of not being heard or listened to about the needs of other folks. And when you’re young, you assume that everyone has the same perceptions that you do. You don’t realize that they’re different. So that’s why I’m so delighted that this meeting is taking place.

Robert Dupuy: I’m the leader of the Interface Engineering Lighting Studio in Portland, Oregon. Eunice and I are co-conspirators in our efforts to bring quality lighting to the elderly.

Roberta Null: I taught housing and interior design at a variety of universities for years. When I taught at San Diego State, I had my students design – because we found that it was close to the campus – training kitchens for the San Diego Center for the Blind. And in the process of doing this – which has turned out to be a wonderful project – we discovered that most blind rehab centers are geared up to rehab young, totally blind people. And the elderly people with partial eyesight are a whole different group and a much larger group, by the way. And it was difficult at that time, which was in the ’80s, to even get funding for rehab for older low-vision people because they didn’t think it was a good investment. Well, when somebody is 70 and you help them to live independently in their own home and they have live until they’re 90, it’s a good investment. And so it’s been a wonderful project. And because of being involved in this, I have expanded my work to work with universal design and wrote a book called “Universal Design: Creative Solutions for ADA Compliance,” which has not been real successful financially but has opened many doors for me. And now, I’m in the process of revising it, and I have – I’m going to tell you tomorrow a little bit about – and show you some pictures, hopefully, if my technology came through – of this wonderful facility that was built in San Diego that I think is a wonderful example of good universal design plus designing supporting environments for older, low-vision people.

Debra Babcock: Good morning, everyone. I work with the Internal Revenue Service, fondly known as the IRS. I have nothing to do with any audits; I purely work with the Web. I was originally hired to revise and renovate IRS.gov. Because we do offer a lot of products for blind and low-vision taxpayers, became very interested in that aspect of it. And, right now, I’m involved in several disability initiatives at the IRS as currently – (inaudible). So I’m very glad to be here, and thank you.

Cheri Wiggs: I’m from the National Eye Institute as part of NIH. One of the portfolios that I oversee is the low-vision and blindness rehabilitation program. So you’ll find out a little bit more about that in a few minutes.

Marie Elise Dennis: Good morning. I’m a public affairs officer for GSA. Thomas Williams graciously invited me to attend, so I’m here covering it for our website.
Bob Lynch: Good morning. I’m an architect. I’ve been involved in universal design since before it was called that. I sit on the American National Standards Institute Committee on Accessible and Usable Buildings and Facilities, and I represent the Brain Injury Association of America on that committee.

Tom Williams: Good morning, everyone. I’m the national accessibility officer for GSA. I have a passion for helping people with disabilities. It’s an acquired passion. It was in total ignorance that I started as an accessibility officer eight years ago and really not knowing anything about the plight of people with disabilities and how difficult the built environment can be for them to function in. With no training when I was an architectural school at VPI about people with disabilities. Nothing was ever mentioned about it. At that point in time, there wasn’t an Architectural Barriers Act, either. So that was a few years ago. But the bottom line is I have learned about the passion of people in the Access Board to help people like them across the country and across the world that have disabilities. Our nation sets an example for other countries in the world. Our agency, GSA, has a leadership role to play in federal government in promoting whatever we can do [in] the design and built environment to assist people with disabilities in whatever way we can. Our leadership of Susan is a wonderful example of leadership committed to this. There has been other leadership in our agency but don’t think it’s taken this on such a personal way as she has. We’ve had management within the Office of Design and Construction that has looked at disability as one of those things they wish they could just sweep under the carpet. And so I’ve tried to bring a heightened awareness of that, and this workshop is part of my heightened awareness of another aspect of disability that I don’t know a lot about. But I think all of us that are advancing in age find that our vision is not – if we had good vision to begin with – is not as keen as it was when we were younger. If some people who have had all of their life to live with a vision loss and function well and achieve much, like Marsha, can be helped by anything that we can do in this workshop, then I am absolutely a hundred percent supportive. And I hope that you have you here are here for that reason, also. I think, together, we can achieve some wonderful things. Even if it’s just initial ideas of what to do, we can achieve a good start on making real progress in this area. Thank you for attending.

Kurt Knight: [I am] director of facilities quality service in VA. We develop all VA standards for facilities. And it’s interesting. We have a couple of types of buildings that reflect blind rehab centers. But as you pointed out, that’s mainly younger veterans that I’ve talked to how you exist and work around obstacles in living and just constant living. We’ve recently had a new vision in nursing-home care for the elderly. The typical VA patient is older than the general population of a typical hospital and, often, has more chronic illnesses of one kind of another. So there’s also multiple things going on with a VA patient. And our long-term care process is dramatically changing to provide more home-built environments or nursing-home patients or long-term care patients called community living centers. And they have addressed vision issues in those because it tends to be an issue. In addition to that, we’ve recently put out a polytrauma design guide which reflects the fact that many of our veterans coming back from the recent wars have multiple injuries, including vision impairment and loss of limbs and a whole series of things that need to be treated differently. So we’ve been building – in the process of developing and building some centers just to deal with these multiple traumas. Again, the major goal is going to be to get people back into society and working around. Having said that, I mean, the VA has always been an advocate for the disabled. I mean, we’ve often gone over and above what the standards are in VA hospitals with more accessible rooms or more accessible bathrooms, et cetera, to ensure that we, you know, deal with those kinds of issues because of our patient type. But I do commend Vijay for starting this because, having said that, I don’t think our – certainly, our standards don’t focus on vision like they do on accessibility and access to the buildings. Now, we have a lot of stuff in our standards relative to that, and we don’t really focus on the vision or low-vision or – I mean, we do some in finishes and our floors and signage to some degree, but we don’t have a real focus on, you know, a direction to accomplish that in a more aggressive way. But it is the right time to do this. I mean, we have the new energy standards where we’re dealing with
new lighting standards. We’re dealing with daylighting requirements. We have daylighting in buildings. So these energy issues in lighting all impact all of this. So I mean, there’s a lot of changes going on in our standards to try to achieve these energy goals. And that relates to a number of issues involved in vision. I think it’s a good opportunity and an excellent time to do this conference.

Mariana Figueiro: I am a social professor at the Lighting Research Center. It’s a polytechnic institute. I do a lot of work with what we call visual. I’m part of the committee that Eunice and Jeanne head. I’ve also done some work with AARP Andrus Foundation on developing guidelines for lighting for the older adults, and we do a lot of human factors work at the Lighting Research Center. I’m also going to touch a little bit on the other area which I have been more involved in the past few years, which is what we call the non-visual effects. Really how light impacts our sleeping patterns. And even though I always say that research has to be predicting what’s going to happen in 10 or 20 years in practice, it’s probably something we should be thinking about knowing that light can also impact how – light during the day may impact how we sleep at night. So that’s also an area that we have been heavily involved. So I look forward to the workshop.

Kate Brennan: I work with Vijay Gupta.

Dr. Suleiman Alibhai: I’m an optometrist who specializes in working with people who are visually impaired. I’m known as a low-vision specialist along with my colleague, Dr. Dennis Siemsen. And I’ve been doing this work with visually impaired people for about 18 years now. And a lot of these issues that you all brought up are very pertinent to the work I do with patients. I am really looking forward to learning from all you, really, how I can better help my patients in all the questions they bring up, especially in terms of how can we make it easier in our homes, and the buildings we work and so on and so forth. So I think this is a wonderful opportunity, and I thank Vijay for inviting me, and I’m really looking forward to learning from all of you.

Dr. Dennis Siemsen: I’m an optometrist as well. I’m a low-vision specialist in clinic in Rochester, Minnesota. I’ve been doing this for 35 years. I got into it because when I was a student – an optometry student – our techniques were not nearly as good as they are today. Bob Massof has been around as long as I have, and, you know, we’ve certainly seen a lot of changes in the way we provide services for visually impaired people. My first task was a young man who was a bystander in a liquor-store robbery in Chicago. He’d gotten the shotgun blast on the side of the head, had no vision in one eye and a little bit in the other. Our task was to get him to be able to do some filing in a filing cabinet so he could get a job. We managed to do that with a very simple, little flip-in loop – Al Rosenbloom was my mentor on that one – and you know, here was this hardened kid from the inner city; when we could get him to do that, he cried and we cried, and then I got it. I understood why this was important. I’m pleased to say that our techniques have improved a lot over the years and the awareness about low vision has improved a lot over these last three to five years. But I think we still have a lot of room to grow. You know, when I tell people that I’m a low vision specialist, they have no idea what that means. They don’t know, does that mean blind? Does that mean I’m legally blind without my glasses? No, no, it’s not quite like that. I mean there’s really a big difference here. I think what you’re probably going to hear is a lot of different perspectives on vision impairment and what the potential impact is. And I hope what you’ll end up with at the end is that it’s really much more than all of that. So I think when Jim invited me, I said well, I don’t really know much about building design other than I hang around with an interior designer. But please feel free to use [our expertise] and references and resources; not just here at the meeting but if you have any questions or comments or how does this work or whatever, I mean, I kind of get it that we’re the people who are in the trenches in those exam rooms with the people who have vision loss. So no question is too dumb. If you have any questions about how this works or how you modify this or is this possible, please ask us. Eye disease – if you don’t know what that means, we’ll try and answer the question. You know, we’ve probably seen just about every kind of disease
processed over the years and how it affects vision. So we’re kind of your resource people here during the conference and please feel free to use us.

Erin Schambureck: I’m the interior designer Dennis is hanging around with: I’m his youngest daughter. I have a commercial interior design background and I’m currently an independent designer but if any of you former professors need to put in a plug, I’ve applied for MFA programs this fall. So feel free to [contact me]. Jim was kind enough to let me tag along as well and participate. I’m very excited to be here, sort of as a personal research project and learn more, kind of connect with what I’ve watched my dad do for the last how ever many years, but also from my standpoint as a potential student going back and becoming a researcher and a grad student looking at how we can disseminate this information that we’re going to be creating and continue to educate the rest of the design population. Not just the people that have really made a point of focusing their careers on that but that are in the trenches designing it – those architects and designers who don’t want to have sullied their beautiful creations by accommodating for a specific population group. How can we share that information and teach them how to use it effectively. So I’m excited to be here. Thank you.

John Brabyn: Hi. I’m from Smith-Kettlewell Eye Research Institute in San Francisco. We have about 20 or 25 people there altogether working on research projects on things to do with blindness and lower vision, including technology for blind people and that sort of thing. I’m really glad to be here. Thanks.

Robert Massof: I’m a professor in the Ophthalmology Department and Neuroscience Department at Johns Hopkins Medical School. Sorry Erin, I won’t be able to help you with the MFA but if you decide to emphasize the visual impairment side, we might be able to work something out. I also direct the Lions Vision Research and Rehabilitation Center of Johns Hopkins Wilmer Eye Institute. We do basic research on visual impairments as well as clinical research on visual impairments and we also have a low vision rehabilitation service that is provided to primarily ophthalmology patients: people coming right out of the doctors’ offices to play their first encounter with how to deal with the visual impairment they’ve just acquired. So you kind of think of this as the front line to the rehabilitation. I’m going to have more to say later, so I’ll stop talking now.

Patrick Fee: Hi, I’m the director of operations for GSA PBS. We have 1,517 owned facilities across the country and some 8,000 leased spaces that we operate. The accessibility program is a program that’s in my division. I’ve been working with Vijay for about the last seven years once I joined GSA. And a few months ago, he came to us and said I need your support and so we’re here to support. And that’s all I have.

Mary Ann Hay: Good morning. I’m with Syska Hennessy Light and Design in New York. I’ve been in the New York lighting design community since the early ‘80s so I’ve had the opportunity to see a lot of change over close to 30 years in the lighting industry. With this global drive to reduce energy consumption and sustainability, it’s really become a daily challenge to provide a quality illuminated environment for our clients: one that people are comfortable in; one that people can perform tasks in – and that’s even for people who don’t have vision impairment. So I think this is a great workshop and something that’s been really overlooked for a number of years and I think it’ll help us, even as lighting designers, give us further support for just why lighting is important in the interior environment and how to really make sure those quality issues are addressed and are maintained.

Frederick Krimgold: I’m from the Virginia Tech Advanced Research Institute and my background is in architecture. I’ve specialized particularly in disaster risk reduction mitigation, which involves a great deal of field work and reconnaissance. About eight years ago, I had experienced severe loss of vision and the diagnosis was that I had irreversible glaucoma and there was nothing to do about it. That was quite a dramatic situation because somehow, you’ve got to keep on making a living. And to my great surprise and benefit, I came across people at the low vision center, the Lions Low Vision Center at Johns Hopkins,
particularly Judy Goldstein who gave me a tremendous amount of help and showed me a wide range of tools. I have every one that’s been offered and have found that they help. No single tool solves the problem; but it is possible to keep on working and keep on maintaining activity. I’m very interested. My expertise is from the other side. That is, I know what it’s like not to see and I’m very interested to see this topic addressed. I’m tremendously appreciative that Vijay and the rest of the team here has seen fit to bring together this amazing group of experts.

**Tom Sachs:** I’m a principal with Oudens Knoop Knoop + Sachs Architects. I’m not an expert in vision of any sort, but I have been involved in design and advocacy for disabilities issues for about 25 years. I was introduced to disabilities when I got a project dumped in my lap called the National Rehabilitation Hospital, a new hospital here in Washington. So that was my introduction. Since then, I have chaired the D.C. Building Code Advisory Committee’s Committee on Design for Persons with Disabilities. So the first D.C. building code requirements for accessibility were developed under that and I’ve been a member of the Alexandria Commission on Persons with Disabilities for about 20 years now, working in that area. I do a lot of health care work, which almost by definition requires more accessibility than many other facilities. And I was lucky enough to be on Earle’s and Vijay’s and Stuart’s list of participants, so I’m looking forward to working with all of you and taking another step forward.

**Jim Woods:** I’m recently retired, quote retired. I haven’t retired from life yet. I want to bring a couple things to the table. One is, it’s in my current residency – we’ve recently moved to a continuous care retirement facility – and I think I’m the youngest person there. It’s absolutely amazing to see these people age. And what I’m learning in this particular case is how you can enable people. There’s a lot of vision issues. There are all kinds of issues. As people get older and we’re an independent living – you go to assisted living and you go to nursing care. And yet people are vital. They’re still vital in that regard. So that was one thing that is really exciting me about being able to deal with these issues right now. The other, I guess, is a background: I’ve been working with Vijay and with Earle for eight years on buildings now I think in some detail to look at how buildings are performing. When I go back to look at my academic background – I’ve been a professor at two universities; I’ve worked in industry – and I’ve seen the good and the bad and the ugly of buildings. My background is bioenvironmental engineering, so my master’s is physiology; my Ph.D. is in mechanical engineering. What I really look at is how the indoor environment affects human response. Lighting is a huge issue. The thing I want to bring across here: I’ve got some really good friends – David Munson was a mentor of mine in some of this regard. But, from the perspective of lighting and vision, this is how architects learn. Almost everything that they learn is by visual acquisition. Mind to hand type situation, but it’s all visual. And as we look at low vision, what happens? As we look at the other aspects of accessibility that architects are not going to perceive visually, how can we make that happen? I’m really looking forward to seeing what comes out of this expert panel.

**Gregory Knoop:** I’m with Oudens Knoop Knoop + Sachs. I’m a practitioner. I design federal buildings. I work on security, health-care projects and projects for long-term care. But I’m a practitioner. So in a way, this workshop is aimed at me. We’re all human here and we’re flawed. We have failing vision, failing body parts; but we also aren’t perfect in the way we do things. We’re learning. Part of the reason why we’re here is to try to develop an impetus to a better way of practice and develop better skills as practitioners, as contributors to our society to make better buildings that accommodate our people better. Now, it’s like everybody’s goal to live life fully in every moment. And to be denied that is, people are acutely aware of it when their eyesight fails, when the environment seems scary. So I’m here as an advocate, also as a son. My father has failing eyesight. In fact, my brother-in-law’s father also had failing eyesight as well. I’ve seen how difficult it is for them to get around, to negotiate a built environment. So it’s also my honor to be here as the advocate of a son for his father, as well as an advocate to the architectural profession.
Synopsis of Workshop Objectives

Gregory Knoop, AIA, Principal, Oudens Knoop Knoop + Sachs, Architects

Purpose of the Workshop

Well, we’re gathered here today in search of an architecture that reflects our society, and our society is inclusive. We’re the United States of America. We’re an inclusive society and we look to strive for an inclusive design (slides 1 and 2). You’ve certainly done that over the last several decades in improvements for persons with disabilities and persons who have difficulty getting around, but yet there’s more work to do.

We’re looking to help those people between the actual darkness and between the light. We’re looking to help the people who are in that transition perhaps or are suffering in their older age or just were born with less eyesight. And in fact, what we do here today could reflect on other issues such as hearing and other types of losses.

Create high-definition environments for people with visual impairment

So we look to put together some concepts for creating a more high-definition environment for people who are visually impaired so that they can experience buildings in a safer, sounder way, so that they can be included in our public buildings and in all buildings in fact. We negotiate and appreciate the world around us through our various senses. The natural and built environments we see with our sight, but we also hear, smell and sense them, feel them. So we look for all sorts of clues visual and non-visual, but it is the visual that we are most dependent on.

Differences in Perspectives between Designers/Photographers and Visually Impaired Occupants

Absence of visual clues

As that visual experience lessens, so does our ability to negotiate the world around us. And so, any lack of clarity in that environment, such as a stair here; a simple stair, which we think is quite elegant looking but here when it’s actually purposefully blurry – my father was very clever in putting that together – this is how he sees the stair (slide 3). Now as that stair becomes less elegant and more scary, it becomes less of a design feature and more of a safety hazard and yet the stair is supposed to egress us and take us to safety. So are we doing right? Have we done wrong? No, but we can do better. We can do better. People are not here just to do no wrong. We’re not here to point fingers; we’re here to point the way.

Buildings do not intrinsically accommodate Persons with Low Vision

This Workshop started as an idea when Vijay and other leaders amongst us, including my father, were gathered in a post-occupancy evaluation workshop looking at courts buildings a year after their construction. These buildings are large, very glamorous, done by our very best architects. These are well-published buildings by well-published architects and so they’re works of art in their own sense (slide 4).

At least two members of that team suffered from low vision and they experienced great discomfort traveling through these buildings at various points along the way and became acutely aware that there was a distinct flaw in the built environment that we are building as a society for our society. Our inclusive society, our government was unable to address this issue. Now, was that by fault? No, but I think we can do better and that’s what we’re here to learn to do better.
So we accommodate for people who are not sighted, but we’re not accommodating people who aren’t fully sighted. These buildings use all the latest technologies and maybe [the designers] get carried away with those technologies because they provide us with incredible opportunities but perhaps desensitize us from the opportunity to service the client, to service the need of our people.

**Accessibility is not a new Subject but Low Vision is not addressed**

Obviously, this is not a new subject (slide 5). In 1961, the American National Standards Institute published ANSI A117.1, making buildings accessible and useful for physically handicapped. In 1968, Congress passed the Architectural Barriers Act. In 1984, we had several federal agencies putting the UFAS standard together. And then of course, in the '90s, the ADA came into play and brought us standards which are incredible improvements, but again, possibly incomplete.

Comment by Tom Williams: Greg, I want to amend the 1984, our agency should be on that list and it’s not.

Response by Greg Knoop: Okay. I apologize. So GSA should be on there.

In 1995, the Rural National Institute for the Blind in the U.K. published *Building Sight: A Handbook of Building and Interior Design Solutions* to include the needs of visually impaired persons. The authors Peter Baker, Jon Barrick and Rod Wilson were not designers. One of them is a mechanical engineer. But the Building Sight was a guideline made by non-designers. It’s still just a guideline, not a standard. To our knowledge, no such standard or guideline exists in the United States.

Low vision affects about 10 million Americans who suffer from age-related macular degeneration, according to the AMD Institute. So we have a growing concern, a growing need to address a population. There’s a true demand.

**Glare and Low Contrast**

Many modern buildings are capable of doing incredible things. We have beautiful windowscapes that are incredible to us but here you’ll see the difference between how perhaps the designer or the photographer for the awards ceremony sees it and how a person with macular degeneration may experience that same space (slide 6). Our light, we use a lot of artificial lighting throughout our buildings. It’s of course a need and requirement, but often, as we experienced earlier today, could you please move that light? Sometimes, the answer is no, that’s a fixed light and you’re workstation’s stuck there (slide 7). It takes several months until actually you can get to a new workstation. These issues can create discomfort and yet we’re trying to provide light to provide comfort and use.

Many of our newer buildings and contemporary buildings try to do things with sleek, monochromatic interior design (slide 8). It looks cool, especially in some photographs in nice books, but often many people experience it this way and that is an environment that’s extremely difficult to negotiate.

Now, we have some experts here who are going to talk about the various pathologies that impair vision, but we’re here to also provide guidance for the built environment. So design for daylight and non-glare spaces that are not uncomfortable to be in, is that just an issue for people who have eyesight loss? It’s actually a universal issue. I think we all find comfort.

Have you ever walked down a stair and found that you’re seeing at the top of the fixture as you’re negotiating the stair and I have perfectly fine vision, although it’s beginning to fail a little bit as well. And I have to deal with the same issues, and light shining, glaring in your eyes. It’s location, location, location. It just was not located correctly and it creates a problem for us. Is that just a small issue for only a small population or is it an issue for all of us? And spaces like this: can all of us find our way around that? Do we know where the
elevator core is without some intense signage or are there architectural clues here to get us around? That’s a space where maybe all of us could be lost.

**Question by [Participant]:** Where’s that site?

**Response by [Participant]:** GSA’s architect.

**Response by Greg Knoop:** Office of the Chief Architect. Office of the GSA.

Actually, later in this conference, I’ll have one of my panels – I’ll show areas where we’ve made mistakes as well. So we’re all here to learn, see our mistakes and learn from them.

### Building Guidelines and Standards are needed for Accommodations of Low Vision Persons

#### Siting of Buildings

We’ll talk about a few issues that are important here to guide this workshop. Siting buildings – these are old principles. We site to improve and reduce glare but we also site to harvest and make best use of natural daylight (slide 9). We have urban design issues to deal with, but we can use tools in the building’s configuration, details and siting to take best advantage of solar orientation to make that building effective as a building as well as it’s beautiful in its architecture and construction.

So we look to control light. We look to integrate the indoor and outdoor spaces so that the pathways – and I think one of us, we were talking about this earlier – the pathways, as you come to an entrance, as you negotiate the site, aren’t weird or clever, but they’re actually somewhat obvious. The building should identify its entrance, should celebrate its entrance and should make the entrance and the experience and going to the entrance something that is celebrated.

#### Exterior Design (slide 10)

We need to develop transitional spaces that take us from the interior to exterior so that the eye can adjust as you go in and out of buildings so that you’re not going from complete brightness to complete darkness. Here’s an example where that’s nicely done and you can see that the light transitions across that space (slide 10). But stairs and ramps and all these things have to be negotiable. So we have to have attention to how they’re detailed, colored, textured and configured in a way that they are easily negotiated by all populations.

#### Interior Layout and Design

Interior layouts need to be logical. They shouldn’t be so clever that they’re hard to negotiate or find your way around. I think we were talking about that again earlier. You shouldn’t need to have – they need to be logically laid out buildings and then architecturally defined in ways that are elegant. In this case though (slides 11 and 12), we see some nice examples of transitions between the daylighting, the day-lit exterior into the interior through various architectural means. So there are some positives to see here.

Definition of doorways and escalators and stairways and elevators – these need to be things that are not lost in the blur of white or monochromatic architecture but are actually easily found and identified by all persons. This includes reception, windows, assembly and meeting rooms. All these things should be easily found by the person who negotiates these spaces.

Now, this may seem a silly thing to think about, but if you blurred your vision, you might wonder what you’re aiming at (slide 13). We must use electrical lighting. It’s a need, but we have tremendous tools available to us to control that light and control the quality, configuration (slide 14). We’re going to hear from experts throughout this workshop on just that subject and what the things we can do.
Interior design. Perhaps if we look at finishes: floors, ceilings, color, value, contrast, furniture and arrangement and configurations of spaces, we can actually read and understand some of these spaces. Here’s a central [corridor] space (slide 15) [in which] and you may see positives and negatives. Let’s look at what we’re doing in interior design finishes, colors and textures, reflection and we have tools now available to us to actually study those things. Revit [computer aided design] allows us to look at light interaction and surfaces in order to study and provide effective design for these spaces.

**Workshop Objectives**

So our purpose here today, our objective of this workshop (slide 16), is to begin the dialogues between the design, medical, and research professionals towards understanding the issues and developing guidelines towards design issues. It is also expected that more resources such as publications, research and individual expertise, may be identified or pursued for a later workshop and a continued pursuit to make sure that we’re taking effective directions.

From the results of this workshop, a plan of action will be proposed to develop the draft guidelines for GSA, for inclusion in your facilities standards for public buildings service and for the U.S. Accessibility Board and for the ADA accessibility guidelines. But also, we’re looking to be leaders here, to begin the process to inform the design industry about imperfect human practice. How we can move forward and actually include an inclusive population in what we see as design excellence? Really make design excellence go deeper than just what it looks like on photographs, but something that you experience and that all people can experience in our inclusive society.

**Research Issues**

**Cheri Wiggs, Ph.D., Program Officer, National Eye Institute, NIH**

Well, I do want to thank the sponsors here for inviting me to this program. I first said, well, I’m really hoping that I can just sit at the table and take notes because I feel like I have a lot to learn. Not as much to offer you all, especially in terms of the immediate goals at hand [and formation of} recommendations for new guidance on building design.

**NIH Interest**

But as I was thinking about this, it’s really nice to be up front at the beginning of this to let you all know that NIH is extremely interested in these types of collaborative efforts. So what I’m hoping is that I plant that seed in your heads and that as you have these discussions today, as insights come up, as you all talk with one another, that possibly this could evolve into future research projects that NIH could support and eventually, perhaps, that kind of research could then further refine the recommendations that you make actually after this workshop.

So what I’d like to do is plant that seed and then just go over a very brief overview of the NIH and the types of programs that exist at the NIH that could support that kind of research efforts. I knew that there would be a number of architects at the workshop here, so I did want to show at least one building at the NIH (slide 2). That’s where Francis Collins, the director of NIH; that’s where his office is. All I know is that my important paperwork always ends up at Building One.

**NIH Mission**

As you all probably know, much of the biomedical research in the United States is supported by the NIH. But what I wanted to do is sort of further drill down to what that mission is (slide
2). I think when people hear biomedical, they immediately think of the scientists in the wet labs curing cancer. But that’s actually, it’s defined pretty broadly in terms of getting fundamental knowledge about the nature and behavior of living systems and then applying that knowledge so that we can better the health of the public and importantly, to reduce the burdens of illness and disability. And so that’s actually a pretty broad swath and can include rehabilitative efforts, behavioral work, all sorts of discussions that I think we’ll have at this table.

NEI Mission

You’ll notice that the National Institutes of Health is a plural and indeed it’s a big plural. There are 27 centers and institutes that are housed under that NIH umbrella (slide 3). Twenty-four of these are funding agencies, each one with a different caliber of disease-related missions, one of which is the National Eye Institute. The NEI mission is to conduct and support research, training, health information dissemination, other programs with respect to blinding eye diseases, visual disorders, mechanisms of visual function, preservation of sight and special health problems and requirement of the blind (slide 4).

I wanted to read that because I wanted to make sure that every component actually was spelled out. The important thing, again, to keep in mind is this can range from very, very basic science up to translational and clinical and rehabilitative efforts. And I’ve underlined conduct and support research because that’s a nice reminder for me to tell you that actually defines the organization of NEI.

NEI Organization

The intramural program has actually a relatively small component of the budget that supports research at laboratories on NIH’s campus (slide 5). There are staff scientists that are actually doing research at NIH. But a larger part of the budget – over 80 percent of NEI’s budget – goes to the extramural program. And that’s NEI administering grants out there to the scientific community, funding research at universities or different institutions that are related to the NEI mission (slide 6).

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Now, I’m at the Division of Extramural Research. As I mentioned, I’m a Program Officer. One of my portfolios of grants is the low vision and blindness rehabilitation program (slide 7). There’s a relatively wide swath of the kinds of research that’s supported in this program: all the way from basic to translational and to technology and methods development.
What I’ve done here is taken parts of the strategic plan that are up on our website. But I wanted to highlight the issue pointed out at the bottom, which is that this program does support work that helps to develop a knowledge base of design requirements that might be necessary for individuals with visual impairment. And so, just optimizing navigation can be supported in this program.

In addition, I wanted to drill down a bit to some other program missions because I think that they apply to the group here. And one is that we do support research that helps to develop a knowledge base of design requirements for architectural structures (slide 8). And I know there’s actually quite a bit of work that’s been supported by NEI on understanding wayfinding in buildings, understanding wayfinding in open spaces and the challenges that people have low vision have in those situations. There’s also parts of the program that help to develop assisted devices that could be useful for people with low vision.

And the last point that I put on here is actually a reflection of how old the strategic plan is. It’s about four years old. We’re in the process of updating it now. But at that point, what we were talking about was supporting the development of infrastructure and programs for training people in the importance of multidisciplinary efforts that go into rehabilitation. And what I’d say is that this table is a great example of – it’s still important to train people in those efforts, but it looks like we’re actually getting to recognize that it has to be multidisciplinary and that people are already working in a more team-oriented fashion and the NIH is definitely supportive of that.

**Program Types**

So if you have these ideas, how you get them to the NIH to get funded, I’ve listed lots of NIH-ese on this slide – I apologize for all the gibberish with the combinations of letters and numbers (slide 9). But I’ve highlighted two research programs that I think would be most important for people to keep in mind and that are supported by the low vision program. And that’s the research project grants and the small business grants.

**Research Projects Grant Program**

The research projects grant program or the R01 that tends to be NIH’s bread and butter; these are investigator initiated projects that come to the NIH as a grant (slide 10). It’s the most commonly used grant program. It’s used to support a discrete research project that typically lasts between three and five years.

A new development – relatively new development – at NIH is that typically, you would have one principal investigator of this kind of a project. But now there are multi PI grants or multi principal investigator grants. Part of that really does reflect that the science has moved to be more integrated, to require different areas of expertise and to work in tandem with one another, really informing one another. So these multi PI grants really do reflect that we want to maximize what you can get out of team science and not just one individual’s input.

The R01 is pretty familiar, I know, with a number of the scientists on this panel. But the other area of the program that I did want to highlight because I think there’s a lot of potential for folks in the group here is the small business research program (slide 11). And NIH actually offers support for small businesses that want to develop high-risk technologies that have commercial promise.

**Small Business Grants**

The two main mechanisms that are used for that support are the small business innovation research grants, the SPIRs, and small business technology transfer, the STTRs (slide 12). Both of these mechanisms have similarities in that the main aim is to stimulate technological innovation and invigorate some private-sector commercialization of those health-related projects.
They run in three phases. The first phase is just establishing feasibility of the project. The second, to actually do research and development for the project. And the third, to actually get it out to market.

The main difference between these two is that with the STTR, the idea is to stimulate technology transfer, possibly from a research lab out into the market. So there’s a required collaboration between a small business and a non-profit, most typically a research university.

Summary

So the bottom line here is that I think there are a lot of research opportunities that could come out of the discussions that take place over the next two days (slide 13). This is really ripe for collaboration. Obviously, the organizers here realize that if you integrate different fields, we’re going to get more than the sum of the parts. We’re really going to have one field really helping to guide in one direction; the other field saying where it would work or where it won’t work.

But I think in addition, and from my own perspective, what’s exciting is that there’s an opportunity for each field to inform the other. So if I think about the different frameworks people have, the different ideas about the way the visual system works or the way buildings are designed, that after these discussions, it could actually – you may find yourself adjusting that framework. And you can only do that when you have people with different backgrounds talking to one another and poking where things don’t seem to make sense or where they do.

The other exciting opportunity, again, from NIH’s perspective, is the opportunity to evaluate new technologies and again their importance for individuals with low vision. We’ve seen lots of exciting use of leveraging these new technologies for use as a system [and] that’s all extremely exciting. I know engineering has been involved with some really, really important new developments.

But I think the flip side of that is that there are also a lot of new challenges for the low vision population with some of these new technologies. We’ve already heard a little bit about that. I expect to hear a lot more over the next two days.

And then I think all of this also – another message that can come out, is that it’s not just going to benefit individuals with low vision; but it could benefit the public at large. And we’ve already seen that in terms of discussions of principles of universal design and I look forward to hearing a bit more about that during the discussions.

I just want to leave you with a couple of places to go if you do think about submitting applications to the NIH. Going to the NEI website (slide 14) is a great resource for finding what kinds of research funding is supported by the NEI and research that’s going on at the NEI, just to get a sense of the kinds of publications coming out there.

But in terms of research funding, you may find program announcements that would be right up your alley and they’d be listed there (slide 15). And especially if you’re a new grantee. I recommend, when you go to the main NIH website, you will see, there are so many places you go, it could be incredibly overwhelming.

I find that the website for the office of extramural research is really, really helpful. It’s sort of one-stop shopping. It’s where you can go to download the electronic forms for submitting an application. But there’s also a lot of guidance for new grantees: what happens when your application comes into NIH. There’s been lots of changes to peer review there and those are all, pretty, I’d say it’s a pretty straightforward website. Most of them aren’t, but this one really is. I think you can navigate – (inaudible).

And most importantly, contact a program officer. When you have these ideas, when you’ve already discussed, you’ve got a sense and you want to know first off would NEI be interested on this project. Program officers are a great resource. I’ve listed my name associated with the research project grants because I’m the person who handles those and [related] portfolios
And my colleague, Jerry Wujek, is the one who handles the small business grants. The number, if you can [remember] that first area code and the 451, 2020 is pretty easy to remember, but we’re also available on the website. Send an e-mail or just call.

**Keynote Address: Definition of Low Vision and its Impact on Accessibility and Performance**

Robert Massof, Ph.D.: Professor, Lions Low Vision Research and Rehabilitation Center, Johns Hopkins School of Medicine

Henry Green: Our next presentation is by Professor Massof. But before he does, Vijay was nice enough to – Vijay, a number of years ago, was a great photographer. He went out and he really enjoyed photography and he’s got a number of photographs that he’s exhibited. And he gave us one out here during the Dogwood Festival in Washington, D.C. This is the Jefferson Memorial. We’ve got lots of them out there. So if you’d like them, just pick one up. And it’s kind of a little memento from the Workshop. So we appreciate it, Vijay.

**Introduction and Definition of Terms**

Thank you very much. Well, I want to thank Vijay for inviting me to participate – exciting and stimulating. I’ve been in the field long enough to have to explain what low vision is each time I get up and talk. It’s just great progress not to have to do that – to actually have a meeting organized for people outside the small circle of those that work on this problem all the time. To organize a meeting devoted to the subject says a lot about how important it’s become.

Vijay asked me to talk about – kind of introduce your client to you, to talk about the low-vision population, what the characteristics of low vision are, and how we define it. So that’s most of what I’m going to talk about. So my apologies to Dr. Alibhai, Dr. Siemsen and Dr. Brabyn who would probably do a better job giving this talk, but too bad.

**Low Vision and Blindness**

So let’s start with a definition of low vision. And I’ve heard a lot of definitions. Before I read what’s on the slide, low vision’s a medical term. And when ophthalmologists measure your vision, they measure visual acuity. And visual acuity is expressed as a ratio of 20/20, 20/200. So the larger the number in the denominator, the worse your vision is. And of course, the smaller the fraction – 20/20, is one; 20/200, point-one.

**Operational Definitions**

So if your vision is low, you have low vision acuity. So low vision is kind of a shorthand notation for low visual acuity. However, the use of the term “low vision” has gone well beyond just talking about visual acuity. In fact, it refers to any chronic visual impairments that cause functional limitations or disability (slide 3).

We say it’s chronic – by definition, it can’t be corrected with medical or surgical interventions. If you can take out the cataract, we don’t call it low vision; if we can give you glasses, we don’t call it low vision. We correct that. So low vision is after everything has been done that can be done and you’re still left with a bit of impairment that interferes with daily activities.

Visual impairment can refer to loss of visual acuity – I’ll explain what that is; loss of contrast sensitivity – I’ll explain what that is; loss of peripheral vision; blind spots and a number of other types of visual bursts, color vision deficiencies and so on, which – and usually, visual impairment is defined in terms of some type of clinical test that gives us a score that we can compare to norms and say whether or not there’s an impairment there. Some impairments
cause more problems with daily functioning than other types of impairments and we'll emphasize those that are most—have the biggest effect on daily functioning.

Functional limitations is a term that refers to an increased difficulty in being able to do certain functions that require vision. Reading is one of the functions we single out; mobility; visual motor activities—this is eye-hand coordination type things, using your hands under visual control; and interpreting visual information. You know, if you’re watching a reality TV show, in order to know what’s going on, you have to be able to interpret what you’re seeing. So an awful lot of what we do every day involves visual information processing and interpreting visual information.

So functional limitations usually imply that you have an increased difficulty doing it, but it’s not impossible to do. Whereas disability usually refers to the activities themselves that are impacted. So if you’re unable to perform your usual customary activities because of your visual impairment, we say you’re suffering a disability. And especially with the new [term]—International Classification Function, disability has come to be defined strictly in terms of activities. So the two more or less go hand in hand, but you’re not necessarily disabled if you have a functional limitation.

Official Definitions

Okay, the official definition of low vision usually goes hand-in-hand with blindness, and low vision and blindness are often in the same sentence. And there’s a kind of commonsense definition of blindness. We think we have no useful vision, that you can’t use your vision at all. But then the technical definition of blindness is usually defined in terms of some level of visual impairment and it’s usually even visual acuity or visual fields.

The World Health Organization defines blindness as corrected visual acuity (slide 4). By corrected I mean wearing your glasses, getting the best vision you can. The corrected visual acuity that’s less than or equal to 20/400 in your better-seeing eye—and I’ll explain what these numbers mean—or your maximum diameter of your visual field is under 10 degrees. Then you qualify for the term blindness, according to the World Health Organization criteria.

World Health Organization finds low vision and its corrected visual acuity that’s less than 20/60, but it’s greater than or equal to 20/200. So if you’re in that range, your vision’s impaired, but still is useful to you, then use the term “low vision”. And they also include a visual field definition that if the maximum diameter of the visual field is 10 degrees or greater, but less than 20 degrees, then you earn the term low vision from the World Health Organization.

In the United States, blindness is defined as part of the Social Security Act for purposes of defining disability for disability benefits (slide 5). And blindness is—it today is defined as corrected visual acuity in the better-seeing eye that is less than 20/100. It used to be less-than or equal to 20/200. The reason for the change is that we got new eye charts. The eye charts used to be 20/100, 20/200 was the next line. We got new eye charts and added a 20/160 line in between. Subsequently, we had a lot of people who could read 20/160; they lost their blindness-related benefits, because of 20/160.

So people like Dr. Siemsen and Dr. Alibhai had the old Snellen charts in the other room. And if you had to come in for a disability test, they’d take out the old Snellen chart and checked to see if—and finally, commonsense prevailed and said what you really mean is they can’t read the 20/100 line, they can read the 20/200. So the cut really is 20/100. So that’s the new definition of blindness for the disability insurance.

The maximum visual field [diameter of] less than 20 degrees. Remember, that’s the low-vision range for the World Health Organization; it’s blindness for the U.S.

Low vision is not a term that is used in that way; however, it is defined by Medicare. And to be eligible for payment for services that are provided for rehabilitation of your vision—receiving rehabilitation related to your visual impairment, Medicare defines low vision using
ICD-9-CM codes – these are diagnostic codes (slide 5). And mild low vision, which they don’t pay for, is in the range of less than 20/40, but greater-than or equal to 20/60. Moderate low vision – they’ll pay for that – is less than 20/60 and greater than 20/200 and/or if your visual acuity is better-than or equal to 20/60, you have blind spots in your central field that interfere with your functioning. So if you can document that, you’re still classified as moderate, even though your acuity might not reach those particular limits. And severe low vision is anything less-than or equal to 20/200 – same definition as legal blindness.

The ICD-9-CM codes go onto to break up severe low vision into severe, profound, near-total blindness, total blindness, but in Medicare’s, those don’t make a difference. And so we’ve tended to just stop at the severe to be all inclusive after that.

**Visual Acuity**

So what is visual acuity? When we’re defining low vision on a basis of [Snellen] test, what is it we’re talking about? Well, visual acuity is just a measure of the limit of your vision resolution (slide 7).

And this is what is called the ETDRS chart (slides 7 and 8). It’s a new design of the eye chart. And if you visit any low-vision clinic or you participate in any type NEI-funded clinical trial, you’re probably familiar with this chart. Okay, 20/20 visual acuity means that the smallest letter that a person can identify is five arc minutes – and I know there are [engineers] in this room, so you know what that means and I’ll explain for those who aren’t (slide 9).

Five arc minutes of visual angle and size and has a critical detail of one arc minute. Okay, if you drop a triangle from the eye to the letters – so the letters at the base of the triangle point to the triangle at the eye. That angle at the eye is what we’re talking about – the size of the angle.

There are 360 degrees in a circle; there are 60 minutes in a degree. So one minute is pretty small. If stars are separated by one minute apart, you can see them as two stars, if you have 20/20 vision acuity. So this is the definition of limited resolution. If they’re closer together than one minute apart, it looks like one star. They blur together.

Okay. The absolute limit to visual acuity, if the optics of the eye were perfect, would be about 20-over-eight. And that corresponds to the distance between pixels in your retina. Okay, these are the photoreceptors. They’re sort of like – think of those like pixels in your camera. We used to say [film] in your camera. But nobody knows what we’re talking about. So each photo receptor we thought of as a pixel. So the limited resolution induced by the pixelized nature of the retina is about – would give you about 20-over-eight, whereas 20/20 is a more practical definition of normal vision as the optics of our eye are anything but perfect (slide 9).

Now, conventionally, we specify visual acuity as the minimum angle of resolution, which abbreviated is M-A-R – MAR (slide 10). And it’s the ratio of the distance to the letters on the chart divided by the size of the letters. And when we’re talking about Snellen notation, which is the 20/20, it is the Snellen notation that dates back to the 1800s (slide 11). He was a Dutch ophthalmologist who invented the eye chart and visual acuity measurements.

The standardized distance is 20 feet. Those of you who develop offices know that nobody has a 20-foot exam room, but we still specify the distance, as if we’re testing at 20 feet. Sometimes people who are purists will use mirrors to optically get the 20 feet, but for the most part, 20 feet is just an idea. So you measure the distance.

Twenty, the bottom number, the other 20, that’s the size of the letter. And the size is specified also as a distance. And it’s the distance at which that letter [transcends] five minutes of arc. So if it’s a bigger letter, you have to put farther away in order for it to be five minutes. So 20/20 says you can resolve this 5-minute arc letter at 20 feet and the size of the letter is five minutes of arc at 20 feet. Twenty-two-hundred means the letter is five minutes of arc at 200 feet, which means it’s 10 times bigger (slide 12). So, if 20/20 the smallest detail you can resolve is one minute of arc, in 20/200 the smallest detail you could resolve is 10
minutes of arc, okay? One-sixth of a degree. That’s pretty good vision, but you’re legally blind if that’s the best you can do. There are a lot of animals that would die to have 20/200 vision.

Okay, and the reason we have some problem with a small amount of visual acuity loss – small, relatively speaking – is because our whole society is built around normal vision. Newspapers, magazines are printed with print size that’s only three times the resolution limit of the average person – 20/20. It’s the size of 20/60 so it can be read comfortably. For most people who would have 20/40 acuity, they would struggle with 20/60, because it’s like trying to read the – if you have 20/20 vision – trying to read the back of the [one dollar] bill because the print size is too small.

**Prevalence and Incidence of Low Vision and Blindness in the U.S.**

Okay, so how much is out there if we’re using these definitions of low vision? What’s the prevalence and incidence of low vision? Well, there have been a lot of numbers thrown around. I think it’s gone as high as about 20 million; it’s gone as low as 800,000, but it depends on what study you look at, how you go about counting it, how you define low vision.

There’s this Inhane Study which is done – you go around and ask people, basically, are you satisfied with your vision? And when you do that, you get a number that’s in the neighborhood of 17 or 18 million.

There have only been five studies published where they’ve actually gone out and measured people’s vision and then corrected their refractive errors and counted how many people in the community. One’s the Baltimore Eye Study; one’s the Beaver Dam Eye Study; one’s is the Framingham Eye Study; and the Salisbury Eye Evaluation Study and the Mud Creek Valley Study.

**Age-related Data**

I have a graph on this slide that shows the data from those five studies all plotted on the same graph (slide 14). And fit to the data is a curve that starts out kind of flat at ages around 55 to 60 and then accelerates and becomes very steep as you get passed age 75. And by the time you get to age 80, the prevalence rate is up about 10 percent. So saying that at around age 80, 10 percent of people will have visual acuity – in this case, worse than 20/70 in the better eye.

Okay, the Mud Creek Valley – all studies agree, except for the Mud Creek Valley study. The Mud Creek Valley study, the prevalence rates are much higher than the other studies. And the reason for that – Mud Creek Valley has, I think, one eye doctor for the entire county. And the cataract rate is at almost Third World levels in Mud Creek Valley, Kentucky. So that area was deliberately chosen to get some sense of what the prevalence of low vision and blindness were in different economic strata. Mud Creek Valley had the least amount of health care in all the areas we looked at so their numbers are bigger. So their numbers don’t fit the same curve. So if you’re trying to build a model based on a national average, the other studies would really give you a better picture.

But what this is saying is that the prevalence rate of low vision, as defined as 20/70 or worse for acuity and defining it the same way Medicare does, starts out around two-tenths of a percent of the population at age 55, accelerates to about 1 percent by the time you get to 70 and is up to 10 percent by the time you get to around 83 and it’s still going up.

So if you live long enough, you’ll get low vision and that’s one of the reasons why there is so much low vision today is that people are living longer, they’re outliving their eyes.

Now, the curve that fits the white population has a different shape from the curve that fits the black population. And the reason for that is the leading cause of low vision among Caucasians is age-related macular degeneration. The leading cause of low vision in the
African-American population is glaucoma. And so glaucoma occurs a little earlier in life and it is – has a shallower rise. It doesn’t climb quite as rapidly as macular degeneration does.

Okay. From those curves, we also can estimate the *incidents* of low vision. And what we find here is the curves basically have the same shape (slide 15). You just take the curve over an exponential [derivative] and it’s saying that our annual incidents – by the time you get up to around 75 – you’re running at about a half-a-percent a year. And by the time you get up to past 80, you’re all the way up to 3 percent a year. So these are new cases of low vision each year. The prevalence is basically what is the census of low vision at any other point in time.

**Projected Low Vision Prevalence over Time**

Okay. This is just another graph showing the number of new cases per year, converting that incidents rate into actual numbers of people in the U.S (slide 16). Basically, what it’s showing is it’s down quite low in the order of 10,000 per year in the 55 to 59 years, by the time you get up to 85, it’s about 100,000 per year. For all people over age 65, it’s running between 200,000 to 250,000 new cases of low vision per year. Now, this was based on 2000 census data.

If we project from the 2000 census data using rates so we know change in actual incidents of preference rate, [we] find the incidents of low vision climb from about 210,000 in 1995 to over 500,000 by 2025 (slide 17). That’s because of the aging in the world population.

**Question by [Participant]:** Bob, is that an accumulative number or is that number –

**Response by Bob Massof:** New cases per year. It’s going to be 500,000 new cases per year.

Okay. If you’ll notice the prevalence figure – that’s almost a straight line relationship (slide 17). The prevalence increases – the prevalence in 1995 – and again, that’s 20/70 or worse, the Medicare definition – the prevalence increases from about 1.35 million in 1995 and it’s expected to – it’s a straight-line – climb up to about 2.4 million in 2025.

So why is the incidents climbing up kind of a power curve, but the prevalence is on a straight line? It’s because the cases of new vision [loss] are almost exactly balanced by the number of deaths in those age groups. And so the death rate almost matches. In fact, the difference is about 38,000 cases per year. And so – the growth. So prevalence can be misleading. If we’re looking at prevalence numbers, we’re underestimating the magnitude of the problem of the age of the population. New cases are coming in at about the same rate as existing cases are dying.

So based on the estimates for 2010, which I can safely make before the census results are out, vision in the range of less than 20/40 to greater-than or equal-to 20/60 in the better eye with best correction has a prevalence in the neighborhood of 2.5 million (slide 18).

Mild low vision, using Medicare’s definition – less than 20/60, but greater than 20/200 in the better eye with best correction – has a prevalence of about 750,000. And severe low vision, which is legal blindness, has a prevalence of about 1.25 million.

In the severe low vision group, the legally blind group, only 10 percent of that group have no useful vision. The rest have some degree of low vision. So the number of people who are totally blind runs in the neighborhood of about 120,000. They all belong to either the NFB or the ACB.

**Comment by [Participant]:** No, they don’t.

So the number that probably you should work with in terms of right now is something that’s in the neighborhood of about 4.5 million. Those are the numbers we’re using for our planning in terms of needs for service provision.

**Question by [Participant]:** I thought on the NEI website there were 30 million.
Response by Bob Massof: That’s how many people read the NEI website.
Response by Cheri Wiggs: More, now that I’ve posted up there.

As I said, there are numbers from all over the place. And depending on which study you quote and who you’re trying to impress, the criterion for how you [define] low vision will vary.

This is defined technically and this is defined for the purpose of who reads these technical definitions of low vision, not are you dissatisfied with your vision? And not that I’ve got visual impairment in one eye, but not the other eye. Macular degeneration doesn’t affect the two eyes equally. And so you could have 20/20 vision in one eye and 20/200 in the other eye. That person does not have low vision.

Comment by [Participant]: But that’s a matter of analysis. That’s a composite of all the studies.

Response by Bob Massof: Yeah.

Characteristics of Low Vision Patients

Okay. So what are the characteristics of this low-vision population?

In order to find this out, we had a network put together, a collaborative network of low-vision centers throughout the country (slide 20). There are 28 of these centers or 30 of these centers that are pooling from the patients they’ve seen. And about 60 percent of the centers are associated with academic medical centers. The other 40 percent are parts of group practices or private practices. So all of these low-vision specialists are combining their data together into a single database and this is an ongoing project. So what I’m giving you is a snapshot based on close to 1,000 patients that have been selected by this network. And it’s just sequential – it’s a series of patients.

So there’s obviously a selection bias, because obviously, patients have to be willing to join. So it shouldn’t be treated as an epidemiological study, but this will give you a good picture of the kinds of people who are seeking services in low-vision clinics.

Age and Gender

Okay. With all due respect to the youngsters in this room who have low vision, most people with low vision are old. The median age is 75 [- 76] years (slides 21 and 22). So half the people with low vision are older than that.

And here is the – this is just a histogram showing the distribution of number of patients in the sample who – by age who are presenting to these low-vision clinics (slide 22). And it’s heavily skewed to the older age – it’s a long tail that goes off to age 18 being the lowest age, and the median, as mentioned, being 76. The mean is 72 – standard deviation is about 16.

So for the most part, 80 percent of the people with low vision who are visiting low-vision clinics – and it agrees with the epidemiologic studies as well – are over age 65.

Most people with low vision are women – two-thirds of them are women (slides 23 and 24). Why? Women live longer. See what you have to look forward to, ladies?

Okay. The age distribution of low vision among women is very similar to the age distribution among men – except there are just more women out there. The percentages – the distribution percentages are the same.

Visual System Disorders

Most people who have low vision have a central vision loss (slide 25). And this is a pie chart showing the various diagnoses of patients who come into these clinics seeking low-vision services (slide 26).
**Macular Disease**

More than half – the ones that have some shade of yellow – are due to a macular disease. That's a disease of your central vision, which is your acuity. Around 10 percent have glaucoma coming in seeking services. Diabetic retinopathy, which represents somewhere in the neighborhood of around 10-12 percent of the retinal vascular diseases is included in here. And stroke is about 2 percent. So by far, most of the people who are seeking services have some type of macular disease. The dry form of macular degeneration is most common, followed by the wet form – inherited forms.

**Reduced Visual Acuity**

The major causes of functional limitations from low vision or reduce visual acuity (slide 27). And looking at the distributions of acuity in the sample (slide 28), about 35 percent of the people who present to a low-vision clinic have acuity in the range of 20/20 to 20/60. So these people feel their vision’s bad enough that they’re seeking services. Close to 40 percent are in the range of 20/60 to 20/200. About 20 percent are 20/200 to 20/500 and about 6 percent are worse than that. Somewhere in the neighbor of about 26 percent are legally blind.

But if you ask these people how's your vision rate on a scale of zero being poor to four being excellent, the average rating is between poor and fair – no matter what your visual acuity when you come in (slide 29). And you'll notice even those with the range of 20/20 to 20/60 are included. To be fair, some of these people have glaucoma. Glaucoma can shrink your visual fields way down and not necessarily have to do with central vision. A lot of these people also have dry forms of macular degeneration, which can produce what's called foveal sparing. The center can still read the eye chart, but it's like looking through a keyhole. And surrounding that would be a blind area so that they could still have very poor vision, even though they might be able to read quite far down on the eye chart.

*Response by Bob Massof:* I'm sure that they're not coming in for refract records. So these are people who have best-corrected visual acuity on presentation. I should say they're wearing their individual correction. If they needed correction, they don't get into the database. Now, if they get corrected and back to normal, they're happy. You've cured their low vision. Same with [those who] come in with a cataract and you say, you came into the wrong department. You have to go over here and get the cataract done. They don't come back. They not in these databases. So these are people (slide 29) who stayed in the database.

Visual acuity is a measure of blur. My daughter's gotten over it, but I haven't. And that the – now, I'm just simulating 20/200 visual acuity (slide 30). So if the only thing that was occurring was blur, the picture on the left would [represent] 20/20, the picture on the right is what 20/200 would look like. That's the difference. And you can overcome that blur with magnification (slide 31). And that's the main trick that's used in a low vision clinic: to provide people with telescopes and magnifiers to compensate for the loss of acuity. You can read the bigger letters on the charts and make everything bigger and you can make the compensation.

**Reduced Contrast Sensitivity**

But the other major cause of functional limitations is reduction in contrast sensitivity (slide 32). We don't hear about that as much. And information in the image is defined by contrast (slide 33). Whereas, if visual acuity is lost, it looks blurred. When contrast sensitivity is lost, it goes away. You don't see at all.

And when patients experience the loss of contrast sensitivity, the way they will describe it is glare. Okay, and here's a simulation of what it looks if you lose contrast sensitivity (slide 34). The only difference between these two images – well, the two differences – one is this is
blurred to 20/200, the same as the other one was. But in addition, the contrast of the image is uniformly reduced, as if you lost contrast sensitivity by about – I guess it would be on the order of about 28 log units.

The way contrast sensitivity is measured is with an eye chart, but the letters are all the same size. It’s called the Pelli-Robson Chart (slide 35). All the letters, which are set up between the viewing distance and the size of the letter, are the equivalent of about 20/400 or 20/800 letters, they try to make them as big as possible. But what varies as you move around the chart is the contrast of the letters.

If you have perfectly normal contrast sensitivity, you should have no trouble reading the letters right here [pointing to bottom of chart]. What you do is just see how far down the track you can read. And each contrast varies in a tenth of a log for each triplet of letters (slides 36 - 42). So you specify contrast sensitivity really as a ratio of the light-to-dark. If the letter’s absolutely black, there’s no light coming off of it, the contrast will be 100 percent, no matter what the background is, as long as it’s not black too.

Contrast is not the same thing as brightness. You can’t improve contrast simply by turning up the intensity of the light. It’s the ratio of the light to the dark. If you turn up the intensity of the room lights, you’re going to reflect the same ratio from the two things. What improves as you turn up the light is your sensitivity to contrast. At low light levels, contrast sensitivity is worse for everybody, whether you have low vision or not; at higher light levels, your contrast sensitivity is better. There are many ways to specify that ratio (slide 43). We won’t go into it. It’s just a light-to-dark ratio which formally you want to use. And it’s important to remember that it’s – those of you who are illuminating engineers – reflectance determines the contrast not the overhead light.

Contrast Correlates to Visual Acuity

In this population [i.e., patients], contrast correlates with visual acuity. If you lose your central vision and you’re forced to use your peripheral vision to do everything you used to do with your central vision – everybody’s contrast sensitivity is worse in the periphery than it is in the center; everybody’s visual acuity is worse in the periphery than it is in the center, so the two tend to go down together more or less (slide 44). But there are people who can lose more contrast sensitivity way out of proportion to the visual acuity loss and vice versa. So even though they correlate, they do have independent effects. I’ll show you those.

Interpreting the Interactions

Now, if we ask: What is the actual distribution of contrast sensitivity in people who have visual acuity loss? Here you can see a normal contrast sensitivity is about 1.3. That’s the lower limit of normal. You get above 1.3, we won’t get too concerned about, but below 1.3 or lower. People in the 20/20, 20/60 range, the average contrast sensitivity is in the range of 1.2 and you can see contrast sensitivity just declines with each of the acuity tabs (slide 45). That’s just a restatement of what we saw before.

However, within these groups, there is a distribution (slide 46). There are people who have in this range – 20/20 and 20/60 – that have contrast sensitivity that is in the pits. They can’t see anything; everything is just totally washed out, even though they have relatively good acuity. And acuity, by the way, is measured with the highest possible contrast you can get. On the visual acuity chart are close to 100 percent contrast. And you can see there are a lot of people – about 40 percent of the people in the range between 20/20 and 20/60 have contrast sensitivity that would be considered moderately impaired.

Those of you who do illumination engineering probably know that as you go to higher spatial frequencies in the images, contrast falls. People who do remote sensing and that type of thing tell us that there’s almost a linear relationship between the contrast in terms of power versus the spatial frequency level. So the more detail there is, the bark on the tree will show
more contrast than the tree; what gets lost is the detailed information, the pattern, the herringbone. The things that you designers are paid so much to put into the environment – they can’t see it, so you’re wasting somebody’s money.

And again, if you ask about contrast sensitivity – whether the contrast sensitivity tests out to be in the normal range, or they all say of course, they all came to a low vision clinic, so we kind of expect them to (slide 47). But then there are – it’s kind of a combination of an appearance.

The third thing that occurs is glare (slide 48). And what we find – and most of the glare [does not] come from eye disease in the retina, [but from] the cataract that didn’t get taken out, because if you have low vision, finding a cataract surgeon to take out that cataract can be pretty difficult, because they’ve been burned a few times where they’ve taken out the cataract and the vision hasn’t changed, because the person had a macular degeneration or something and they’re very unhappy. So you become a poor candidate [for cataract surgery], in technical terms, if you have low vision. And so a lot of the glare is coming from the cataract.

Effects of Lighting and Daylighting on Performance

Most patients self-report their vision quality is quite poor – in poor ranges, over 90 percent (slide 49). And important to you is when we ask them, what kind of affect does lighting have on your performance activities? Close to 70 percent say it has a major effect. Lighting is one of the biggest problems. Over 20 percent say moderate effect and only 11 percent say it has no effect. So lighting is a very important consideration.

**Question by [Participant]:** Day lighting?

**Response by Bob Massof:** Yeah, daylight – both too much and too little. Too much light and they tend to wash out from this glare. Too little light their sensitivity is reduced and what might look like mood lighting to the average person can be a funhouse.

Other Health Problems with Low Vision Patients

Okay, the other thing to keep in mind is these people are old and they have other health problems. More than half or two-thirds will report they’re in good to excellent health when they come to the clinic (slide 51). Of course, we don’t see the ones that can’t get to the clinic to go to get help, so there is a bit of a sample bias here – and that’s true for all ages.

Frequency Distribution of Health Problems

But when you ask them about their health, they have all the same diseases that anybody in that age group would have (slide 52). They report diabetes, heart problems, heart attacks, high blood pressure, neurological problems. Back pain is a real common one. Thirty-percent said they have back pain.

These co-morbidities that you have to consider [as part of] the overall health burden that this population has. And you’re adding a visual impairment on top of all the bricks they’re carrying. So the effects of visual impairment in this population can be magnified compared to the effects in a younger population. A lot of times compensation is more difficult, because of the other things they’re dealing with.

Cognition and Emotional States

I think given the time limit, you can scroll ahead, because I want to make a particular point about – let me just say one thing is that depression is also a problem with this group (slide 53). Thirty percent of people with low vision have clinically significant depression and they become isolated and don’t go out. A lot of this is related to fear of falling (slide 55), not getting outside the home. Life space shrinks down to very few social interactions.
Falls and Injuries

So talking about falls: Just in general, if you look at the epidemiology literature, there was actually a Safety and Seniors Act that was passed in 2007 or 2008. It was called the Act of 2007 of Putting Emphasis on Preventing Falls and Injuries in the Older Population. But a third of the people who reach 65 have fallen at least once in the preceding year (slide 64). About a third of the people over 65 have a strong fear of falling and that limits their activities. And this prevalence of both falls and fear of falling increases with age.

Well, in terms of hip fractures, 90 percent of the hip fractures occur in this population because of falls (slide 65). Visual acuity loss turns out to be a major independent risk factor for hip fractures. I'll give you those numbers in a minute. Relative to people who have 20/20 visual acuity – if you test for all the other variables – hip fractures double in the acuity range of 20/30 to 20/40. They triple in the range of 20/50 to 20/70. We're not even up to Medicare paying for it. And then once you get up into Medicare's definition of low vision, it quadruples. So you have four times the risk of hip fracture if you have low vision by Medicare definition than you if you don't – all else being equal.

Accidents are the leading cause of death in seniors; falls account for about 50 percent of accident of deaths, car accidents account for the other 50 percent (slide 66). The death rate from all causes increases 20 percent for people who are 20/25 relative to 20/20 (slides 67 and 68). It goes up to 25 percent more for people who are 20/32 – it's just a small change, one line. And less than 20/30 – that's not even into what we conventionally considered a low vision category – 20/40s kind of important. They take your driver's license – put restrictions on your driver's license. The death rate is 60 percent higher. So the 30 million figure might not be too far off if we're thinking in terms of the impact it could have on safety.

So probably the reason for this is that as you age, you get nerve degeneration occurring in the vestibular apparatus. That's the inner ear that controls your balance (slide 71). And you also get nerve degeneration occurring in the stretch receptors and appropriate receptive feedback that you're getting from your muscles and joints (slide 70). And making your balance – three systems are involved: your vestibular system, which senses accelerations; your receptive feedback from your muscles and joints and your vision (slide 69). These are called flow fields that tell you that you're moving relative to your environment. If you have two of those three systems intact, you can control your balance. If you drink a lot, that screws up the vestibular system, okay? But it also, in doing that – because of dehydration – it also induces what we call vestibular-ocular reflex that, for kind of a nice name, we call it getting dizzy. And balance tests tend to be good diagnoses that you are having too much to drink.

If you lose two of these systems, you cannot maintain your balance. If we have just neuro-degeneration going on, we're probably increasing the load on vision to maintain balance as we grow older. Added to that, neural-degenerative diseases like peripheral artery disease and things like that in this composite, and so [there is] more reliance on vision. And even so, small changes in vision seem to have a big impact on both.

Mobility

So we can get more or less back on schedule, I'll not go through the details of these other slides, except to show you that for all functions, they decrease pretty systematically with visual acuity and with contrast sensitivity (slides 72 – 77). But notice that mobility is very poor to begin with. Normal here would be about five. So even for people with very good contrast sensitivity and going back even for people with very good visual acuity, mobility is the worst affected and it stays bad. And as the vision gets worse, the other functions come down, but mobility gets clobbered early and stays clobbered. And blind spots do the same kind of thing. Mobility gets clobbered early and stays clobbered. These are all independent effects.

So the focus really has to be – the biggest bang really has to be on mobility (slide 78). And what can be done – I've already heard people talk about; I don't think I'm going to tell you
anything new – but increase contrast. Glass doors are not good for people who have visual impairments; reduce camouflaging clutter. Increase the light, but not too much; you want to reduce glare. What that means is get the light sources out of the line of sight, okay?

Increase safety is a big part and we saw pictures of stairs and other things. And the emphasis here really has to be on steps, stairs and drop-offs. That’s where the falls occur, either on the top of the steps or the bottom of the steps or off a curb. And the changes in surface elevation – ramps on sidewalks – these types of things. Even on a small ramp to go up to change a level can be a deadly hazard for someone who can’t see that transition. And transitions from surface texture – going from carpet to tile – can be a tripping hazard. To people who can’t see that texture change, that could increase the risk.

Discussion

**Question by [Participant]:** The concept of glaucoma affects glare. Is that correct? Is that because it diffuses the light in the fluid of the eye?

**Response by Bob Massof:** No. Two things seem to affect glare. One – and you guys will correct me – one is optical. So if a glare source is off axis for anybody – it doesn’t have to be somebody with low vision – it’s called *disability glare*. That’s just scattered light inside your eye. Okay, the light hits the back of the eye and bounces around inside the eye and it causes what’s called *veiling luminance* and that washes out the contrast of the image. Okay, so that’s a form of *disability glare*.

For anyone who has something wrong with the optics, whether you have dirty glasses or your tear film is too full of mucus, or there’s something that is having optical affects, that scatter gets even greater. If you have a cataract, especially nuclear sclerosis, you get even more scatter. So those types of things just wipe out the contrast. It will wash things out just from having that glare source there. That’s from having just a bright light that’s in the line of sight – even if you’re not looking right at it, it’s off to the side – if it’s visible, the light is getting in through the pupil and it’s going to have an effect.

Now, people with glaucoma do get cataracts. But also, there’s some neural adjustment that occurs – being able to compensate for the scattered light neurally in the retina. Glaucoma is one of the conditions that can [cause patients to] become more sensitive to glare, as well as macular degeneration.

**Question from Fred Krimgold:** I noticed that the tests you referred to are all static. And one thing that I was concerned about is that vision in a dynamic situation, like traffic or mobility, is very different from simply accumulating cues and being able to read a chart. Are there measures that give you a sense of that dynamic function in vision?

**Response by Bob Massof:** Well, there are measures. Certainly, a number of measures that are used in research studies, used in a laboratory to study the dynamics of vision. There are not very many clinical measures. But in many cases, you’re really not trying to answer that question. It’s more you’re trying to deal with identifying the stage of the disease or the impact of the disease on the vision. So these are used as indicators of where –

**Comment by Fred Krimgold:** Well, the particular case is that the driving test is a static test. Driving is not static. And also, as you mentioned, mobility. When we look at wayfinding and other situations in which low-vision people find themselves, they’re adequacy or their functionality is dependent on being able to function in a dynamic situation, which is quite different from the measured static situation.

**Response by Bob Massof:** Right.

**Comment by Vijay Gupta:** Over the years when I [have had] – according to what I heard – my low vision for 30 years. And I’ve been through John Hopkins, through NIH and
many other places, but what I've found [is] a big disconnect between the medical profession and the design community of buildings. That's the basic comment that I have, because I will get into more a little bit later.

**Process for Developing Standards for the U.S. Access Board**

**Marsha Mazz, Director, Office of Technical and Information Services, U.S. Access Board**

**Introduction**

I'm really pleased to be here. And I want to thank Vijay for being the instigator for this project.

Just a little bit about myself: I am director of the Office of Technical and Information Services with the U.S. Access Board. I am a person who is legally blind and I'm in the 2 percentile, for whatever that's worth on that pie chart. And, just for the record, I want everyone here to understand that I do not have an age-related [disability]. I've been visually impaired pretty much since birth. Consequently, I think that perhaps I pass a little better than folks who acquire a vision impairment later.

I'm going to ask everyone a favor: When you speak, if you would identify yourself, that would make it easier for me to know who's talking. Don't assume I can see your nametag. You don't want me looking at your chest to find out who you are. I'm famous for having introduced myself, of course, to my own father. I recognize people during a meeting over time, because I remember what they're wearing. Tom's got yellow on today; I know that. So I won't lose Tom unless somebody loses him.

I want to talk about the Access Board, what our responsibilities are, what – how we do rulemaking. And so this is a real change of pace for this group, but Vijay made it clear from the get go that his goal was to have some enforceable standards. And to the extent that everybody here is going to support that goal, I think you need to know what you're up against.

**Background of U.S. Access Board**

The U.S. Access Board is a federal agency (slide 2). Our real name is the U.S. Architectural and Transportation Barriers Complaints Board. We have more letters in our name than we have employees. We have about 27 staff; we have board members who are either very high level federal agency personnel and their liaison staff, such as Susan and Tom; or we have individuals who are appointed by the president to serve on the board. Half of our board members from the private sector must be people with various disabilities or parents of individuals with disabilities in some cases.

Our office is divided into three units: the Executive Office, which is sort of self-explanatory; Gen. Counsel Office, which again, is self-explanation; and Technical and Information Services. And Technical and Information Services, which is my unit, is the unit that conducts our rulemaking and also conducts our very miniscule research arm, as well as provides all the technical assistance and all the training related to our work.

And you can see Access Board programs, which I've listed here (slide 3). This is essentially what we're authorized to do under various laws. The Architectural Barriers Act was actually passed in 1968. That gives you a clue as to how old Tom is. [The ABA] has applied to federal facilities.
Architectural Barriers Act (ABA) and the Americans with Disabilities Act (ADA)

The Architectural Barriers Act requires federal buildings to comply with accessibility standards. The U.S. Access Board, my agency and their Office of Gen. Counsel, enforces the [ABA], which functions like a building code. We will not enforce new standards on any existing building, unless that existing building is altered or added to. Our other authorities are under the Americans with Disabilities Act of 1990 are our architectural piece – our guidelines under the ADA – are a very small piece of the ADA.

The ADA, of course, applies to everybody that the ABA doesn’t apply to. And in fact, there can be some overlap, because the Barriers Act will reach into the private sector where federal construction dollars are used. As an example, almost all the stimulus work that’s being done is covered by the Architectural Barriers Act.

So many people really don’t really realize [how] much housing is also covered by the Architectural Barriers Act. There are a number of HUD programs that trigger not only HUD’s agency regulations, but also trigger Architectural Barriers Act requirements.

Under the ADA, there are a number of requirements to remediate existing buildings, both with and panel 2 and panel 3 of the ADA, that does -- are unique to the ADA. So as we publish guidelines, and our guidelines become ADA standards, there’s always the potential for those guidelines or standards to be applied to the private sector and state-and-local-government sector in a retroactive way.

We’re also responsible – and I have to look here, under the rehabilitation act -- for promulgating standards that cover the accessibility of electronic and information technology, as well as telecommunications. As I said earlier, we do technical assistance and training on all these regulations. We have a very small research program. And it’s fair to say that our research coordinator’s primary job is to convince other federal agencies to do work that we would like to see done, which is why, you know, I was able to con my friend, Vijay, into funding this meeting.

ABA Enforcement

So what we do, in terms of ABA, and of course with barriers act enforcement, is essentially done by complaint (slide 4). If we receive a complaint in our office, we notify the federal agency that is the funding agency, and we work with that agency to resolve the complaint. There really isn’t a lot of interaction between the complainant and the federal agency because we protect the identity of the complainant, and that is because, under the ABA, this is a fact-based investigation: Does the building comply with the enforceable standards or does it not?

The fact that someone brought that complaint is irrelevant, because we don’t – that person doesn’t need to really have standing under the law to bring that complaint. So it’s, again, a very fact-based investigation. Often we find that we do not have jurisdiction because the building predates even the architectural barriers act, and the element that the person has complained about has not been, in any way, altered since prior to 1968 or prior to the effective standards.

Rulemaking Authority

I want to talk about our rulemaking authority. Again, what we’re concerned here primarily is new construction and alterations. And I’m not accustomed to having to look at the screen, by the way. I usually sit my computer right in front of me, so bear with me as I check that out. Our guidelines are not enforceable until they are adopted by a standard-setting agency under the architectural barriers act or under the Americans with Disabilities Act. GSA is a standard-setting agency, and, quite frankly, GSA sets the standard for almost all federal construction.
They're going to set the standard for everything but military installations, housing and postal service – and post offices. So GSA is really your go-to agency on this.

Under the ADA and the ABA, our guidelines, as I said earlier, extend only to the built environment. We do not generally regulate things that get put into the environment that are not attached in some way to the building – so we're not going to regulate this furniture (slide 6). But under the Americans With Disabilities Act and under other federal civil rights regulations, a federal entity may use our guidelines to benchmark accessibility, particularly where there is an individual complaint – someone with, who uses a wheelchair and says I can't get up onto this table. They're going to look at the knee and toe clearances that our guidelines establish in order to determine whether or not the table is generally useable to individuals who use wheelchairs.

Let's see, I think it's important just to mention the technology side of our office, because I think that, as time goes on, all of this is converging (slides 7 and 8). The built environment, technology, how we communicate, particularly within a building – a lot of this is sort of becoming one thing. So our technology guidelines, our technology standards, our information communication technology standards apply at this moment only to technology that is procured by the federal government itself.

Naturally, that was a really brilliant thing for Congress to do, because essentially what the federal government is saying is, we're willing to buy it; you produce it. And, as a matter of fact, if there's an accessible piece of technology out there, we are going to say that we have to buy the accessible piece of technology and not the inaccessible piece of technology. So the federal government is saying not only are they demanding accessibility to technology procured by the government, but "we're willing to pay for it."

By and large, we produce guidelines except under the section 508 regulations, in which case we produce standards, which are endorsed by the FCC. The difference being that our guidelines have to be adopted by other agencies before they are enforceable.

**Rulemaking Process**

Our rulemaking process is like every other federal agency's rulemaking process (slides 9 – 11). There are certain mandatory steps that we absolutely have to follow. So we can't walk away today from this meeting and say, oh yes, we're going to go out and write standards. Oh wait, we're going to have to have an awful lot of evidence in order to write those standards or guidelines for the built environment.

The first step in federal rulemaking is always, at a minimum, a notice of proposed rulemaking in the Federal Register. So we publish that notice of proposed rulemaking in the Federal Register. It's open for public comment. Anybody and everybody is allowed to comment on the substance of that rule, though we have to analyze those comments and ultimately issue a final rule in, again, in the Federal Register.

Now, the access board, and every other federal agency, must perform a regulatory assessment every time we do a proposed rule. To be quite honest, regulatory assessments are becoming much more difficult than they were in the past. For those of you who work with codes and standards, you will know that if you want to put in a proposal to the International Code Council to require a certain amount of lighting over stairs, or whatever, all you have to do is check a box that says, “This proposal will or will not increase the cost of construction.” That's all you have to do. And it doesn't matter whether you say it will increase the cost of construction because there's not – nobody ever asks you by how much.

In the government, we have the Office of Management and Budget, and they will always ask us, how much is this going to cost? And then they want to know the benefits. The benefits of accessibility very often are completely unquantifiable. This is where we really need the research support to say that, well, if we control lighting in this way, x-percentage of the population with low vision will have improved mobility by this much. Now, you know, that
seems almost impossible. But I think that with the talent around this table, we can begin to frame research projects that will, in fact, support rulemaking in this area. It will be a long, hard row to hoe. It’s not going to be easy. And, again Office of Management and Budget, they strain at gnats. So we have to have very strong evidence in order, anymore, to issue any kind of rules under either the architectural barriers act or the Americans With Disabilities Act.

One of the things that the access board routinely does, in order to allay OMB’s fears of overregulation, is we involve stakeholders at a very early point in our rulemaking. Very often, we convene federal advisory committees – those federal advisory committees where a representative of the stakeholders who are affected, or potentially affected by the rulemaking – and we’ve done that in almost every rulemaking that we’ve been involved in, in the last 30 years (slide 12). That builds support for the rule. It helps us to reach out to individuals and organizations that can provide greater evidence for the necessity of the rule. And you’re going to hear that theme from me over and over and over again. And it’s not because – I myself am [not one] of those bean counters but I have to respond to them. I have to answer to them. I can’t just go to the Office of Management and Budget and say, these are good works. Please bless them. That won’t wash.

We’ve also done regulatory negotiations. And regulatory negotiations differ from advisory committees in that, when the agency becomes a party to the negotiation, the agency sits down and actually takes positions on the recommendations that come from the advisory committee, and then the agency is pretty much bound to publish the advisory committee’s deliberations as its notice of proposed rulemaking. We tend not to do those anymore, and that’s because, quite frankly, the advisers that we get on advisory committees are content experts, but they’re not good rule-writers. And so very often they deliver us a product that has to be pretty substantially changed, at least in its format, in order to be an acceptable guideline or standard that would be enforceable and unambiguous in the real world.

So again, we see this effort here as sort of the very beginning. We’re hoping that in the future we can proceed to a rulemaking, but we are going to need – this is just a shot of our advisory committee – we’re going to, we’re going to, we’re going to need to be prepared to move forward when we take that first step. And this is just a list of all our previous rulemakings going back to the ’90s or so (slide 13). Actually, we did rulemaking prior to that, but these are the ones that are most recent, and you’ll be familiar with them, including the ADA accessibility guidelines and all the supplements to the ADA accessibility guidelines. You can see from this list that we cover everything, from playgrounds, to courtrooms, to boat and ferry docks. Our guidelines are very, very broad reaching and they will – they really do cover everything, not just office buildings.

We also cover transportation vehicles (slide 14). Actually, lighting has become an issue in the promulgation of our vehicles rules, because often there’s not sufficient light at the boarding point, where people step up onto a bus in order for them to negotiate that step. I’ll tell a funny story myself. For those of you who are from the D.C. area, you know that all our buses used to have three steps up, and they were the big, tall buses. And then we went and acquired these low-floor buses. Well, the first time I encountered one of those low-floor buses, I took a step, preparing for the big step onto – the three steps up. I just assumed those three steps were there. And so here’s this wonderful, accessible, very easy to use low-floor bus, and I went to step into it and fell flat on my face. It was – I learned very quickly – by experience. So these are some of the barriers that we all encounter every day.

The update of the ADA and ABA accessibility guidelines was – the project that Tom referred to as endless, and it did take 10 years – but in our defense, we convened a federal advisory committee; they worked for two years. We then decided to combine our guidelines under the architectural barriers act with our guidelines under the Americans With Disabilities Act, so they would be internally consistent. And because they’re two different laws, that required us to develop two separate allocation and scoping provisions, but all the technical criteria are the same now. And I’m proud to say that these 2004 guidelines have now been adopted by all
the ADA standard-setting agencies – that’s Justice and Department of Transportation, and the ABA, the barriers act standard-setting agencies, except for HUD.

These are the rulemakings that we had in development. And you can see, with our 27-staff, and in my unit are 12 to 15 staff members, this is a very full plate. We’re working on new guidelines for outdoor developed areas – picnicking and camping areas; passenger vessels; public rights-of-way; transportation vehicles – that’s a refresh of our existing rules; information and communications technology, which is a complete rewrite and refresh of our section 508 standards and our telecommunications standards under 255 of the telecommunications act.

We have a new responsibility for accessibility to medical diagnostic equipment, and this is – this is quite interesting. There have been many [legal] settlement agreements around the country against hospitals and doctors’ offices, because people can’t get on exam tables; they can’t get into examination chairs. And yes, it will probably impact Hopkins and our optometry friends, because people need to be able to use the sitting devices in order to obtain a diagnosis. Most of my friends who use wheelchairs haven’t been weighed since they were disabled, because there are very few facilities now that have scales which you can roll onto. So this is a very big deal.

The interesting thing about this particular ruling is that we’re to write essentially a standard for medical diagnostic equipment, but we’re not to apply it to anybody. There’s no mandatory provision in the law that says that anybody has to comply with it. But the Department of Justice has already signaled, in an advance notice of proposed rulemaking, that they are planning to use our medical diagnostic equipment guidelines as the basis for enforceable requirements under the Americans With Disabilities Act. So again, the board’s work does ultimately impact those things that are not built into the environment.

And then shared-use paths is another thing that we’re working on. Shared-use paths are routes that are usually referred to as hiker/biker trails. They’re used primarily for transportation to get from point A to point B. And people with disabilities, again, want to use these paths just like everybody else.

And then classroom acoustics – I can’t forget classroom acoustics. This is a project that I’ve been working on for a very long time. And this is an example of federal rulemaking I think at its best. What we did was we recognized that there was, indeed, a problem in classrooms, in terms of acoustics, in providing an adequate learning environment for not only children who are hard of hearing, but also for children who had English as a second language, children who have learning disabilities, and just children in general. So we reached out to the Acoustical Society of America that had convened a voluntary consensus standard(s) working group to actually write and improve a standard that they were working on for classrooms and classroom acoustics.

We have been shocked that improved standard for classroom acoustics – which is now code referenceable, which is something that Acoustical Society of America has not heretofore valued. They write standards using nonmandatory language in a lot of guidance embedded in the standard. And so it took a lot of effort to get them to rewrite the standard to be code referenceable. And for those of you who are [architects and engineers], we hired Ken Schoonover, former vice president of BOCA, Building Officials and Code Administrators, and International Code Council to rewrite it. And now we’re shopping that to the International Building Code. I have to say that we’ve been shot down. One of the reasons we’ve been shot down is these requirements are not in the ADA. I’ve had wonderful luck getting the International Code Council to adopt provisions that are already federal laws. I’ve gone to them and said, here’s your chance to adopt this and it won’t be a federal law. They haven’t quite understood that.

And, unfortunately for ICC, now it’s going to be a federal law. We are going to introduce classroom acoustics requirements into the Americans With Disabilities Act accessibility guidelines and the architectural barriers act accessibility guidelines. Ultimately people will
have a private right of action, if they want to, to sue under these requirements, which they
would not have had, had these only been building code requirements.

Again, here’s a little bit about our technical assistance (slide 15). Our technical assistance is
available to everybody. And with that, here’s our training, some of our training folks (slide
16). And we have a number of very small research projects. This is a shot of a research
project that we’re doing on surfaces for accessible trails, and the like (slide 17). And one of
the issues there is, you know, you can’t have the surface displaced as someone who’s trying
to push a wheelchair through it.

Then we have a very major research project that’s being conducted, and we’ve only funded in
part, at the State University of New York on anthropometry related to that dynamic envelope
that a person who uses a powered mobility device might occupy, looking at their reach and
the space requirements for that occupied wheelchair. [This] is really groundbreaking
research, since almost all the accessibility criteria in the Americans With Disabilities Act, the
ANSI 117.1, and the Architectural Barriers Act are based on research conducted on returning
male veterans who use big manual wheelchairs. The profile of people with disabilities has
changed substantially since then, and their devices have changed substantially, and that has
space consequences in the built environment.

We have an airport issue (slide 18). We’re developing all new technical assistance. We
have [recently] acquired a whole bunch of new toys with our head, our Revit – a bunch of
other tools from modeling. And in the next few years, you’re going to see our website convey
a lot of technical assistance about the requirements in the Americans With Disabilities Act.
As was mentioned earlier, we will also be able to demonstrate how lighting can affect a space
in the built environment. So that’s very, very exciting.

Our website, www.access-board.gov (slide 20). And sign up for our newsletter. Sign up for
our e-mail alerts. They’re very timely. They all inform you of anything that’s going on, on the
board, and anything that’s going on that is significant in the area of accessibility.

Panel 1: Requirements and Accommodations for Persons with Low Vision (Vijay Gupta, Moderator)

Suleiman Alibhai, O.D., Low Vision Services, PLC.

Introduction

Well, thank you, Vijay. I’m glad we have an opportunity to discuss things, because I think
everything I would like to say has been said – thanks a lot, Bob. And apologies to Dr.
Brabyn, frankly, because a lot of the slides that I have may also duplicate what you’re going
to use.

And I’m going to start with this quote that says, “It’s not the strongest of the species that
survives, nor the most intelligent; it is the one most adaptable to change,” and that’s a quote
by Charles Darwin (slide 2). I find it fascinating to sit here and participate in this group,
because the work that we do as low-vision specialists is not to adapt the environment to the
individual; we try to adapt the individual to the environment by providing various tools. So
this is a sort of unique opportunity for us to come to you and say, well, look, here are the
issues our patients are having. What things can you do to make it easier for them?

And, fortunately, we are the most intelligent of the species on the earth, and therefore we are
able to survive because we adapt with tools, and low-vision specialists are the tools of the
people that who have low vision. And I think patients always come to me and say, I’ve come
to see the toys that you have to help me, because they were expecting some tool, some
gadget; hopefully, just a pair of glasses magically is going to fix their vision. Now I think we have a good understanding that we’re talking about people who are beyond basic tools like glasses.

Role of Low Vision Specialist

The three or four things that we have been emphasizing here are the things I think we have now all really understood: To enable people who are visually impaired to function, we’re talking about modifying light or glare; modifying contrast; as low-vision specialists, we also modify size, or we provide magnification, and we have the tools to do that; or we modify their behavior (slide 3).

As you’ve heard from Dr. Massof’s presentation, for example, we’re talking about, really, older people here having issues with functioning. And they modify their behavior by becoming depressed, by staying indoors, and really becoming restricted in terms of their activities. So how [are] you specialists – how are we going to modify the environment, make it more engaging to them, so they’re not afraid of falling, they’re not afraid of losing their independence, and there are ways to get around? So I think these are the things we’ve all established – the lighting, glare, contrast (slide 4). We haven’t talked much about magnification, but that could certainly be an issue when it comes to signs.

I think it’s important that we realize, like it’s been brought out, that we all have experienced low vision. Initially, I thought about putting up slides of diseases to show you blind spots, and the narrow tunnel view. But you know, it’s really not like that. It’s fine for putting up slides and showing those things, but in the real world, if you want to understand what does the visually impaired person experience, think of things like: the oncoming headlights of a car; the sun low on the horizon, especially for those who drive around the beltway; reading menus in romantic restaurants; finding a seat in a movie theater. I mean, these are things we’ve all experienced. And think of that being as more amplified in people who have low vision.

Contrast, we’ve talked about ad nauseam now, about the edges of steps and curbs; or reading something that hasn’t been printed well; and magnification – going back to that size thing, it’s like the back of a medicine bottle – who is supposed to read those anyway; or the disclaimers on the some of the things that we buy. I think it’s ridiculously small. And like Dr. Massof mentioned, we assume that everyone in the world has next to perfect vision, and if you don’t, try to adapt to it and deal with it. And many of us just kind of fake it. We go, yeah, that’s right. Well, now, how much was it again? They may not really have seen the price, but it’s a way we deal with it.

The other thing we’ve talked about today is: What is low vision? What’s the range of vision? It’s not a number. This is the most frustrating thing I think Dr. Siemsen and I have, is that people come to us and we see them because we are reimbursed to deal with them. Medicare pays me to see these patients. But if their vision is too good, Medicare says, you can’t see this person. We’re not going to pay for it, because this number that we require their vision to be, isn’t satisfied. And so this is frustrating from a practitioner’s standpoint.

There aren’t many low-vision practitioners because of that, because it’s hard for us to make a living when it’s all about reimbursing. We didn’t get into this low-vision field because we were going to make it rich; more because we felt the need – I think, like some here pointed out, that there are people having difficulties functioning. And not just we’re talking about older people, don’t forget, children, and we’ve talked about adaptations in the school system, and playgrounds, and so on and so forth. So it’s hard to give you a definition of low vision in terms of a number, and I would hope that in developing guidelines and in talking about low vision, we don’t use a number to define it.
Visually Impaired People are not easily Identifiable

And remember, the other thing is that the visually-impaired people are not easily identifiable. This is the difference between somebody you identify as being blind and immediately you can anticipate what the difficulties are, because a visually-impaired person – and we have at least three in this room – are not walking around with a white cane; don't wear glasses even, except Mr. Gupta perhaps; and don't look like they're visually-impaired – they make normal eye contact (slide 5). So how do you know, as you're dealing with people in the real world, that they're even visually-impaired, because “they look normal”?

Age and Low Vision

All right, I'm not going to go over these pictures again (slides 6 – 15). Dr. Brabyn is going to discuss these. But the one thing I would bring up here is a study done at Berkeley by a researcher-optometrist-scientist, Dr. Gunilla Haegerstrom-Portnoy, who did a study on 900 people from the ages of 58 to 102 (slide 16). They were normally well-sighted. In other words, their vision was 20/40 or better – what we would consider good vision, not even low vision by any definition. And she measured their vision under various conditions of contrast and glare (slide 17).

And what's interesting here is what occurs with age. I think we've all got this point now that the aging population has low-vision issues, and you're thinking of the aging population with macular degeneration, glaucoma, cataracts and things like that. This graph is showing you the effect of contrast, glare on an aging population that is well sighted; has had cataract surgery; have been to their ophthalmologist and been told, your vision is good; you're legal to drive; you've been doing well; if you've had a problem, we've treated it.

This group, as you can see, as they get older have increasing difficulty. And this is saying, along the y-axis, times worse than young for those whose vision is 20/40 or better, because that's who we're comparing this group to. They have more and more difficulty with: high contrast – with low-contrast vision (low contrast vision just means you measure their acuity and the letters are not black on white). Contrast sensitivity in general – how much more black on white they need than the average person. Glare – how much more trouble glare issues are. And, how much more more time it takes to recover. So we have to take that into account as well. So if you're going to build a building with good light, which is great, and then to have to move to another area of the building and it suddenly turns dark, well they have to make a transition. And I think the first speaker [Greg Knoop] brought that out nicely, that we have to find ways of making these transitions from light to dark, or for dark to light.

So the reason I put this graph up really was to say to all of us here that when we think of these issues, all of these things that have been brought up so far, don't necessarily apply just to the low-vision population. We're talking about this aging population. And as we know, the group over 65 is the fastest growing segment of our population. So even if we don't call this “Building Design for People with Low Vision,” I think it's building design for all of us, assuming we're all going to get there. But you might say, I'm going to take good care of my eyes and not have a problem with my eyes. I'm going to get my cataracts seen; I'm going to get my glaucoma checked; and I'm never going to get macular degeneration; and I'm going to eat leafy green vegetables every day. You can do everything. You'll have 20/40 vision, but you'll experience all these difficulties.

So it does behoove us to address these issues and address them in a meaningful way (slide 19). So I've skipped all my other slides because I know we're running out of time, and I think they've already been addressed. And I would much prefer now to have a discussion, and questions, and back-and-forth that we can address some of these issues in more practical ways.
Dennis W. Siemsen, O.D., Low Vision Service, Department of Ophthalmology, Mayo Clinic

Introduction

Well, I work at world-famous Mayo Clinic up in Minnesota. And, this is the main outpatient building [slide not included]. I work at the building on the right, that’s the Mayo building. And while most people think of Rochester, Minnesota as “the frozen tundra” – and it does look like that sometimes in the middle of winter, right now it looks kind of like this, so, [you may] want to get out of the hustle and bustle of the East Coast here and come out to wide-open Minnesota.

Some of the things that we want to talk about today relate to contrast, plus – (slide 1) and I’m glad you caught the irony of this, because you’ve all probably been in meetings where somebody kind of didn’t get the idea of how colors clash, and what makes it easy to see. You certainly don’t want to put bright red on bright blue. This is a little bit better, but because of this kind of fuzzy background, it’s a little — a little difficult to see (slide 2). And you might also think that, you know, if you want good contrast, you’d want pure black on pure white (slide 3). But even that’s not the easiest thing either because you get all this glare back again. So whenever I do my presentations I like to use something with a darker background, something with a lighter foreground, or with the letters, and so forth, and go from there (slide 4). And I won’t bore you on fonts and things, although that may be a discussion for another day.

Definitions

Bob already talked about the definitions of low vision (slides 5 and 6), and I understand from Stephanie that you’re all going to get either a CD or an access to a website for all of this stuff. So if you ever want to refer back to this again, you can always look it up again.

Visual Acuity

But the whole point, as Bob mentioned, was: what is visual acuity? It’s really how big a letter you can see at what particular distance (slide 7). And the other thing that you want to remember is that if you come — if you start at one distance, you sit twice as close, it makes it twice as big (slide 8). If you ever – you know, if you wonder why your kids and grandkids sit close to the TV, it’s because if they get twice as close, it makes it twice as big. So that’s really the thing.

The challenge is, of course, you can’t always move closer to this. It’s easy to make things bigger when you – when you either sit closer, walk closer, drive closer, or bring the newspaper closer to you if you’re trying to read. But it becomes more difficult if you’re not able to do that. And part of what we do in low vision is to bring those virtual images closer to our patients. We’ll talk about devices here in a minute. Again, this is just — you know, I wasn’t sure what Bob was going to present, so I threw a slide up here about what visual acuity really means (slide 9). It’s the definition of the resolution of the eye. It really doesn’t tell us anything about how well they function. So let’s go through all of this.

Visual Field

Now, let’s talk a little bit about visual field. We kind of danced around that a little bit. And, technically, it’s the sensitivity of the vision throughout the field of view; throughout all of this area out here (slide 10). And I think most of you know intuitively that you see very sharply in the center of your vision, but when you get out in the periphery, you don’t see things quite so sharply.

So someone with macular degeneration, where they’ve lost their central vision, well, you know, they can see, they can move around — they actually function very well in mobility.
situations, but they can’t see the regular-sized print. On the flip side, if you get somebody with retinitis pigmentosa, where they’ve lost all their peripheral vision, they might be able to read — although there are areas that they haven’t been able to [discern] medium or small — but just have them walk across the room, or try and negotiate a room like this, they’d be bumping into things just walking around this room. So you kind of get an idea of what someone with a peripheral vision loss would have.

So technically, that’s what we’re talking about here. And we measure that by how large and bright the stimulus can be. Now, Fred made a good comment about driving, because when we talk about vision impairment in driving — it’s a little off the subject, but when we talk about vision impairment in driving, when you go to the DMV and have your vision measured, they measure two things: They measure how big a letter you can see at a certain distance — that’s visual acuity; and they measure your peripheral vision, which is visual field.

Neither one of them are good predictors of whether you’re going to have a crash or not; visual acuity, several studies have noted, has no relation to whether you’re going to have a crash or not. So these are just good examples. And if you want to take what we would consider a very visual task, like driving a car, and apply these measures — a visual field, a visual acuity — very poor predictors. So if it’s bad for that, you can imagine that it’s bad for all the other tests that we’re trying to describe.

This is just a diagram of what we’re talking about. You know, normally sighted individuals can get about 70-to-80 degrees temporally, and about 50-to-60 degrees nasally in each eye (slide 11). When you add the two together, you end up with about 140, 150 degrees all together. And the same thing applies, superior — you know, you get so much superior, so much inferior (slide 12). And why is it more down below? Well, just take a look at your eyes. You’ve got larger brows through that evolutionary process, and you’ve got more space down below. So that’s what visual acuity is. We’ve talked about legal blindness (slide 13).

We’ll touch just a little bit on contrast here too: it is your ability to see, distinguish those shapes and objects from a background (slide 14). I describe this a little bit different. If you have a perfect – 100 percent, 1.0 perfect contrast, the best example of that would be pure black next to pure white; no contrast, the two are exactly the same. It’s all black; it’s white; it’s all gray; it’s all the same, so there’s no difference between the two. And this is just a slide that shows the difference there (slide 15). And you’ve probably been in presentations where the PowerPoint slides look like this too.

Low Vision Rehabilitation

Now, what do we really do at low vision? And it’s so nice when I get together. Now, Suleiman and I probably have met once or twice, but we have the same concept here. What do we really do with low vision (slide 16)? Well, we make it bigger. When somebody comes in and they want to be able to read better, the first thing we do is make things bigger, because it’s easier to see that way. We fiddle around with the illumination and the contrast by adding direct light. I mean, we’ve been talking a lot about overhead lighting, and glare coming at you. but when it’s time to read the newspaper, probably the most important thing that we can do for our patients is to add some direct light right on the newspaper. Most of you probably understand that today newspapers use lots of recycled paper, which isn’t as light, and they use soy-based ink, which isn’t as black. So therefore, the contrast between the background, the newsprint and the print is [not so] hot.

Now, Bob made a comment about what happens when you add that light on there. Well, it’s true that we aren’t actually enhancing the contrast, but the sensitivity of the individual to those contrasting images is improving, because the newsprint is going to reflect more of the light than what the black print is, and therefore it’s going to be a little easier for the individual to see.

So what do we do? We’ve – and I mentioned that, in terms of magnification, twice as close is twice as big. I think most of you in lighting understand the concept of the inverse square law,
where if you bring that source places close, it’s going to make it four times square. So for my patients, I’m going to make sure they’ve got that light nice and close, because it’s going to make a difference.

We also train those individuals. I can give them a magnifier; I can give them a device; but if they aren’t trained to use it properly, they’re not going to do very well with it. So what we really engage in is a rehabilitative process. It’s not just, what kind of toys do you have; can I get a magnifier; can I get those glasses stronger? Well, yeah, you can, but we need to make sure that, when you get it home, you’re actually going to be able to use it for the task intended. And because of that, we also add things like using peripheral vision. If the central vision is gone, we need to train the individual to use more peripheral vision, or vice versa.

There was a comment made about increasing depression. We often engage with social and psychological services. I have a social worker who is designated for my service, and I try and get all my new patients, just to have them sit down in a chat with the social worker to find out what life is like, how things are going. I’m not a psychologist, and I rely on other professionals to give me some feedback, because if we don’t deal with some of these social services, psychological issues, nothing I do in the exam room is going to make any difference, because they’re still going to be depressed and they’re not going to want to be rehabilitated.

And finally, we use rehabilitation services. We use teachers of the visually impaired [or] rehab counselors; we use state services for the blind, we use occupational therapy, and a variety of other rehab services, because, really this is a total process, in terms of what we do. I’ll just skip over some of these slides because we’ve covered all of them already (slides 17 – 19).

**Low Vision Patient Requests**

What does a typical low-vision patient ask for (slide 20)? Number one on the list has got to be reading. I mean, almost everybody, even young, old, you know, the issue is reading, because we have a very visually-oriented society, whether it’s print, computer – computers are becoming more of a problem. Getting a driver’s license – in our society, they need public transportation. It’s better here on the East Coast, but when you get to Minnesota, if you don’t have a driver’s license, you know, you don’t get anywhere. And Rochester, Minnesota is actually, for a town its size – 100,000, has a very good public transportation system, but it gets you downtown; it doesn’t get you to the grocery store. And that doesn’t even talk about, can you see the bus sign; can you see which bus is coming? It helps you get on the right bus, and so forth.

Continuing independent living: We heard comments already that it’s certainly a benefit for the patient, as well as society, to keep people in their own homes. I’ve often told my patients, you’re not going to have to leave your home because of your eyes. If you follow our techniques; if you get the devices that you need; if you get the training – not just from us, but from other sources, you’re going to be able to live independently.

Now, you may fall and break your hip, or you may have some other medical issues that will take you out of your home, but you’re not going to have to leave because of your eyes. And that alone just takes a huge weight off their mind. It’s like, oh, really? There is something there? Yes, there is. But bear with me; it’s not – it may not be quite as simple as you might think.

To get and keep a job, we’re going to talk a little bit about environments for a workspace; improve independent mobility – we talked a lot about that so far. My questions of my patients are, what do you want to be able to do that you can’t do because of your eyes? That’s the question you ask. And it’s not just to see better. Okay, fine, sure, I want to see better too. You know, I’d to be able to read without my progressive lenses. But what – and be specific: Is it reading? Is there a specific task? Do you want to play softball again? I mean, what is it that you want to be able to do? You know, just as an example here with reading, newsprint is
1.4 millimeters high on the average – that’s a lower-case “o”. Large print is about twice that high. And as I mentioned before, by bringing it closer makes it bigger (slide 21).

When I consult with the people in employee health at Mayo – we haven’t talked a lot about working situations here (slide 22). We’ve talked about elderly mobility, getting places, but when you talk about what some of the challenges are in the workplace, being able to read the computer screen is top on the list, because we have – we’re entirely electronic at Mayo, even medical records, billing, everything is electronic (slide 23).

I have six programs active on my screen that I use at all times. And, you know  when a new program comes out, I’m immediately on the phone with systems and procedures and information technology to get them to fix it, because even I can’t see it. We have 50,000 employees at Mayo Clinic, so even if you get – even if you think of 1 percent have some type of vision challenge, that’s a lot of people who are having trouble seeing the screens. We also have glare issues. I could give you lots of examples of that: reading, and room size and lights; seeing patient’s faces; and all that sort of thing. Well, let me – we’ve talked about walls too. I had one lady who was having trouble with glare, and I said, well, we’ll just move you away from the window. And she said, I worked 15 years to get that place.

Interaction between clinical practice and research programs

All right, we’re going to go – we’re going to go past these (slides 24 – 26), because you probably know this stuff, and we’ve talked a lot about it already. And there are lots of things that we can do. But what I’d like them to talk about a little bit here is a project that I’m not a signatory to. However, I do work with Dr. Gordon Legge up at the University of Minnesota. He’s got a very active low-vision research lab (slide 27). Gordon’s low-vision research lab is not in the ophthalmology department; it happens to be in the Department of Psychology. And Gordon and his group have provided us with – as Bob has too, I want to give Bob suitable credit here.

I’m a clinician, and for me to do some of this basic research to figure out some of those nuances of why, how vision works the way it does; why do people have challenges; what factors can we modify to make it better, comes from people like Bob and Gordon Legge. And it helps people like me, because where Suleiman and I see a patient in the office, and they have a visual challenge, the basic science researchers are the ones that tell us why, how, and give us some ideas on how we modify it. It also provides us with the ammunition, so that when go to the access board, we can cite chapter and verse, and we’ve got the research to do that. I think part of the reason why low vision hasn’t gotten the attention it deserves, is that we haven’t really done enough of this basic research. So I give – I really give Bob a lot of credit.

This group has done a lot of really cool stuff, and it’s an ongoing process, and it’s difficult to collect this data, partially because we all do things a little differently.

So I wanted to bring this up because, after I got the invite to come to this meeting, Erin and I went up to the University of Minnesota to see what they’re doing. It’s lovingly called the “DEVA project,” Designing Visually Accessible Spaces. And it’s a multi-disciplinary project through the University of Minnesota, the University of Utah and Indiana University. Somewhere along the line you’ll get a handout, or at least access to a webpage that will have the link to the project on [the] bottom of the screen. So some of these slides are right off their stuff, and I give them full credit for it (slide 28).

The goal is to provide an environment so that people can travel safely, perceive the spatial layout and key features in that environment: keep track of where you’re at (slide 29). If you ever hear the term “orientation and mobility,” orientation is where you are at any given time in space, and mobility is, how do I transverse that space without killing myself? So part of what this project is, is: Where are you? How do you get there? How do you move through that space? Ultimately, the aim is to improve accessibility.
They really want to be able to influence designers. Unfortunately, they don’t have any designers on the team. So they were tickled pink when they heard that I was coming to this meeting. So they would really like you to access their website, and take a look at what they’re doing, and make contact with them and offer suggestions.

I’m going to kind of go through a few things here. One of the things that they’re doing is developing a model, an analytical tool (slide 30). We talk a lot about that. How do you translate what’s going on in the clinic, at a very natural setting, into a research design with backing? And what you have here is – in these two images, on the left side, you have the actual luminance value that they measured in their lab work with different lighting conditions, with luminance values. On the right side is the digital rendering of the simulated lab.

Comment by Erin Schambureck: And the way you can tell that is the door on the right does not exist in the actual room. That’s the only thing that’s different.

So what they’re trying to do is develop this model so that they can change different lighting conditions, and then do some studies with actual subjects; see how well they perform; so that as spaces are designed in the future, you could use a computer model and then work backwards, and know that, that model is [reliable]. Does that make sense? Throw your two cents in here while you’re at it too. She understands this stuff.

This is a digitally rendered model of the lab that we just looked at (slide 31). That platform that was on the right side of the previous slide, basically you’d be standing on top of that. So you’re seeing the rest of the room. And they figured that he’d get within about 5 percent of the measurements in the physical space. So it’s really pretty cool how they do that.

Now, what are they going to do with this? Just as an example, they’re taking a look at how different objects look under different luminance values, different types of illumination – overhead, near the window, by the window, black backgrounds, light backgrounds (slide 32). [They] also have gone beyond this phase, to where they’ve gone to the checkerboard patterns, and lines and stuff to determine what kind of shapes, and what with visual cues an individual can use in order to navigate this better. And, again, that’s the actual set up, and hopefully they’ll be able to put this into that model so that they’ll be able to use it later for your own design purposes (slide 33).

These are just some slides of the main atrium at the Mayo Clinic, the Gonda building [slide not available]. And, you know, this is one of those spaces that’s incredibly difficult to navigate. I don’t like going up and down this thing. It makes me nervous. I can imagine what it’s like to – anyone with a vision impairment, that’s with glare coming in through the atrium. This is where a person who has poor glare recovery would be in a bright situation and then go into a dark undercroft.

But I did want to get to this last – this is the staircase again [slide not available]. And the first one was about 7:00 in the morning. This is about 10:30 in the morning with the light streaming in. It’s great, huh? Now, this is the view right outside my office (slide not available). The building was built in 1953. For those of you who’ve been around for a while, does that look familiar? Cork floors, which I know are making a comeback. We’re going to be remodeling our floor in the coming year, and were told we’re going to keep the cork. Yet I don’t like the way it looks. However, it’s soft underneath; it’s fairly warm.

And as I look at this from a vision standpoint, because we’ve had these paneled walls to kind of give you this kind of soft, comfortable homey appearance, but this checkerboard pattern on the floor actually helps focus your attention, so you know that’s where the floor is. So you know, there may be some benefit to having designs like this that help channel our focus in the appropriate way. So anyway, that’s— that’s the end.

I do want to give some credit to my colleagues up in Minnesota low vision lab (slides 33 and 34). Interestingly enough, Rob Shakespeare, with Indiana University, is the kind of the lighting – he’s in the theater department; he’s a professor of theater; and he’s the tech guy from IU.
David L Munson, IALD Aff.

Introduction

I didn’t graduate from medical school but I have learned a couple of lessons. One I’ve learned is that I’m going to get older; I’m going to have vision problems; and somebody is going to make me some more rules. You have an aging orphan. That’s not real popular, because I don’t like rules.

Before I came to HOK, I worked and studied under Jim Knuckles at the Parsons School of Design. And I learned a lot of stories, and I learned a lot of “why.” The neat thing about “why” is that you can make intelligent decisions.

Lighting Design

Current Lighting “Rules” focus on Illuminance Issues; conversely, Lighting Design should focus on Luminance and Contrast Issues

Now people keep talking about lighting rules. Most of the rules – or, most of the things that we’ve caused in lighting aren’t necessarily just a lighting issue, but it’s really a contrast and it’s a luminance issue rather than [an] illuminance issue. You were talking about [lighting], even on the newspaper. I don’t need any on mine.

Comment by [Participant]: There you go.

Response by Dave Munson: It’s illuminance.

I was going to talk about some clients, but you did have an issue this morning, and I don’t think anybody has hit on it yet – lighting in vision can be cured, and be easier with time. When we first did the original lighting studies to determine how much light we needed on objects – that’s why we have 4,000 footcandles inside the body when we’re doing some surgery, and two-tenths of a footcandle when you’re scrubbing the floor in the hallway. More light, height of the iris, greater depth of field.

It all got screwed up with time. Original studies were: let’s raise the illumination models; we’ll do five assimilations per second; and we’ll have a motor action to determine accuracy. The minute we took the motor action out of it, the scores went way up. I mean – we lowered the time, the accuracy went way up. I think we had an – I can’t remember all those numbers, but they – 1973. I forgot, it was 99 – 95 percent accuracy – five assimilations per second. It was crazy. If you take time, it cures it. Just on the highway, I think if everybody drove 35 at night, we wouldn’t have any problems.

Illuminance Requirements can be reduced

Control of Glare (headlight story)

I wrote the “rules” of the new highway [design], and I said, we don’t have a lighting problem here, we have a headlight problem – because now we understand what highways are, if you block the oncoming headlight glare, you don’t need to light the highway because your headlights do it. So I convinced the state of Missouri to put in a 5-foot wall to block all the headlights. I wanted it 8 feet because then we wouldn’t see the short-skirted woman trying to change the spare tire on the other side and control the rubbernecking.

Control of Contrast (colorblind person story)

I’ve been very privileged in my career to deal with a lot of individual problems with lighting. One of my first clients calls up and said he had this beautiful house, and he loved it in the daytime, and he hated it at night, and you’ve got to come over and fix my lighting problem.
Well, we got there, he admitted to me that he was colorblind. And so when I went back to the office, I said, would you send Paula out and photograph the house in low-contrast 5-point film. It got back, I said, it's really not a lighting problem as much as it is an interior designer problem who put in all beige furniture. [He is] walking over the furniture.

Once I saw the photographs, I said, okay, Sam, let's add some light. And I also noticed that every time he would go and look at lighting he'd always look at his hands. And I think what he was doing is a contrast between that and this, because I know he can feel light.

So I was known for many years as the guy that saved his house. And then later, I became the guy that fixed his colorblindness. Anybody know Edwin Land? You guys all knew him, okay. Lighting designers don't know anything about Edwin Land. He had a theory that all color was comprised of black and white and red.

The story that I remember from 1971 is, he took a stereo camera of black and white film, put a primary red subtractive filter over one lens, took a street scene, developed the film with the same primary red subtractive filter over this projecting on the wall, and he had pseudo color enough that you can actually tell what green was.

[At a] cocktail party, I'm talking to this guy who's an optometrist. He said, is there anything that's similar between colorblindness and lens theory of color? The guy looked at me, and he was really kind of shaken, and he said, how did you know I was reading that today? He said, I just read a guy named Warner Zentner invented the X-Chrom contact lens, primary red subtractive filter, put it on one eye, and certain people can see color.

Before I came here, I said, you know, I better look on the Internet, make sure I can still justify the story that [occurred] three or four years ago. Now I find out there are people will all kinds of contact lenses that can fix all kinds of things, all color deficiencies.

Now, I have come across a guy with a new vision problem. I've never heard of it before; I don't know if there's a cure. He's not colorblind; he's color dumb. When he was a child, everybody thought he was colorblind, so they never included him in decisions of color or descriptions of color. Nobody taught him that that was red. Now that he's older, he said, yeah, I can see the difference, and you can sit and explain what colors those are, but in 20 minutes I kind of forget. So it's early education of color.

Oh, my wife's grandmother couldn't play Skipbo which is a card game. And I said, well, let's just add more light, and it just didn't help. We fixed it with a set of pinhole glasses, because now the iris is really small. And in fact, I even find that that works for me, too.

**Lighting for “Visually Reduced People” is not difficult if a Couple of Rules are followed:**

The other thing is, I was – I don’t want to take too much time; I’ve got lots of stories. In doing research, [Missouri] is always a show-me state. So we always try to figure out what people can actually see. Well, I had a welding accident a couple weeks ago and it involved a vision problem in my left eye. We’re not sure whether it’s a welder’s flash or whether it’s an infection or if it’s inflammatory. Think of something; I might have to come see you.

I have developed a pair of glasses that are very similar to what my vision was in this eye a week ago. And here’s the thing. Lighting for visually reduced people is not difficult if you follow a couple of rules. Here’s the first rule. You have to remember that the eye is attracted by the brightest object in a room. It also means the brightest object is also distracted or the eye is distracted by the brightest object in the room.

When you do vision studies and we’re doing tests, the task wants to be the brightest object in your field of view. The surface around it should be slightly darker. Putting a white piece of paper on a black blotter is kind of like taking a picture of a white guy against a black wall.
Your candle will overcompensate for one of the fields. The other thing is, the surrounding fields should be slightly darker so you can concentrate on this field.

If you remember those rules, then it gets easier. I think we might have to go back to the future to solve some of these problems. With technology, the light sources have gotten smaller.

[Rule 1: The eye is attracted/distracted by the brightest object in a room
Rule 2: The “task” should be the brightest object in your field of view
Rule 2a: The surface around [the task] should be slightly darker
Rule 2b: The surrounding fields should be slightly darker so you can concentrate on this field]

Lamps and Fixtures

In the ‘50s, we had something called a comfort lamp. You ever seen one? T16, T20 diameter fluorescent tube, it was nice and big, it wasn’t glary. When we went from T12 lamps – in lighting, everything is measured in one-eighths of an inch – T12 is an inch-and-a-half in diameter. T8 is one inch in diameter. When we went from T12 to T8, lighting got very glary in offices when people would look up [into the] parabolics.

The parabolics in very early lighting were nice and deep, shielded all the lamps. In fact, I remember Jim Knuckles talking about the first time they did recessed down lights in the ceiling, and the lights were made exactly the right color so they were the same color as the ceiling. They had to put table lamps in some of the rooms because it was so disorienting, nobody knew where the light was coming from [important behavioral issue].

MR16s, these little glary things [i.e., halogen light bulbs] here [pointing to the track-lighting in the conference room] made it very difficult to see. And I’m afraid that the newest technology is going to become our worst nightmare, and that’s the LED [light emitting diode bulbs].

Summary

The important thing is that you have to know why things happen. And if you understand why, I mean, I’ve seen so many books that said how to do it. But if you know why, then the how is easy.

Open Discussion

Issue 1: What are the effects of energy-efficient lamps and fixtures on persons with low vision

Comment and Question by [Participant]: The research that you’ve been talking about a little bit as an idea of integrated design, you mentioned LED lighting. I mean, there’s tremendous drive to reduce energy usage in building that impacts lighting because that impacts air conditioning and blah, blah, blah.

And you go to energy conferences, and a lot of times they’ll tell you, we’ve got too much light. You know, some of the buildings are so bright that you don’t need all that. Certainly, that’s probably for normal-vision people, I don’t know. But have any of these studies been trying to integrate LEDs, these T8s, and all that, which are becoming the standard, compact fluorescents, all that are being installed everywhere?

Response by Dave Munson: Those are sciences that evolve so quickly today, that by the time you write a rule for it, it doesn’t exist.

Question by [Participant]: But what impact do they have on low vision and – ?
Response by Dave Munson: Well, there’s no answer but an opposite reaction. We invented all these CFL lamps. I’ll tell you, you want to see a disaster, drop one at the Home Depot on the floor, now you’ve got a hazardous cleanup.

Comment by [Participant]: That’s not going to stop. I mean, the energy is going to be –

Response by Dave Munson: The cost of the energy to light a building, compared to all the costs of all the people in the building is pretty small.

Comment by [Participant]: It impacts air conditioning, too. All I’m saying is, that’s reality.

Comment by Dennis Siemsen: Yeah. I think what Richard’s saying is that we shouldn’t be looking at the individual light sources. We shouldn’t just, you know, worry so much about whether it’s a T8 or a T12 or an LED or a CFL.

What we should be saying is, if, for a given light source and a given surface that will be illuminated, how do the two interact? Because then, you can always work backwards and say, okay, we’ve got a new light technology, whatever the next one is going to be, and it’s a small point source, and it’s got so much spread and gives you so many candelas at this particular point. Once you know that stuff, then whatever new technology comes out you can go through.

What we don’t have, and I think what the DEVA people are trying to do, is, how does that specifically impact the individual, whether they’re normally sighted or not normally sighted? And those are things that we really ought to know. There’s not good research out there.

And [while] we’ve got low-vision researchers on the project, there isn’t a clinician in there. So –

Response by [Participant]: And there’s no electrical lighting person on there that deals with some of these other issues associated with [lighting design].

Comment by Dennis Siemsen: Yeah, so I think what it’s really going to need is a team approach. And hopefully, through the wonder of the Internet and integrated databases, if I were writing a research proposal and I go to NEI – we were talking about this at the break – and I get this right in my search and see who is doing what, who is interested in this – not what’s published because there [are] partners.

But it’s very interesting to go to the NEI or other – and I don’t know what your database is in your area. I would search on NetLine, I might go to the NEI, I might go to NIH. But I’m just stuck. Except that I’ve got a designer [in the] family, I wouldn’t know what database to search to see which one of you is interested in these topics, where I might be able to call you and say, hey, let’s collaborate.

Issue 2: What Approach is needed to develop “Guidelines”?

Comment by Jeanne Halloin: There’s another important issue here, though, and Marsha mentioned how much time that these new regulations or guidelines are put out for us to react to, and a lot of us don’t take the time. Eunice usually prods me to taking the time.

But I mean, we have a period of time that we can get in there and say why something isn’t making sense or why something is making sense. And so we do have a chance to get in and get involved [as] the guidelines become standards. And I think more of us have to take that responsibility.

Question by [Participant]: I guess one question I have, too, is, when a guideline comes out and it would appear to have some connection with vision, do you have a set of consultants that you go to and say, okay, what do you think about this? Maybe FAB is one organization [that] would be someone you would go to. But do you have a set of experts?
And again, you know, if it came to me, I'd say, fine, I'll do the search, and I'll do my research, and I'll come up with this, and I can give you my two cents’ worth. But unless I can come up and cite chapter and verse in the research literature, I’m not sure it’s going to have much impact on the development of your [guideline].

Response by [Participant]: Well, that’s why some of us [who] worked on [the] documents – there are published documents that were research based – are the ones that should be getting involved in it.

Response by Marsha Mazz: We would not publish a guideline if we didn’t have some research to support that guideline. That’s cart before the horse. We have to have research that will support the claims that the guidelines make. I mean, after all, the whole intent of any of these guidelines is to provide greater accessibility. If it’s not going to achieve the intended goal, then it’s a true waste of money.

Comment by Fred Krimgold: Can I make a point before we take that next question? What worries me is, we’re going to sit here, and let’s say we do come up with some consensus and some guidelines. The other thing to keep in mind is, when you talk about lighting, for example, no two people are the same. We talk about low-vision patients; Dennis will tell you, sometimes that [he] issues a 60-watt incandescent bulb and bring it close. Sometimes it’s a big [magnifying glass] – can you see these new little lights, these LEDs? They’re bright. I take them to the restaurant all the time, they work great for me.

So I think we have to be careful that we’re not going to be able to find a blanket sort of recommendation that’s going to work in every situation, because every individual with low vision is going to be a little bit different.

Question by Marsha Mazz: And I was going to ask you that very question. When I’m asked what can you do for me, I usually say improve the lighting, the illumination, the lumens for everybody, and I’ll benefit. But that’s true for me. I don’t know if there are people who have vision loss whose needs differ greatly from the needs of the population of people who don’t have vision loss.

Response by Dennis Siemsen: They do differ. And I think with the three of you here with low vision, I think each of you would have a unique preference to type of lighting, positioning of lighting and how much glare and things you could tolerate. And I think this is why we do this on an individual basis with each patient and try to adapt the patient to the environment.

Because we’ll say, like, you produce those filters but we would certainly prescribe different types of filters for different situations to try to cope with that kind of situation.

Question by Greg Knoop: How useful is it the term low vision from the perspective of trying to modify the environment, because as you’ve said, there are very different demands. I had a discussion with the ADA people at Washington Metro. And they said, well, what’s good for some is bad for others, so we’re not going to change anything.

Response by [Participant]: That’s Metro’s answer to everything.

That’s right. But how serious is that? Does low vision identify a common set of needs to which we can respond? Or do we need to differentiate that somehow? And how do we balance this individual modification to environmental modification?

Response by Bob Massof: I think it’s very difficult. And I think we can come up with some general rules. You know, we took this inverse-square law, for example, which is a neat law because, like Dennis said, you bring the light source down twice as close; you can get four times as much light.

It may be that we have to think more in terms of, how do we individually be able to shield that light? So just like we’ve sat in this room or I sit in my car now and my wife can have a different air conditioning than I can have, even though we’re sitting in the
same car. It may be that each of us sits down in a room like this, and he might say, I want to back-illuminate the system like my iPad to look at the presentation on the screen. Somebody else might say, I want it projected, but not a screen like that, a screen like this.

It may be we have to figure out, is there a way of designing lighting systems, is there a system you implement into a building, which give individuals the ability to adjust lighting, whether we adjust the height of our chair to where we're sitting, we have to have some type of maybe lamps on the table where it's a gooseneck and we bring it down and it has a choice of lighting perhaps –

**Question by Greg Knoop:** Are there useful subdivisions of the concept of low vision that are reasonably similar and consistent?

**Response by Dennis Siemsen:** Consistent? Boy, I think that's something that we struggle with a lot, even within our professional organizations. We're members of the section on low vision in the American Academy of Optometry, okay, so that means something to the doctors that are in the academy. But it doesn't for other people, low vision could mean anything from, if I take my glasses off, I can't see the paper, to someone who is totally blind. And we can substitute other terms like vision impairment or [disability] – severe, profound, blah, blah, blah. But again, that doesn't help the person who only has general knowledge or no knowledge of vision loss.

**Comment by Vijay Gupta:** I think there are two separate issues. One is the workstation and one is the public space. I think [the] work place is very clear, all these [workstation] or other issues. Then there are the public space types of issues. I mean, we can at least modify a workstation to suit an individual, right? Whereas in a public space, we're at the mercy of –

**Comment by Dave Munson:** [For a] GSA project several years ago, they put out the requirements of footcandles and ESI and VCP and all these technical terms. And then after the job was completed, they wrote a paper called “Lessons Learned.” The problem was, in order to meet the guidelines, the lights were spread so far that by the time you put the workstation in, there was no light in the workstations. So everybody added all workstation lighting. Guess what? Twice as much energy being consumed by the lighting. But if it was an overhead system, it was lighting each individual space.

**Question by Jim Woods:** I want to pick a little bit up on what Fred was saying and maybe twist it just a bit. Since we've got practitioners at the table, what would you like to see from the design profession that is going to help you the most?

**Response by Dennis Siemens:** I think consistency would be one thing. Because what we are faced with is, we have no clue when a patient comes and says to us, I'm having a problem getting to work because of lighting. I don't know really what the lighting in the building is. I don't do site visits, so I don't know what's sort of the minimum standard with which they're working. I can relate to the Metro, because I take the Metro, so I definitely know what the issue is in the Metro station.

But because there is no consistency, I guess, you know, I didn't know I'd walk into this room and there would be lights like this. How do we as practitioners – that's why I went back to that original thing, that all we're able to do is to try to adapt the individual to the situation. In other words, you throw the situation at us, and we'll go, okay, yeah, what do you think?

And it's trial and error. I wish I could say it was more scientific, but it's not.

**Question by Jim Woods:** So is that what you need, then, is a scientific base from the environmental standpoint to help you make decisions?
Response by Dennis Siemsen: Some consistency. I think if we knew that all hallways have this amount of luminance and this amount of glare and this is what it would be like, then I think it’s certainly easier to work with.

Question by [Participant]: What color?

Response by [Participant]: In the Labor Department, we got sued many times, not because we didn’t have enough illumination, it’s because we didn’t have enough luminance.

That’s where [there were] dark, dark, dark, dark, dark green walls. Some of the light, we couldn’t get quite 50 footcandles in the toilet and the cost for not having open enough [lighting], because you couldn’t get an occupancy permit, gets really expensive. So it’s a total environmental issue. It’s not just lighting, it’s not just interior design, it’s a coordination of all of this. And the architects with the clear glass and the, you know – it’s a very complicated problem. There’s not just one solution.

Issue 3: Is there a need for a different kind of Practice?

Question by [Participant]: Does this suggest possibly the evolution of different kind of practice? That is, you know, I watch “House,” and invariably, he sends out his team to check the place where people have come from to see what the chemicals in their environment are. Should there not be a counterpart of that to what you do, that there would be a component of your low-vision practice, which actually looks at the environments that the patient deals with?

Response by Dennis Siemens: I think what Suleiman and I do is, we take the existing environment, whatever that is, because we have little or no control over what happens, even at Mayo Clinic. I yell and scream at them, and they smile and nod. But I have the luxury of being able to go out and do site visits within my institution. So if I have an employee that has a challenge, I go out and say, okay, where you at, get there early so I can go in before I see patients, or go over at lunch, and I’ll take a look and we’ll see what it looks like.

And you know, sometimes I have to look for the supervisor, and they said, well, we just remodeled this whole thing. You’re going to have to do it over because you’ve got one in particular lady [who] was doing appointments, so they wanted her at patient height, you know, eye level. So she was sitting on a tall stool. They had spotlights coming on her and the screen. You know what I showed you on here with the red and the blue? That’s what her screen looked like because that’s what the computer program was. I said, you’ve got to change this, this, this and this, you know? Well, we can’t. Well, you have to, because you’re making this not accessible for this patient. So they hated me but I have the liberty of doing that.

But I think you’re absolutely right. And even a group like occupational therapy, who some therapists are very well-versed in this, reminds me that might be a way. But again, they’ve got to be able to bill for it too or they can’t do it either. So it’s tough to do that stuff.

Sometimes we do those with simulations in our office with a workstation so that we can kind of demonstrate what’s going on and simulate things, but that’s not practical.

Comment by Eunice Noell-Waggoner: I wanted to say that what you had suggested, I actually participated in. I was invited to Los Angeles from a low-sight specialist, David Slay, who works for the V.A. And with the returning veterans that have a lot of head brain trauma, although this person could see, the glare was really horrific for him.

Since I worked for a nonprofit, I said, well, I’ll come down, and I’ll see if I can help analyze the situation. It was in the veteran’s home. And the wife had heard, well, you know, he
has problems with vision, and you need a lot of light. Well, so she had gone to a big-box store and bought these really glary light fixtures. And I’m thinking, oh, no.

I was traveling from Portland, so I had a suitcase of stuff, but [it was] kind of hard to get through security with that. But I happened to have some light bulbs that had a silver bottom on the bowl. And I just screwed that light bulb in, and it shot the light to the ceiling, removed the bright glare, and it was kind of like he said, oh, this is great. And when you talk about quality of life, the glare was so bad that his wife would have to prepare dinner at 3:30 in the afternoon when there was enough light in the kitchen from natural light sources without turning on these lights so that they could have dinner.

Well, I mean, it’s like their whole life was turned upside-down because of, you know, inadequate and not understanding the problem. And so I think, you know, it really goes to a lot of different issues.

Comment by Bob Massof: Let me add one more note on that same idea here. When you describe a head trauma situation, for example, and I think the data coming out of the V.A. with our returning veterans who have had significant head trauma. I’ve talked to some of the people who do research in this area. These guys are coming back. It’s not something that’s easily measurable, the visual acuity, the peripheral vision, but it’s their visual perception that is screwed up.

This is a good example that we don’t see with our eyes, we see with our brains. Remember, a lot of you are old enough now, when you were a kid that in science class they look like the eye was like a camera with film? It doesn’t work that way at all. The light comes into the eye, hits the retina. The signal then goes from the retina back to the brain, and the brain translates it into what we know as vision.

And part of what we’re describing here is that we’re all different, and our visual perception is different for different circumstances. And so that’s why, you know, one size doesn’t fit all. And it’s helpful for us if we can quantify, you know, what your vision problem is and yours. But even at that, I can take all my patients with glaucoma or macular degeneration, but they’re still different.

Comment by Marsha Mazza: I wanted to follow up on something that Vijay said, because I see the conversation may be going in certain directions. If we’re looking to write guidelines or standards under the Americans With Disabilities Act, for example, bear in mind that the Americans With Disabilities Act does not establish guidelines or standards for home environments or for work environments. So we don’t regulate under the ADA an employee work area, because the ADA under Title I entitles, gives a civil right to each employee with a disability to advocate for their modifications that he or she needs. And the employer must provide them unless there is a substantial undue burden.

So as we begin to think about writing guidelines or standards or using existing, which would be my first choice, using existing standards that are out there or reviewing those existing standards, we probably should be thinking about public environments, you know, public-use spaces, such as National Airport, the Metro station, corridors within an office building, which we do regulate, and on another track be dealing with environments that people can adjust to suit their own needs, such as their homes and their work environments.

I’m not saying don’t work on both, but I’m saying realize that there is sort of a natural division here.

Question by [Participant]: Are you saying that the worker has no rights under ADA for the employer to modify the workspace?

Response by Marsha Mazza: Exactly the opposite. The ADA standards for design and construction do not regulate the workspace because Title I of the ADA extends the right
Panel 2: Existing Standards and Design Guidance (Tom O. Sachs, AIA, Moderator)

Note: Transcripts for this Panel were not available. The Proceedings from this Panel are based on notes by JEW and TOS)

Tom Sachs, AIA, Oudens Knoop Knoop + Sachs, Architects

Design Excellence must include function

Debra E. Babcock, PMP: Information Center for Accessibility Needs (iCAN) at IRS

Introduction

Twenty-four Initiatives on accessibility have been started by new Commissioner.

iCAN instituted to streamline solutions and assistance for employees with disabilities (slide 1).

IRS has approximately 10,000 employees with disabilities.

Disabilities covered: blind, low vision, deaf, hard of hearing, mobility impairment, loss of limbs, psychological, and cognitive (slide 1).

Focus Groups being conducted at IRS Facilities

Managers find it time consuming and often confusing to find the right reasonable accommodation process and other disability-related help (“Took hours to find up to date information on the Reasonable Accommodation process because the information was scattered in different places”) (slide 2).

Safety for employees with disabilities, particularly during emergencies, was a recurring theme among managers and employees (slide 3).

Building accessibility and navigation were raised as problems in several locations (slide 3).

Conclusions

Employees would like to be empowered to resolve their own problems using a Web site like iCAN (slide 4).

Managers need a tool to save them time and to get issues resolved quickly so their employees can be fully engaged and productive (slide 4).

John Brabyn, Ph.D., Director of Rehabilitation Engineering Research, Center on Low Vision and Blindness (NIDRR), Smith-Kettlewell Eye Research Institute

Introduction

Some Vision Research Relevant to Built Environment Codes & Standards (slide 1)

Research is being funded by NIH/NEI.
No standardized tests for glare.

**Description of Smith-Kettlewell Institute (SKI) Study**

**Study Goals (slide 10)**
- To assess vision function comprehensively in an older population
- To explore relationships between vision function and visual task performance

**Study Population (slide 11)**
- Visual Function Measures (slides 12 and 13)
  - Examples (slides 14 – 17)

**Results from SKI Study**

- Degradation of Standard Visual Acuity with Age (slide 18)
- Exacerbation of Low Contrast Acuity in Glare and other Visual Functions with Age (slides 19 and 20)
- Percentages failing to meet criteria as functions of age (slides 21 and 22)
- Percent of those with 20/40 or better standard high contrast visual acuity who are "legally blind" (20/200 or 10 times worse) on non-standard measures as functions of age (slide 23)

**Implications from SKI Study**

**Impact of Poor Low Contrast Vision on Task Performance and Face Recognition (slides 24 – 39)**
- Low contrast vision losses will clearly affect lipreading.
- Effects will be worse in the presence of glare.
- Reading facial expressions, eye contact and other aspects of communication also affected for a large segment of society including many with "normal" vision and hearing.

**Safety and Mobility**

- Photographic examples of hazards (slides 40 – 55).

**Role of Alternative Signage**

- Braille signs can help but have to be found before they can be read (slide 56).
- Audible signs are another alternative for which standards already exist (slides 57 – 64).

  Revised ADA Regulations Implementing Title II and Title III, September 15, 2010, (slides 67 – 69).

**Design Recommendations from reference: Peter Barker, Jon Barrick & Rod Wilson. 1995. Building Sight: A handbook of building and interior design solutions to include the needs of visually impaired people. JMU Publication (slides 70 – 74)**

- Bollards should be a minimum of 1 m high, and color contrasted with the background against which they will be viewed. They should also have a contrasting band near the top.
Street furniture should be color contrasted with background—and offset from the main pedestrian route where possible.

Distinguish doors and doorways with visual contrast.

Highlight glazed doors and side panels with prominent signs, logos or decorative features at eye level.

Provide 2” wide contrasting nosings on stairs.

Handrails should contrast visually with background surfaces.

Floor finishings should contrast with walls or a contrasting skirting should be provided.

Provide means of controlling natural and artificial light.

Aim for uniformity of illumination, avoiding strong shadows.

Signs should be consistent, using prescribed typefaces, colors and graphics.

Overall Conclusions (slides 74 – 75)

Vision under conditions of low contrast, glare and low light is impaired even in "normal" people as they age, and much more so in people with low vision.

Contrast, Glare and Lighting are vital considerations for making the built environment more friendly to elders and people with low vision.

Simple environmental modifications (e.g., high contrast painting of edges, handrails, door jabs, etc) can help a lot.

Knowing contrast levels of features & signs, we can estimate what proportion of the older population can see them.

Alternative signage can be part of the overall solution.

Pricilla Rogers, Ph.D., Center on Vision Loss, American Foundation for the Blind

Introduction

What Our Laws and Regulations Do Not Say About Low Vision and the Built Environment (slides 1 and 2).

Low vision poses special issues for planners (and designers) (slide 3).

The low vision population in this country is large and growing. Current estimates indicate over 25 million with vision problems.

The population is comprised of people who have normal age-related vision loss as well as people with eye conditions that affect vision temporarily or permanently.

Most of these individuals are used to having good vision and may not have adapted to reduced vision nor have most of them had low vision services.

Most have received no skills training such as orientation to the environment, trailing or self-protective techniques, nor braille.

Most do not use mobility canes.

If traveling with others, most do not know proper sighted guide techniques.

Many older individuals experience hearing losses. These can be disorienting and also make it difficult for persons to interpret verbal directions and to localize sounds.
Some Existing Codes/Standards/Guidelines on Lighting

Indoors (slide 4)

ASHRAE 90.1: Commercial lighting code [i.e., standard]. Code does allow for lighting in spaces designed for people with special light needs such as those with vision loss or age-related issues.

ASHRAE 189.1—sustainability code [i.e., standard] for green buildings; provides for 10% less interior lighting wattage than ASHRAE [90.1].

Outdoors (slide 5)

IEP publication RP-28-07 addresses lighting in public outdoor areas to ensure that people do not have to step out of brightly lit interior into a darker exterior.

Other relevant codes/standards/guidelines include (slide 6):

Americans with Disabilities Act Accessibility Guidelines (ADAAG).
Uniform Federal Accessibility Standards (UFAS) (note-these codes are similar to ADAAG).
ADA Final Rule Title III, Sept., 2010.

Low Vision Issues not covered in Codes/Standards/Guidelines

Accessible Approach to Buildings (slide 7)

Accessible routes that provide landmarks for way finding (purposefully move through an environment toward a destination) (e.g. walking through a parking lot is not accessible route for persons with vision loss).

Lighting standards.
Contrast or texture indicators with sidewalks.

Signage (slide 8)

Glare and contrast on signage (addressed but not adequately).
Audible signage.
Building directories.
Use of texture on flooring to promote wayfinding (e.g.: carpet and tile in contrasting colors).

Stairs (slide 9)

Color contrasting rails including extensions.
Contrast and texture on the edge of steps (contrast covered by ANSI; not by ADAAG).
Adequate lighting on steps.

Elevators (slide 10)

Audible voice announcement indicating floor number inside elevator.
Destination-oriented elevators (addressed in 2010 Title III but not adequately).
Programming presents timing issues.

Restrooms (slide 11)

Building layout for placement of restrooms on the same side of hall consistently throughout a building.

Layout of restrooms such as placement of lavs, toilets, trashcans, towel dispensers in same locations.

Use of visual contrast in restrooms—such as contrast of towel dispensers with wall; stall doors with supports, etc.).

Building Layout (slide 12)

Placement of elevators and stairways consistently adjacent.

Avoid diagonals; use right angles if possible.

Eliminate extra noise and distractions such as waterfalls and fountains.

Use the flooring to create a building map such as the use of differences in flooring texture and color contrast.

Use of contrast on door frames.

Other Safety Considerations (slide 13)

Markings on floor-to-ceiling windows.

Glare on flooring.

Window treatments to reduce glare.

Floor-to-ceiling windows have significant glare issues.

Conclusions: Design Concepts that Enhance Wayfinding (slide 14)

Increasing “visibility” with high contrast.

Providing sufficient lighting and glare control.

Using logical, consistent layouts in building design.

Eliminating extra/distracting sounds/echoes.

Using tactile/visual surfaces for flooring.

Consistently placing signage in large print and Braille (ADA requires raised print or Braille).

References (slides 15 and 16)

Built Environment:


Note: This chapter includes several pages of references.

For built environment consultation (other than lighting): www.accessforblind.org

Lighting:

Terry McGowan, Director of Engineering Technology for the American Lighting Association.
IES publication: Lighting and the Visual Environment for Senior Living (RP-28-07).

Jeanne Halloin, IES. Existing Standards and Design Guidance

[This presentation focused on accessibility issues. Excellent examples of criteria and guidance are given in the slides, but references to relevant codes/standards/guidelines are not cited.]

Entrances (slides 3 and 4)

Additional comments:
- Need better signage at entrances
- Handle locations should be consistent

Ramps (slide 5)

Route of Travel (slide 6)

Rooms and Spaces (slide 7)

Additional comments:
- Low power density (i.e., ASHRAE 90.1-2010) with high intensity lighting increases contrast and glare problems.
- Perimeters need to be lighted higher on walls.

Emergency Egress (slide 8)

Additional comment:
- Location of flashing lights is too high.

Signage

For Goods and Services (slide 9)

For Directions and Information (slide 10)

Vertical Circulation

Stairs (slide 11)

Elevators (slide 12)

Open Discussion

Note: Transcripts for this Panel were not available. These edited Proceedings are based on notes by JEW and TOS

Issue 4: Based on available references, can we develop "viable" design standards and guidelines”?
- Must they be written in terms of measurable parameters and values? Consensus was not obvious.
Must they address Risk-Management (e.g., liability and insurance) issues? Consensus was not obvious.

Must they be based on a scientific foundation and database? Consensus was affirmative. A “Gap Analysis” may be an immediate task.

Top issues in developing design guidance and standards are:

- Define Intent
- Define Problem
- Signage
- Severe Changes in Lighting Levels
- Glare
- Coordination between energy codes and low vision accommodations.

Panel 3: Impacts on Vision – Glare, Contrast, Color (Gregory Knoop, AIA, Moderator)

Note: Transcripts for this Panel were not available. These edited Proceedings are based on notes by JEW and TOS

Robert Dale Lynch, FAIA. Architectural Expert and Consultant

Introduction

An Architect’s Perspective (slide 1).

Adhere to the “Principles of Universal Design” (the actual principles were not described).

Design Issues: Architectural Context and Considerations

- Slowness to Adjust to Changes in Lighting Levels (slide 2).
- Obstruction of View Due to Glare (slide 3).
- Visual Confusion Due to Lack of Contrast in Color & Value (slide 4).
- Wayfinding Disorientation (slide 5).
- Safety Considerations (slide 6).
- Difficulty in Operating Controls (slide 7).
- Performance Impaired by Lack of Visual Acuity (slide 8).

Frederick Krimgold, Ph.D., Director, Disaster Risk Management Program, Virginia Tech Advanced Research Institute – National Capitol Region

Introduction

A Low Vision View (slide 1).

Indoor and Outdoor Environment as seen with Low Vision.

Steps and Stairs (slides 2 – 4)

Lighting.

Lack of Contrast.
Distracting Pattern.

**Wayfinding and Signage (slides 5 - 10)**
- Lighting.
- Size.
- Context.
- Contrast.

**Controls (slides 11 - 13)**
- Timely Visibility.
- Position.
- Lighting.

**Humiliation (slides 14 – 15)**
- Black on black.

**Mariana Figueiro, Ph.D., Program Director, Assistant Professor, The Lighting Research Center, Rensselaer Polytechnic Institute**

**Introduction**
- 24-hr Lighting Schemes for Older Adults and Persons with Low Vision (slide 1).
- Why is light so important? (slide 2).
- The Visual System (slide 3).
- The Perceptual System (slide 4).
- The Circadian System (slide 5 and 6).

**Light and the aging visual system (slide 7)**

**Lighting for Older Adults “Putting it all together” (slide 8)**

**Aging perceptual system (slide 9)**

**Light and the aging perceptual system (slide 10)**
- Left/right weight symmetry (slide 11).
- Sway Velocity (slide 12).

**Aging circadian system (slide 13)**

**Light and the aging circadian system**
- Percentage of time subjects were found asleep under two lighting conditions (slides 14 and 15).
- Average light/dark ratio before and after intervention (slide 16).
- Photos of room with proposed 24 hour lighting solution (slide 17).
Summary (slide 18)

Light isn’t just for vision anymore
Light touches every aspect of our lives

Much of the information we gather from the environment is through the retina

Architects can incorporate scientific findings into their design now

Integration (circadian, visual, perceptual, aesthetic) is needed and qualitative solutions (e.g., daylight, high CCT, bright or dim light) aren’t good enough.

Mary Ann Hay, IALD, LEED AP, Vice President, Director, Architectural Lighting Design, Syska Hennessy Group, Inc.

Glare

Sources of Glare (slide 2)

Poorly Shielded light sources.
Exposed lamps.
Light reflecting from highly reflective surfaces.
Windows.
Skylights.

Disability Glare (slide 3)

Definition: The reduction in visibility caused by intense light sources in the field of view.

Sources of Disability Glare:

Created by light being scattered in the eye.
Unshielded artificial light sources.
Light reflecting from highly reflective surfaces.
Unshielded sources of natural illumination.

Discomfort Glare (slide 4)

Definition: A sensation of irritation or pain from high luminances in the field of view

Sources of Discomfort Glare:

High luminance sources.
Large area light sources (natural & artificial).
Light sources that are close to the line of sight.
Bright sources placed against a dark background.
Contrast (slide 5)

Definition: Visual task requires some combination of light & dark areas that human visual system must discern in order to see it.

Definition of Color Contrast: The difference in perceived color between a task & its background.

Factors that Influence Color (slides 6 and 7)

"Color" of the light source (color $T'$).
Color rendering characteristics of light source (CRI).
Color contrast.
Color appearance of skin tones.

Summary: Lighting Design Considerations (slide 8)

Provide shielded sources of illumination.
Control glare from daylight sources.
Consider opportunities for task lighting.
Provide high color rendition light sources.
Evaluate color temperature of light source within environment.

Open Discussion

(Note: Transcripts for this Panel were not available. These edited Proceedings are based on notes by JEW and TOS)

Issue 5: Can a new chapter be written with a structure for PBS P100 that is performance based and does not disaggregate lighting design by professional disciplines (i.e., integrates subject matter in Chapters 2, 3, 5, and 6)?

Comments by [Participants]: Criteria should be based on measurable psychosocial and psychophysiological metrics (i.e., parameters and values).
Color separation in signal lighting is a critical criterion.
Contrast and color contrast may have priority of illuminance.
Prescriptive and performance subsections should be considered.

Issue 6: Is there a metric for the ratio of scotopic/photopic interactions?

Question by [Participant]: Are glare and contrast parameters synonymous for design and optometric use? (This question may lead to a major gap in scientific information.)

Preface for Day 2: Discussion led by Earle Kennett

Okay, here is what I want to change a bit. I’ve got 30 minutes here, and instead of boring you with all my Internet printings – you know, I’ve got all kinds of stuff we could talk about – is I thought we’d talk about these four issues, because, quite frankly, if you look at the agenda, we’ve got four panels, and based on what happened yesterday, I’m concluding that we’re not going to have much time at the end of the day when people start wanting to leave.
So I’d like to spend a few extra minutes over the next 20 or 30 minutes dealing with these four issues and getting your – oh, this is where he missed it. That’s okay; I sent the article over to VA to about six of their main people and told them they should look at this. It would move [the] VA standards, Kurt.

I found a piece of research this morning from Life Science that says that a researcher, Daniel Zimmerman – and he’s a psychiatrist in Bellevue Hospital Center in New York – his research findings are that swearing can provide an emotional help in hospital settings. And although – and I thought maybe they’d add that to the VA criteria – although he does say that the use of obscene language is never a good idea. So some of your friends, you might just, you know, allow them to swear.

Comment from Kurt Knight: We get a little of all of that.

Anyway, I’d like to deal with these four issues, open it up. Let’s definitely take notes as we go through it.

Question by Marsha Mazz: How about a handout?

Response by Earle Kennett: When I finish my preface. They’re simple, Marsha, and we’ll do one at a time.

Focus on Four Issues (Issues 7 – 10)

Issue 7: Do we need a State-of-the-Art Literature Search?

This will help is in our generation of final report and also identifying next steps. And, really, the first one deals with state of the art literature search. I assume that needs to be done within this area and it would be helpful for all of you all to send Stephanie any research or publications or information you have that might be of some benefit to this area. So we’ve captured quite a bit, and you’ll see that in our handouts (Appendix D), but we’d like you to provide that to her over the next few weeks. She’ll bug you about it, but we’d like to go in and do that pretty quickly.

Issue 8: What are the top issues for developing design guidance (i.e., Low-hanging fruit design issues)?

The second one, which is a real important one, is what are the low-hanging fruit issues that we can attempt to promote to the federal agencies that they should look at in their design criteria.

Identify Design Directives that affect Low Vision

Comment by [Participant]: I think that one of the things that I feel that we don’t do enough of is really looking at the process of doing environmental programming, where you find out – and I thought about yesterday, because the first step in doing it is finding as much as you can about a profile of your user – you know, and what are their characteristics, and then to think about the next step: What are the design directives based on research that you find that help you to make a decision about what you’re going to do?

There’s an interesting old book that Victor Regnier and Jon Pynoos from USC did that was called, actually, “Design Directives” and – for doing senior housing or whatever it was. And it’s such a wonderful format, you know, because someone who doesn’t know anything about it can look at it and think, oh, you know, that makes sense.

The problem is with so many of these literature searches now, in fact because of the Internet, you get so much junk, and then you get some of these groups that do a
synopsis of research, like in interior design they have informed design from the University of Minnesota, and it's – well, they've already lost their funding.

And the Environmental Design Research Association has another thing that's called Research Design Direct Connection, I think it is, which is a very good synopsis because most people are not researchers and they don't know how to interpret this stuff.

If you can work out some kind of a template or a format for feeding in the wonderful information we got yesterday. I thought, well, you couldn't do any better user profile. I mean, you can add a few little things to it, but it was great. And then, what are the next steps to how do you apply that research that's done, and really talk about “evidence-based design”, [which] is the new buzzword. But it has to be based on a good [research] – I mean, one little article or one little research study that they did at some little university or whatever, and I think that some of the things that I've [seen come] across my desk (and I think ?), why would you research that? So in thinking about some of those things, it helps if you start out with sort of a template that you could follow.

Design (Performance or Prescriptive) Criteria for Contrast and Glare (anchor criteria to safety) in private and public areas

Okay. What about the issues of contrast? That's not really dealt with in any of the criteria, or even looking at contrasts especially in terms of stairs, in terms of hallways, in terms of doors. It's a major topic that could be incorporated in criteria.

Comment by [Participant]: You could define intent without being so prescriptive as to say doors have to be dark and walls have to be light, but defining intent. That's circulation, entrances, vertical circulation; stairs should be enhanced and made safer by providing proper contrast that allows for persons with all levels of vision to progress through space safely.

I think you have to anchor it in a very basic principle – safety – because there people can't challenge it. Safety is safety.

And that's what I think Susan was alluding to yesterday, and that's kind of what I was, talking about yesterday also is that this criteria – I mean, we don't have to get prescriptive – and certainly we'll talk about that a little bit – to do research to bring those findings back into criteria. There's things that we can offer to the agencies to write in the criteria, and that would at least encourage the design team to think about these issues, and right now they probably don't. I think contrast is a good one.

Comment by Fred Krimgold: I think what was mentioned by a number of people yesterday that seems a very important early step, and that is the problem of definition; you mentioned topics but I think we really need to say, where do problems occur? Where are the issues now? What is the evidence of a failure or of a limitation of access so that we're focused on what issue we're looking at before we begin talking about potential solutions, before we begin talking about other factors or even how to deliver the answers. And we have to – in a sense we have to market those problems before we can market the solutions.

Response by [Participant]: A guideline can speak, though, to the designer. It can speak to also the owners' representative, which is our government, because they're also having to review and understand, comprehend and look at and pay for, on behalf of the people, these projects.

So is it fair to say, leading from what you said, that common problems to be avoided are [identified] and just list some of the common problems to give them some intent without actually prescribing it as a solution?

Response by Fred Krimgold: But I think that a disciplined – and some part scientific and some part maybe not – exploration and elaboration of what those issues are and
why they’re important. But why they’re important I think is what Susan was referring to, in part.

Well, I’m not disagreeing. I’m with you, because I’m that “kumbaya” guy – but there is a chance –

Response by Fred Krimgold: Go ahead; disagree.

I’ve known this guy for, what, 30 years? We’ve never had a disagreement.

There is a chance, I think, with [Susan], and I think with Kurt being here, to get something in the criteria very quickly. And, again, I think, as Greg says, it doesn’t have to be prescriptive but it does – I think there’s a chance to get a page in there that says, listen, you should – the design team should look at contrast and the design – there is stuff written about it later but I think it’s a workplace – glare in the workplace, at the workstation, and not really glare in terms of circulation. And I think most designers think, hey, you move down that hallway, you’ll be out of it, you know.

I think the signage issue needs to be discussed. I mean, you know, the door part is there but not really making the signage large enough so that people with –

Comment by Marsha Mazz: Well, signs are already required to be a certain size when they designate permanent rooms and spaces. That’s already in the ADA standards, the contrast –

Well, GSA must not be following that because –

Response by Marsha Mazz: GSA established that standard.

Yeah, I know, but I’m saying I’ve been in enough courthouses I don’t think they’re following that because the signage is pretty small.

Response by Marsha Mazz: The overhead signs and directional signs, it’s slightly different. But for the sign that designates that room, says you are here, there is already a standard for that. Now, any of these standards can be improved, but there is in fact already a standard.

And I completely agree with the comments from my colleague across the table. We’re always asked to explain why – what are the benefits. Just saying that glare is a problem doesn’t tell anybody much about that problem. It doesn’t say why it interferes with someone’s ability to use the building, and if you fix the problem, what the result will be. And I think we need to be able to say that.

Well, I’ve written enough federal design criteria to know that you don’t spend a lot of time talking about those issues. You basically come in and you – it’s direction, and you’ve got GSA/VA here to either agree or disagree with me – where the agencies come in and tell the design team, these are the issues we want you to consider. And sometimes it’s prescriptive, sometimes it’s performance and sometimes it leaves the decision up to the design team. And all I’m saying is –

Comment by Fred Krimgold: And sometimes they’re wrong.

Response by Marsha Mazz: Yes.

Yes, sometimes they’re wrong. But, quite frankly, here’s the part, Fred, if we don’t put it in. we wait for years and years, several years and get [nothing] – well, let me finish. You know, it’s funny; we develop the research – and, as I said, we don’t do research; I’m just saying it is an opportunity to bring this low-vision issue into the criteria, you know, relatively rapidly.

And, again, I’m not saying we do prescriptive or you’ve got to do it this way, but to me it’s a no-brainer to go in and say, listen, consider contrast in circulation [areas]. GSA may have been the lead architect on the signage but I know I’ve been in enough GSA buildings and VA buildings to know that their signage directing people around is problematic for 20/20 vision.
And, Kurt, we've seen that. So, there's no reason not to write something so a design team can deal with it.

And again with glare – I think glare is covered now, although there's no –

Comment by Jim Woods: It's not. It's not.

There's not, in the workplace? So again, there's an issue – glare, not only in the workplace but in circulation. And, again, I've been in enough – especially GSA [facilities] to recognize that you hit that lobby and, even if you're well-sighted, you've got orientation problems. So --

Continued Comment by Jim Woods: Earle, we have criteria right now. The best we've been able to do in the P-100 is have some illumination criteria. The issue for me is accountability, one of the big issues: if we've got measurable criteria in terms that you could design to and evaluate. And we see this in the post-occupancy evaluations all the time. Nobody is accountable for the number. If you don't have the numbers down [defined in] there – and this is a liability issue – designers are going to kill me for this. Okay?

No, they won't kill you for that. If you take –

Continued Comment by Jim Woods: If you get a number down, it has to be measurable, and it has to relate to the psychophysiology of what's going on in a public space or private space. But those are the design issues. Then the architects can start dealing with it and the engineers can start solving some problems. But until you get the criteria, it's very difficult.

Response by [Participant]: There's a basic thing also with glare, and I can speak from this from not having a disability with vision or anything; it's just over time. And what I find myself telling my teenage boys [is] look at that with your young eyes instead of my old eyes, and you deal with it differently.

The concept of glare, as an architecture student, is nowhere near what it is when you're in your 50s or, you know, I'm below those ages where you start defining it as issues. It changes, and so [does] your concept of what the issue is – you can intellectually say you understand it but you don't until you start feeling it or it's a measurable thing that you can identify where that barrier is. So if you have a design criteria that says reduce glare, you know, among the other 2,000 things you've got to do, that one is going to get no attention. It's just the practical way of life.

Question and Comment by Kurt Knight: Is that VA criteria [or] another governmental criteria? I think as far as problem identification, there needs to be some description of the problem. It doesn't need to go on and on forever. For example, if we were going to improve our standards for low vision, we would probably put a statement in our design guidance or someplace that VA recognizes, because of the aging population of its patient load, that low vision is an increasing issue, and therefore we're going to charge the architects with doing something about it at this stage.

And many of these things are architectural-design issues. No matter what you say or what parameters you put down, an architect has to sit down and pick interiors, pick lighting schemes, all that. I don't know how we can do a lot to make that very prescriptive because it's so vast.

Comment by Tom Williams: We have to know what criteria we're working towards. And as somebody said earlier, you have to identify it or define it in some fashion so that it doesn't become a nebulous, subjective criteria that nobody knows or understands until after the building is built and occupied –

I understand that, Tom, but here's my concern – and I'm all for that, okay? I mean, I've pushed measurement for years and years and years. My concern is if we wait for that, if we look at [the P 100], I would say 80 percent of us probably [ignore] it, right?
And same with this. So why do we say, oh, for low vision we’re going to wait until we – I’m saying we need to get stuff in there now.

Comment by Fred Krimgold: What I’m suggesting is that in the process –

Response by Marsha Mazz: Earle, can we take a straw poll right at this very minute and ask how many people in this room are ready to move on to developing guidance and how many are not?

Continued Comment by Fred Krimgold: Let’s define what we mean. But I suggest in a kumbaya –

There’s nothing kumbaya about you.

Continued Comment by Fred Krimgold: I’m making an effort to speak your language, right? But we really embrace a two-track approach, one which is do the best that we can with what we’ve got now, recognizing that there’s a short-term opportunity, and that we do that responsibly, recognizing that it may preempt more accurate, more responsible activity later – so be careful about that – and at the same time not trimming it off but right now laying the foundation to take advantage of the terrific multidisciplinary opportunity represented by this meeting –

I agree.

Continued Comment by Fred Krimgold: The fact is we’ve got experts [here] who really know what the conditions are and that’s in terms of the architectural approach. It’s one thing to say that the architect is the one that has to define the environment and has to choose the materials and so on, but that’s got to be done on the basis of understanding the physiology. That’s got to be done on the basis of understanding the phenomenon. And that’s not simple, it’s not evident, and it’s not intuitive.

Response by [Participant]: But there’s a lot already available.

Continued Comment by Fred Krimgold: Well, what’s available we should apply, but that requires an organized and disciplined approach. But the other thing is that there are a lot of things that aren’t clear or available or resolved, and those we have to recognize and structure an approach to resolve it.

Conflicts with energy requirements and codes

Comment by Jim Woods: One other issue that really is burning me that I want to get on the table right now, and that’s timeliness.

That’s what?

Continued Comment by Jim Woods: Timeliness. We’ve got a huge change – sea change with regard to Zero Net Energy (ZNE) buildings.

Right.

Continued Comment by Jim Woods: A lot of changes are being made in codes and standards, as we speak, to go to Zero Net Energy, which is a thermodynamic impossibility, okay? Now, it’s going to impact lighting like crazy.

Responses from [two Participants]: Oh, yes. Yes

Continued Comment by Jim Woods: And it’s going to impact low-vision persons even worse. So those cases are happening right now. They’re happening. There’s no reason we can’t get in and have something that increases the awareness of what the consequences are in terms of health issues with regard to lighting, et cetera. I don’t think we have a choice but to do some of these right away.
Comment by Greg Knoop: I think we also have to be willing to take one of these to the existing language and find the problem-makers in the codes for this subject matter, not just what do we have to add in but what do we have to take out?

Response by [Participant]: Right.

Continued Comment by Greg Knoop: Things like atriums and courtyards are not program elements; they are solutions. Great space or lobby is the program element. So what we should be careful of is to prescribe a solution that's guised as program space that actually creates problems. Let the solutions of creating a pleasant, low-glare, you know, wonderful environment that does less harm, those solutions come from the architect. We're going to give them a greater hand rather than tying it further. I think that's important to do.

Reduction in lighting power density (watts/sf)

Comment by Robert Dupuy: I think an important thing that's been missing in this whole discussion is energy codes. And the federal government has its own energy code. Every state has some energy code. Cities have energy codes. Some are enforced, some are not. The federal government, on some of the federal projects I've worked on, has said, well, forget the code; don't worry about it. They don't have to comply with states, their law and things like this.

But these codes are definitely causing a major problem for people like myself as a practitioner who deals with this on a daily basis. The watts per square foot, are continually dropping; the technology is not there to compensate for it, and therefore things like me talking about, you know, low vision and people wayfinding and so forth – the codes are requiring us to produce less-light, you know, space. And so there is a huge disconnect going on here that really needs to be addressed. It's really a major problem.

And the Zero Net Energy thing – the LEED buildings, we see lots of facilities for the elderly wanting a LEED certification, LEED gold, all of that. And so, you know, we're looking at 30 percent below code for lighting. Well, that's absurd if you have low vision. Even if you have normal vision it's getting to be ridiculous. It's a major, major issue.

And I think that's what Jim – that's what you were talking about.

Response by Jim Woods: That's exactly what –

And, quite frankly, at least with GSA, almost 100 percent is being driven, you know, in that direction.

Response by Jim Woods: [The political pressure is] huge.

Continued Comment by Robert Dupuy: Absolutely. It's the driving force of building design now – 30 percent reduction in energy and Zero [Net] Energy in the next 15 years. We don't even know how we're going to do it, but that is legislatively mandated. It's not a code.

Response by [Participant]: Right.

Continued Comment by Robert Dupuy: It's a law that says, you shall do this.

No relationship between LEED requirements for certification and health and safety of occupants, especially LV occupants

The other piece is LEED certification. And, again, the A/E's are now mandated to get LEED certification. And, there you've got a bunch of checklists and there's really no relationship between those solutions, that checklist, and any of the issues we're talking about.
Issue 9: What are the top research topics that need to be undertaken (i.e., Identification of R&D Opportunities)?

Okay, let’s go to the next one. I want to try and get through this so we can start [the next panel]. The next one is the one – Fred – Fred, that you have been waiting on with bated breath, and that is to identify any R&D – where are you? – any new R&D.

Large show of interest

Comment by Fred Krimgold: What I was thinking about – what we talked about briefly yesterday at dinner – was the possibility of, right now, from this meeting, identifying people who would be interested in developing a longer-term collaboration for the development of specific research projects that would bring together the talents in the room here. And maybe NIBS could provide a kind of center point for coordinating that activity in the near future.

It was very encouraging to hear that NIH has a serious interest in this area and that apparently the program we heard about yesterday is not the only opportunity. But if we could, leaving here today, have a list of the interested parties and their contact information and a way of pushing this proposal idea – concrete proposal idea forward, that we could do that refinement over the Internet and really come to some specific action in the near term that would not preclude the kind of activity you’re talking about as immediately relevant, but would actually initiate the second track that I mentioned.

Okay, let me – do you want to ask for who would like to be involved in developing a proposal?

Response by Fred Krimgold: Yes, who would be interested in that discussion? Now, a number of issues have been raised. I have a sense that it has been raised.

Keep them up because I’m presuming that Fred would like to sort of honcho that effort.

Response by Fred Krimgold: I’ll share the honcho.

I’m not saying honcho; just kind of, you know. Just keep your hands up, just so she doesn’t – and we’ll send it out to everybody if you decide –

Response by Fred Krimgold: Actually, let me do it the other way. Who doesn’t want to?

NIBS can serve as a forum

All right. Stephanie will send it out and ask you to comment back. And then, I would think, Fred, you might want to put together a small group, identify some topics, and then send that out [to] get a consensus of which project we should go over and go after. And NIBS would be glad to sort of act as that forum.

Response by Fred Krimgold: Excellent.

That would allow federal dollars to transfer. Many of you don’t even know who we are. We’re private, a 501(c)(3), but we actually were established by Congress, so we have enabling legislation that does two really interesting things. This is all building-related. One is it allows the federal agencies to fund my services, my contracts to do certain things – develop criteria and do research, information dissemination, without going through federal procurement requirements, okay? So they don’t have to go out and competitive bid, in essence.

So they can come to us directly if they have a problem and fund us. We have a fairly small staff of about 20, 25 and we go out and contract with experts that basically do the work. The second piece which agencies find interesting is the legislation encourages federal agencies to use the recommendations and criteria that come out of the institute. It doesn’t say we
have to. So it’s not like the federal standards we’re already using, but it says if something comes out in the [form of guidelines or standards], because NIBS is an open, unbiased, no specific constituency, then the agencies are encouraged to use it. So that’s two very beneficial attributes. And we have significant contracts with almost all of the agencies – GSA and military, VA, DOE, DHS that have to deal with buildings.

Are low energy consumption and high lighting quality compatible goals?

Comment by [Participant]: One research area or group we may need to bring [on board] are people who are on the energy side, because they’re the ones we’re arm wrestling over some of these issues. So where have they overstepped and where can they give in order to help us on several topics? So we’re going to need some interaction with your people who are –

Now, yeah, just one small thing [that] keeps coming up. In fact, Susan mentioned it in passing when she [referred to] the energy bill [and indicated that] it [excluded] accessibility. It does and it doesn’t. People list this.

The EISA legislation of 2007 – the Energy Independence and Security Act, which is the last energy law that we have on the books – defines high-performance buildings – there’s a whole section in there on high-performance buildings – defines high-performance buildings as all-inclusive, comprehensive, and in fact mentions things like energy sustainability, security, safety, cost-effective, but it specifically doesn’t mention accessibility only because of some conflict it was in, in Congress at the time, but it does say it should be all-comprehensive, all-inclusive and comprehensive.

And if you go to the criteria – or you go to the website that most federal agencies use to distribute their criteria, which is The Whole Building Design Guide, which is a website out of the institute [NIBS], whole building design is defined including accessibility as a major component of that. So --

Comment by Marsha Maz: And accessibility is a component of sustainability.

Yeah. So it’s in there although the word [accessibility] was not in the definition. Now, most agencies, because of the push towards zero net energy, have excluded all that. I mean, they just focused on green. And, you know, we’re constantly up on the Hill, testifying that the agency shouldn’t forget all of the other things, including functionality, operations and maintenance, accessibility and safety, and all of the other issues; and not just focus on sustainability at this point.

Comment by Kurt Knight: But it is a fact that if solutions are going to be identified in research, they need to recognize that it’s not going to be very appropriate, or you’re going to have a hard sell, if you’re going to double the energy for lighting or something in a building. You have to look for solutions that help the issue but also the energy conservation.

Well, that’s just a game we play in this city. We’ve got a project with the Department of Homeland Security who is interested – all agencies have stovepipes. DHS is interested in glass and chem bio. Okay, that’s what they like. And I’d love to get them in a room with Susan to discuss this.

They’ve recognized they want to develop new glass, new envelope systems that have a higher degree of glass protection, but at least they’ve recognized they’re not going to do that unless those systems are energy conserving and [are from] sustainable materials. So you know, they’ve folded that all in, so everybody has sort of got to ride that horse right now because that’s the horse to ride.

Comment by Kurt Knight: And it’s not just the [energy consumption]. Reality is energy [cost] is going to increase significantly. Ten years from now we’re going to pay a lot more money for energy than we do now, and it’s a major issue for the whole country.
And so, whether you’re private or public sector in that high-performance building group, some companies are thinking about times when they can’t get energy, and how do they continue their operations in that kind of scenario? So [the] energy [issue] is not going to go away; it’s going to get worse or more difficult all the time.

Response by Mary Ann Hay: I don’t think we’re talking about doubling the energy for lighting. I think even if we could have a time-out on the energy-code reductions with lighting it would help tremendously, because what happens is it’s just across-the-board cuts that keep pushing it down further.

And one of the biggest challenges with the energy code is it doesn’t take into account the three-dimensional qualities of the space. So it just looks at the wattage per square foot [of floor area], and that wattage per square foot is the same whether you have an eight-foot ceiling or you have a 20-foot ceiling.

So I think there needs to be a serious look at the energy codes and stopping this drive to just keep reducing and maybe focus on other areas of the built environment where there can be significant energy reductions. But, I mean, for an office environment, one watt a square foot, that’s very difficult to provide a quality illuminated environment that addresses low-vision issues, provides appropriate glare control, provides vertical illumination. You know, there’s a lot of difficulties with that. So to say you have to cut this 30 percent, it’s not going to happen. We’re going to have very low light levels, and the technology, it’s not keeping up with it.

Comment by [Participant]: I think the challenge for us is to take those limitations, though, and find other ways to respond.

Response by [Participant]: Yeah, but if you get pigeonholed into this box, you don’t have enough energy, you can’t meet the minimum lighting codes.

Comment by [Participant]: I think one of the hopes is that we would create the impetus to create better technologies to address these issues, to actually harvest energy that’s free and therefore offset the energy use in buildings. Is that realistic in the next 10 years? It’s hard to say, but if we use more energy to light buildings, then we’re going to have to harvest more energy for those buildings.

Comment by Jim Woods: As part of the research, I would like to attack the myth that lighting is going to cause more [whole building] energy consumption. When we do actual measurements of energy consumption in a building, there has been no change in 30 years against the CBECS database.

**Issue 10: What are the recommendations for long-term activities?**

*Participants agree to working as a Committee*

How does this group see coming back together over some time? Is that advantageous? Should we set up a bloggers site? What are your feelings about this? It’s an area that has not been explored. You’re sort of the pioneers in it. You know, it’s been explored but in a fragmented way.

Question by Fred Krimgold: Can we have some kind of status within NIBS as a temporary committee or as an exploratory committee?

Sure, if that’s the recommendation of the group.

Responses by [three Participants]: “That would be terrific.” “That would be good, yeah.” “Yeah.”

[A committee] or something like that?

Response by [Participant]: NIBS would be a terrific forum.
Okay. You'll have to pick a chairperson because it won't be me.

Comment by [Participant]: We should re-gather in less than six months, because otherwise, three months – some way so that we don’t lose the current –

Response by [Participant]: I think even if we do conference calls.

Yeah, we can do that.

Response by [Participant]: We can do, once a month, once every two months. You can do conference calls at least to keep in touch and then you do another meeting.

And we can set up subcommittees, people who are interested in specific areas.

Comment by [Participant]: Or you can have a taskforce where everybody goes into what they’re interested in and then you have one conference call with everybody so you update on what the task forces are. I think a conference call is not that onerous.

Response by Fred Krimgold: That’s right. I think if we could schedule a point, say, three or four months out as one in which we intend to have some kind of a draft or set of proposals or action initiated by this group and its membership, and either a conference call or some other kind of consultation at that point, that that would be useful. It would give us a framework and that it would allow us to reevaluate –

All right, well, we’ll put something together and send it out and get a consensus from everybody.

Question by [Participant]: Can you set up something on your website for this group that would allow people to post things to it that would be of interest to the group?

Yup. We can set up the website. We can have free conference calls. We can even teleconference if we ever want to. The one restriction is getting travel dollars for you, and we’ll have to get some agency – either GSA or DVA or someone to throw in a few bucks and – to get you here personally, but all the other stuff, we can handle it.

Comment by Tom Williams: I can’t speak for Susan but I’m sure that she’ll support it – and we can get agency money to back up some of this travel.

Comment from Kurt Knight: One of the goals that I think we should come up with in the next three months is some noncontroversial things that we should do in our criteria. The simplest ones – Fred brought up the issue of elevators and the way the numbers are portrayed on the elevators. For us at VA, that’s a no-brainer. I could just go into our master specifications and say it has to be this way. That doesn’t require anybody but me to say, do it. I mean, there’s other things of that type that are small, safety-oriented that we could make some recommendations of guidance or something – guidance would be the word to – that doesn’t need any studies; it doesn’t need a great deal of contravention. It’s obvious and commonsense.

And that was my point in that second piece – to get our foot in the door, to show that it’s an issue. Low vision is an issue. And then we can go from there.

Comment from Marsha Mazz: Just very quickly, coming from the federal agency perspective, I wanted to piggyback on that. I was just going to write an e-mail. But things like contrast, that’s your low-hanging fruit. It’s something that the federal agencies can do right away. And when I had conversations with counsel last night, those were some of the things that we were talking about. What are some of the things that this group can provide in guidance that can be implemented right away? And then it puts you on the map. It lends credence and then [Low Vision] catches the momentum.
Accessibility Stories by Vijay Gupta

Testing the ABA

Just a couple of new stories for you guys. I’ve been here a long time so I know a lot of stories. I came to the U.S. in ’74, and the ABA got passed in ’68. In ’74, I see every morning two young architects. They come in: very good-looking, young and walking good. But at 10:00, I see a lot of noise in the hallways, riding around in the wheelchairs. I see nothing wrong with them. Everything looked really very well.

So finally one day I asked [why were those] rubber tires and these floors are made of [concrete] flooring so noisy. So I asked my colleagues, I said, well, what’s going on? These guys come in looking good; suddenly at 10:00 they got into the wheelchairs, and then this all day, and I’ve been seeing it for four or five days.

They said, well, they’re testing the American barriers – like what barriers, architectural barriers to see what barriers need to be moved to have easy access.

And, you know, in 40 years, a lot of progress, but it took so long to get to this point. Even now, like Tom was saying yesterday, there are issues with the doors, there are issues with the [elevators]. Still there are issues for future access. But I see a lot of opportunity and I think it can be achieved. It will take a lot of experience, a lot of [work]. That’s one story I wanted to tell.

Uncertainties

The other story is, we had a chief judge in Los Angeles and the building, 1970 design, and bathrooms were really old. He’s very unhappy with the bathroom, so he called the GSA manager: I want to get my bathroom redone. I want a brand-new bathroom.

So it took about three, four months, and the judge opened the bathroom and he looks in there. He saw handicap-accessible grab bars [on the wall] – high up. And he [had a discussion] with the building manager. I’m going to put you in [jail]. He said, but I had nothing to do with it. Talk to the design folks.

So he called the project manager and he was so mad. He said, do I look handicapped? I never asked you to – he said, Judge, that’s the law, and the law was passed by Congress, and everybody has to comply with the law – handicapped bathroom within so many feet. We have to have a handicapped bathroom. He mumbled and grumbled but it’s too late; now it’s already built.

Anyhow, about six months later he went on a fishing trip in Wyoming somewhere, and he slipped on the rock [while he was] fishing and he had vertical fractures in both his legs. He was in surgery and all that good stuff for six months. He came back six months later on crutches.

So he called the project manager and the building manager. He thanked both of them for building the bathroom there. And now he said, I want you to build the whole area so I can go in my wheelchair.

Comment by Marsha Mazza: It just proves that disability is the only minority group you get to join after birth.

And, [this] judge was so powerful but he was going to [approve] some $300 million for new projects within the POE. And when we did the POE, we had to do the justification for the POE: I want new courtroom.

So he came with the crutches but he wanted to make sure that we didn’t take the video while he uses the crutches. He sat down nicely, but he didn’t want anyone to know that he’s handicapped, [so he ordered that the design team] put a barricade or some kind of a banister.
so you couldn’t see him going on the wheelchair. So he [became aware of the need for accessibility design] changes as well of their disabilities.

Anyhow, those are the stories.

Comment by Earle Kennett: Okay. Thank you, Vijay. Vijay is full of stories. You should travel around the country with him.

Panel 4: Natural Lighting (Thomas Williams, AIA, Moderator)

Tom Williams, AIA, National Accessibility Officer, GSA, Public Buildings Service

Introductory comments based on a Recent Article on Daylighting in Architectural Record (2009)

The subject matter for our panel is natural lighting. I’m not an expert – I am an architect – but I did do a little reading. There was an interesting article in the Architectural Record in 2009 on daylighting. It was weighted toward energy conservation, energy savings, but also there are a lot of issues in that daylighting article that I think are very pertinent to our topics for the workshop.

I want to make a couple of quotes from it and then sort of go through some of the things that the article brings out, because I think I can do that very quickly if it kind of piques your interest, and point out some of the things that architects [try to] mitigate – problems for [design solutions].

And first of all I would say that none of us can do without sunlight. Sunlight is an essential part of human life. You know, doctors recommend at least 10 minutes of exposure to natural sunlight a day so that you can produce enough Vitamin D in your body to keep your bones strong.

So we’re not hermits. We don’t live in caves. We do have to expose ourselves to some sun. The question is, how do we control it an indoor environment so that it doesn’t become a hindrance in what we do, especially if we’re sitting in front of computer screens in federal agencies or private sector offices, whatever [we do in buildings] today.

(Tom will provide copy of article or a complete reference to it.)

Two interesting quotations at beginning of the article:

The article has an interesting quote at the beginning of the article that I wanted to share. “A central challenge of effective daylighting design is allowing natural light to penetrate deep into the interior spaces while eliminating glare and heat gain or loss.”

“One of the most common failures today in daylighting strategies is glare control. Large window areas provide generous amounts of daylight to task areas, but if daylight is not properly regulated, glare results, particularly in today’s computer environment.”

Solar Gain and Glare are Major Issues for Energy Control

So that’s a big issue, solar gain and glare. For those of you that are dealing with energy control in buildings, that’s a major issue. It’s a major issue in our federal buildings, which have large glass exposures and often because of design policies that were originated with Design Excellence – enormous glass atriums, which are, in and of themselves, very problematic for energy mandates now coming out of the White House and so forth.
Architectural Control Techniques for Daylighting

So what are the techniques that are used to control daylighting that architects can take advantage of? Well, this whole myriad of starting with the exterior of the building wall. There are various things now that automate louver systems that have controllers – computer-operated controllers that are geared to the action of the sun, prevailing cloud cover, et cetera, and how the louver systems on the exterior of a building will control the daylight entering it.

This also can apply to interior blind systems. There actually are automated blind systems that have been developed that allow blinds to raise and lower and to adjust the angle of the louvers in the blinds so that they can compensate for the angle of the sun coming into a building, and reduce glare. So the blinds can be lowered so that you don't get glare into a work area at the times of day when the sun is penetrating, and raise it at other times of the day.

Building Orientation and Areas of Glazing

Of course, we all know the basics of architectural design is your north and south exposures of a building are the ones that are least – that are most uniform in terms of light. They're the ones that are the easiest to control. It's those east and west orientations where we tend to get the most glare penetration into a building because of the severe angles of sun -- sunlight, sunset, time of day, et cetera, to deal with.

Exterior Louvers and Light Shelves

So starting with the exterior, there are louver systems. There are what are called light shelves, which are horizontal elements that can be built into the building façade that will bounce light to the ceiling on the interior space and allow it to penetrate deeply into the space and reflect light downward into space, but will not allow it to penetrate directly into the space.

Those are good in certain environments, not all environments. What you would do in Texas or Arizona would not be the same thing you would do if you were living in New England or in the South or in the Pacific Northwest. There are all kinds of variables.

Then we go from those systems, which can be eliminated and sometimes are. Some of our GSA buildings have automated systems of this type and use light shelves and some of these elements.

Glazing Systems

The next line of defense is the glazing system. And shading can occur both inside and outside. So you have a choice of different kinds of shading. Some light shades are actually built in the envelope. If you have a double-glazing system, they're actually located in the envelope inside the two layers of glass – can be automated, can produce great energy savings as well as providing the shade for the light, controlling the glare.

The probably least effective and most commonly used exterior controls on windows, which are louver systems of all kinds and whatever, you get solar gain though glass that way. You don't control that, so your heat load inside the space is going to tend to be the highest level of heat load because you're controlling it from the inside rather than from the outside.

On the exterior of the glass, the glazing systems, there are several ways of dealing with that. Glass today can have a tint built into it. It can receive various kinds of coatings. There are double-glazing systems, triple-glazing systems. It can have interior coatings as well. Some of the most recent coatings are very, very effective at reducing solar energy in interior spaces as well as controlling the level of light that you get.
Interior Blind Systems

[Automated blind systems have been developed that allow blinds to raise and lower and to adjust the angle of the louvers in the blinds so that they can compensate for the angle of the sun coming into a building, and reduce glare. [Editor's note: this statement was previously made by Tom, and added here for consistency]

Energy Implications

So, there are a lot of different techniques that can be used in designing buildings to control sunlight that comes in and achieve some of the results that we need to control solar glare for those with low vision. That's kind of an area of design that is a specialty area. There are many, many companies that specialize in one component or the other of this. It's the architect's job to look at the whole global picture of what's available on a palette, on a design palette, to deal with all of these issues of sunlight control in the building space.

And I don't want to say a lot more than that. The article is very interesting and the record is – it has a lot of different solutions that have been developed. Some issues about glass I didn't know. There's this new kind of coated glass called sputter-coated glass, which actually uses a thin layer of silver that can be applied to the glass. This is one of the best, probably the most recent light coating out there. It really has a huge ability to control solar gain.

And that plays into all the issues about energy mandates and controlling how much heat [transfer that occurs] in the building, et cetera, and heat loss as well because these reflectivity possibilities with glass can apply either to preventing sun from coming in and heat gain, or they can also work the opposite to keep you from losing heat in cold environments. So there are just multiple issues out there and many, many ways of handing it.

I've said enough. The panel here today is comprised of folks you've already – I think with the exception of Mark. Mark, were you on a panel –

Mark J. Mazz, AIA: Architectural Consultant on Accessibility

Introduction

My presentation is coming at it from a different angle, different direction (slide 1). I don't design buildings anymore because I like being self-employed without employees. And what I find that I do best is defining what is required for accessibility, particularly with the ADA or the Fair Housing Act, or even the Architectural Barriers Act.

Quality Assurance

Standards vs. Standard of Care

[The easiest thing to do to tell an architect or a builder they did something wrong is point to the standard and say: This is what you're supposed to do; this is what you didn't do. When there's not a clearly defined standard, the next thing you go to is what is the "standard of care"? And if you have design criteria that says you shall not produce glare, and call that a "performance standard," it also becomes something that architects have to do as part of their standard of care; and therefore that's the level at which they're liable to.

Measurable Design Criteria

So, I get worried when things start getting written down, if they're not clear and if they're not measurable. Performance-based [design] is a great way to talk about stuff, but it is a very
difficult way to prove that you – or convince a judge or a jury that you did what you were supposed to do and you didn’t do anything wrong.

**Daylighting and Architectural Photography**

**Residential Example (slide 2)**

With that, moving into a few images that I wanted to show, on this first slide (slide 2) you can tell it wasn’t taken by an architect because the base isn’t precisely centered on the table. The reason I’m showing this photo is, first of all, when architects or anybody taking architectural photography tries to show daylight, the easiest way they convince people they’ve got beautiful daylight coming in is they show the contrasting shadows that hit the floor and hit the walls and stuff and see the light that’s coming in from outside.

You don’t see the light sources here. It’s coming in from third-story windows above. There is no artificial light in this space. I believe it’s coming in from all four walls and from up above. It’s an interior room. And also there’s borrowed light coming in from the outside, from the covered porch outside. By having that much nice diffused light coming in, it sort of balances out some of the direct light that’s coming in from the porch behind. You do have shadows. That’s how you can tell the base is round and not flat. You see it start here in the area closer to the camera lens. And it just – it looks nice. It’s a wonderful space to be in. I highly recommend it.

**Ultimate Daylight (slide 3)**

Here you’ve got the ultimate daylight, because you’re outside (slide 3). And it’s a place that, if you’ve got teenage boys who want to see lava flow, it’s a great place to go. However, you really can’t make it a family event if your wife has low vision, because there’s not enough contrast going on with the black surface, it’s not a predictable surface, and walking is a nightmare. Consequently, the boys didn’t get to see the lava. We had to stop short because they were there for two hours and only walking about a quarter of a mile. It was just too much for all of us to bear. But here again, daylight is a great thing, but it doesn’t always solve all the problems that are going on in the area.

**Public Space Example (slide 4)**

And the third one (slide 4), which I don’t know if this would be a space that you all would agree with me – I think is an absolutely delightful space. What’s hard is, it’s the C terminal at the National Airport. You have light coming in from two major walls; one’s east, one’s west. The east wall is probably 30 feet high with the sun coming in. You have daylight coming through skylights above. You have a ceiling that helps diffuse the light as it comes through. And then you have more borrowed light coming in from the west side.

Again, when architects try and take photographs of this space – this isn’t mine; I just grabbed it off a website – they love to show the shadow lines and how all the natural light comes in. But it’s a space that, when you walk through you can feel the colors, you feel the size of it, and everything seems to work well.

Again, maybe my eyes are still younger than the eyes that start having trouble dealing with glare and stuff, but daylight is a good thing to incorporate. And the more daylight, the better, because you can deal with more colors and the contrasting issue does not become as severe, and the glare isn’t as severe if you bring it in well.

**Some Design Guidance for Daylighting**

Some of the things that I learned 30 years ago in school are:

1. Don’t bring daylight in on one wall; try and bring it in from more than one direction. It takes advantage of the fact that the sun is doing different things outside, and it
balances out the one-source issue of bringing it through one wall. It may be more
difficult in office buildings, particularly when you have a 10-foot floor-to-floor height in
Washington, D.C. But you get the interplay with the colors.

2. You have to still deal with glare by diffusing the light when it comes in. Things work
out better that way.

3. Shadows are not a bad thing. Shadows are very good for a lot of aspects of things.
And yesterday, listening to stuff, I got the sense that shadows were being considered
a bad idea. But you don’t see corners if you don’t have shadows. As an example, in
this dark corner over here [pointing in the room], you can tell you have a corner there
because one side is almost in full shadow, even though you have ambient light hitting
it. That’s how we know there’s a line there that points in a direction.

Another example would be what I commented yesterday, that I did not see the curve
in the one slide that Fred showed. It’s a good idea. It helps create vocabulary, that
when you see that stripe of darker tile, of darker brick, that there’s going to be a step-
down at that point. But visually, the photo cuts off the ends of it where you can see
the actual step down. And depending on the clarity of the photo, you can’t really see
that, because there isn’t a shadow line showing the top edge, the visual cue that’s
used by quite a few people.

Now, granted, if I was talking to somebody, out of the corner of my eye I would
assume there’s a step there because of the darkness. And when you start creating
the vocabulary of using a dark strip against a light strip as a step, it’s something you
have to be mindful of other areas, too, where you’re just doing some landscaping
details and you want to either accentuate the entrance to a building, not using a step
of any kind because of dark versus light. You may start creating images. If the
vocabulary becomes too strong and too consistent everywhere, it can create that
image that you’ve got a step there, and you don’t.

This is something that I see. It gets confusing when people are trying to do things to
denote certain areas, but then all of a sudden you start seeing steps. The classic
example, where Bob mentioned about the carpet runner upstairs stopping before the
end of the step, is something that should be just a visual faux pas for any architect or
any designer that they shouldn’t do, because they know that’s a natural tendency
[stepping] point.

4. The shape of the ceilings can make a big difference as well, how you bring the light
in, how you treat the lights so that you have ambient light throughout the room.
Fred’s example of Metro: there’s a perfect one showing how you’re never going to be
able to solve the problem down there because of the coffered ceilings. How much
light would you have to bring in to make that happen? This is a little off the topic.

**Measurability is a Major Issue**

The other thing of dealing with measurability is, if you’re dealing with light levels in a room,
you try and measure the lumens or the foot-candles on the surface of your desk. That can be
done. You know, when you’re bringing daylight and stuff, you can bring the light levels up
high enough at that point.

But I’m unaware of a way that you can actually measure the light in such a way that you take
care of glare issues or some other measurement that can be used and incorporated into the
energy guidelines to get at the issues of dealing with glare as Tom pointed out. It’s a big
issue. I mean, you can get the 50 foot-candles on the desktop, but you don’t necessarily get
at glare in a useful fashion. Thank you.

**Comment by Tom Williams:** When we’re talking about the 50 foot-candles in office
space, some information is out there about the amount of foot-candles that are produced
outside. The sun provides about 7 (thousand) to 10,000 foot-candles. So you’re really
damping down when you talk about task lighting and working inside a closed environment. There’s a huge difference. The light is free outside. Trying to channel that light so that it allows us to work comfortably inside, that’s a huge challenge.

Mariana Figueiro, Ph.D. 24-hr Lighting Schemes for Older Adults and Persons with Low Vision

Introduction

I will [restate] a little bit on what I started to talk about yesterday and talk a little bit more about buildings rather than just residences.

The Circadian System (slide 2)

We talked about the circadian system yesterday. All the rhythms in our body [run on] approximately 24 hour light-dark cycles. We have a circadian system that runs with timing slightly greater than 24 hours. We need morning light so that every day is synchronized. And we set our internal clock so that it runs with 24 – rather than 24.2 hours on average.

New Paradigm for Light (slide 3)

Intensity or Quantity

[Lighting attributes include]: intensity or quantity – “intensity” probably is the wrong word; “quantity” would be the right word – spectrum, which is the color of light, distribution, timing and duration.

Notwithstanding people with low vision or the aging eye -- we tend to see at low-light level. We tend to be able to, when we’re young and we don’t have visual problems, we tend to be able to navigate in the space at night with a nightlight, or not with light, because we tend to have a good visual system that works at lower-light levels.

Well, the circadian system needs a lot more light. You really navigate in the space at night with a nightlight; you’re not impacting your circadian system even though you can see.

Spectrum or Color

In terms of color of light, we talked about the circadian system being a blue sky detector, and I’ll show you a few numbers that will put in context with – I think the argument we had yesterday about 17,000K really put daylight into perspective. If you want to add the 17,000K more instead of daylight in the space, it’s another alternative. I’m sure it’s going to be much better accepted than a 17,000K-lamp.

Distribution

And in terms of distribution, we talked a lot about glare, and a [visual system] is very sensitive to how you provide the light. For general comfort, the circadian system needs the light to reach the back of the eye.

There was a study done in 1998 that was actually published in Science out of Cornell saying that if you put light on the back of the knee, you were able to [adjust] your circadian clock. There were five studies that were never able to replicate that. It does seem like chickens – if you put light on the skull of a chicken, they will respond to light with the circadian system. But we have thick skulls and we really need the light reaching the retina.
So, when you think about designing lighting for the circadian system, you have to think about how the light reaches the retina.

**Timing and Duration**

We really should start thinking about not static light in the environment, but dynamic lighting in the environment. And that might take care of some of the energy issues. And it also helps with the circadian system.

You really need some light in the morning. A lot of people say, well, how much light do I need? Right now, you know, if you go for half-hour, 45 minutes of a walk outside, you've pretty much had enough light to synchronize your circadian system every day.

So you could have dynamic lighting where you have high light levels in the morning and pretty much [the same] or more daylight in the space, and then you bring it down towards the end of the day when you don't need as much light.

And in terms of duration, the visual system is very quick to respond. The circadian system takes at least five or 10 minutes for you to start seeing a measurable effect.

So, again, those are challenges for the future, but I guess when we start talking about zero-energy buildings, when we start talking about guidelines and so on, we have to remember that if we solve one problem, we might be creating other problems.

**Melatonin Suppression**

Again, this is to achieve – what we call achieve 50-percent melatonin suppression. Melatonin is a hormone we produce at night under conditions of darkness, and it's been associated with a series of things, including sleeping.

The only thing melatonin really does: it's a signal. It tells your body it's nighttime. Since you're a diurnal species, you're going to go to sleep at night. Mice, which is a nocturnal species, are going to be active at night with high melatonin levels. And so, really, melatonin is a timing signal, okay? And, if you get enough light in the middle of the night, you're going to cease melatonin production, suppress melatonin. We now know that that's not something you want to do. You do not want to suppress melatonin at night, and you want to be able not to have any melatonin early in the morning when you first get up. You naturally don't produce it during the day.

**Illuminance and Relative Electrical Power to achieve 50% Melatonin Suppression (slide 4)**

Okay, so this is just a surrogate for how it impacts the circadian system. So, if you're looking at the different light sources, if you look at a blue LED, which is literally a blue light, you need a lot less light in terms of lux – and that's just converting using the right spectral sensitivity function – I’m not going to get there but, trust me, those numbers are taking into account how the circadian system responds to light. If you look at a 3,300K florescent lamp – which is what you see in the space of a 4,100K, you need a lot more light to be able to activate the circadian system than you need with a blue LED, for example, or with a light source like a daylight light source, which is a 6,500K light.

**Light and the Circadian System (slide 5)**

The function of the wavelength in the X axis and the relative efficiency, which is this red curve, is what we talked yesterday. This is the photopic luminous efficiency function. It’s what your light meter is typically calibrated to.

All the energy that falls under this photopic curve is involved with this photopic luminous efficiency function, and it gives you movements. The black curve represents the circadian
response. And as you can see, we’re really looking at blue light in terms of the circadian system.

A lot of energy is required to get a lot of lumens per watt, which is basically what you care about when you talk about a zero-energy building, or an energy efficient building. You’re using a lot of watts that are not necessarily going to impact your circadian system. So is that the right way to go?

**Daylighting and the Circadian System (slide 6)**

Now, as a coincidence, this is the spectral power distribution of the north sky at noontime. And as you can see, if you go back and forth [between slides 5 and 6], daylight puts a lot of the energy exactly where your circadian system is maximally sensitive. So, it’s a really good light source for the circadian system.

If you can bring daylight into the space, it is a natural light source that does give the right circadian stimulation. It gives enough high light levels and gives the light spectrum. So it is a very nice light source for impacting the circadian system.

**Research Projects**

Light has been shown to impact all of these different groups of people (slide 7).

I’m just going to briefly talk about a couple of projects we did.

There were studies done in California a few years ago saying that daylight in schools impacts test scores and that daylight impacts performance. There was a publication out of the National Academy that criticized the results, basically saying that it was a ménage of studies and that obviously when you collect a large amount of data you are bound to get some statistical significance. So there was some controversy about it.

The approach we took was: Well, if light really impacts performance in kids or in offices, it may be through its impact on maintaining that synchrony with the solar day. It may be that in the wintertime you go to work in the dark, you come back in the dark, and you may not get, in your cubicle, enough light to synchronize your circadian system.

**Daylight in Schools**

So, in a middle school in North Carolina (slide 8), which has beautiful daylighting design, we collected dim-light melatonin onset data from students, which is really the timing which the melatonin starts rising in the evening. That is associated with your bedtime. You would typically go to bed about a couple of hours after your, what we call DLMO, or dim-light melatonin onset. So the later your melatonin starts rising, the later the bedtime.

Kids have a fixed time to wake up to get the school bus. So we measured their dim-light melatonin onset prior to the intervention, and then we gave them those really goofy orange glasses (slide 9). They used [the glasses] for a week in school. It was really cool to see them wearing these things.

But what these glasses do – if you look at the upper graph [in slide 9] - is basically cut your blue light. So you can see that you don’t have the circadian stimulation. So it’s like being in biological darkness, for the circadian system.

And what we saw, which is the graph in the bottom [of slide 9], is a delay in the dim-light melatonin onset from Monday to Friday by about a half-hour. So, only with five days of the intervention, not getting the morning light through the school, it delayed their bedtimes and it delayed the amount of time they slept.

So if you consider that throughout the whole winter, it may be chronic sleep deprivation that the kids might be exposed to. And it may explain why they may not perform better -- especially in the first part of the morning, which is what typically they have trouble with.
**Windows in Office Spaces**

The other study, conducted in 2002, was a little bit disappointing. We looked at spaces that had windows and non-windows. It was a matched population of a group of software designers that all had the same tasks. They were two-person offices. Half of the offices had daylight; the other half didn’t.

And we looked at the amount of time they were spending doing computer work, paperwork, talking, and so on [slide 10]. And what we saw was, in terms of occupancy, whether [the space] had a window or not didn’t make any difference in the wintertime. It was the amount of time you were in your office. Nobody was in their office more than half of the time.

But we did see an increase in times that people spent on the computer. That was a significant increase, suggesting that yes, in the wintertime, if they had a window in their offices, they did have an increase in productivity.

However, as with every research we do, you always have to be cautioned about your results. If we are not able to replicate our results. We went back to this place, and we were not able to replicate those results. It could be that when we went back there was a lot of changes in the organization; it was a much smaller group. For whatever reason, we never replicated those studies.

So, can I tell you that daylighting may impact productivity in offices? To me it’s still up in the air, and I don’t think I have enough data to support a statement like that.

**Summary (slide 11)**

I think more research is needed in terms of how daylighting may impact performance productivity in the workplace. And, if it does, it may be through maintaining synchronization with the circadian system.

So, even though we’re not ready for giving recommendations in terms of the non-visual effect of light, we have to remember that whatever recommendations we give may impact the other side of light [i.e., the circadian system].

Those with low vision may actually suffer from circadian disruption more than those without vision problems.

Daylighting does deliver the right amount of spectral timing and duration of light to positively impact the circadian system.

Daylighting in a space needs to be quantified. Just having a small window doesn’t mean you have [effective] daylighting in a space. Or having too much daylight where you have to control it because it’s glaring and uncomfortable also doesn’t mean you have [effective] daylighting in a space. So, it is important to define [effective] daylighting in a space, before we can make any statement on that.

**Discussion**

**Performance and Productivity**

**Comment by Tom Williams:** It’s interesting to me that there doesn’t seem to be any more research out there on the connection of daylight to productivity. That’s almost amazing, that scientifically there isn’t any kind of support for that.

**Response by Mariana Figueiro:** Measuring productivity is really hard.

**Comment by Jeanne Halloin:** The Heschong-Mahone Group out of California has other daylighting research on productivity, both in schools, and then they also did one in Wal-Mart where in the daylit areas, no matter what was being sold there, they sold like 50 percent more
in the stores. So I think there are two other studies that -- if we want to start talking about daylight -- that we could look at.

Response by Mariana Figueiro: Actually, that study was the one with the schools that the National Academy questioned. So there’s still some debate about the Heschong study. Some people agree with it; other people still have some questions about the data, how the variance explains the data and so on. In [the Heschong study] with performance in offices, they weren’t able to replicate with daylight. Measuring productivity is really hard, especially measuring productivity in the field.

Greg Knoop. Daylighting

Introduction

I remember when I was a student. The first year I had to purchase a book called “Sun, Wind and Light.” It’s a popular educational book. It taught us that the world around us has resources -- sun – sunlight – that it’s harvestable, that is usable; that ancient societies, even leading up to only a hundred years ago, actually harvested it as a resource. And harvest is not just simply to let it in, but it’s actually to manage, manipulate and control and make use of that resource.

Benefits and Challenges of Daylighting (slides 2 – 4)

Benefits (slide 2)

Daylighting has tremendous benefits: provides illumination for space, free illumination, provides thermal benefits in the areas of certain climates. It gives us energy savings from actually using electronic light sources, or it allows us to use electronic light sources in a sophisticated way with daylight sensors and other means.

It gives us a connection to the exterior, the natural world. We’ve talked about the circadian issues. It has great spatial impact which creates inspiration and beauty within our spaces. And, here is the classic example: the oculus (slide 2) providing light to our oculus, which receives that light as inspiration, beauty and a connection to the world -- to God in this case, or to gods.

Challenges (slides 3 and 4)

Daylighting in buildings, the potential challenges here are uncontrolled glare; the lack of transitions that can be overpowering. This is not just for a special population; this is for all of us. It’s funny that a lot of these studies show the glare on the computer. How about the glare on the person with glasses, or the glare on the person facing that sunlight because of bad orientation of a work station?

Uncontrolled heat gain. Again, we talked about uncontrolled, meaning that we have the ability to control our destiny by applying good, proper design. Let’s kick it back to old school. Let’s forget about when we could just air-condition the hell out of spaces, light the hell out of spaces, black-out spaces that we just put windows in, because we wanted the windows for the exterior effect but we didn’t want to actually look out those windows. But we control our destiny. We are architects, we are engineers, we should take control.

We have reflections issues. And location, location, location. [Light] can be an effective tool to draw us to a specific location. It can also be an ineffective tool, if it actually draws us away or pushes us away. So, where you place that lighting is critical. Design with it. Or no light at all: Obviously, there are cases where that can be a negative, or in some cases, if you don’t want somebody to go down that hall – maybe it has a dark end -- and that’s to say that’s not our destination. So, light can communicate, and buildings need to communicate to their users.
Why contemporary architecture is challenged (slide 4). Well, of late, in our particular issue, we seem to be at war with energy savings as one side of the coin and providing proper lighting as another side. Is that necessarily a battle, or is it just a challenge? I believe it’s a challenge.

There is a desire to bring in as much light as possible. Give us huge “lightscapes;” give us atriums. That will bring in a lot of light. Now we can’t use the atrium because it’s overpowering. So, harvest light intelligently. Harvest light appropriately.

New technologies: The window. A hundred-and-twenty years ago, windows – that’s as big as a glass pane could be, you know, 150 years ago. Technology has allowed us to be greedy with less. That’s what it is. We’re glass gluttons. And we just eat it up. We just take it in. We’ve lost the ability to savor the flavor of glass, to savor light. We just take it all in, but we’re not savoring it, tasting it, using it, making it ours, owning it in a way that’s intelligent.

Aesthetics with these new technologies. We create “excellence” by the photographs that we look at. In fact, we have awards committees who never see the spaces; never walk, smell, taste, encounter or feel the overpowering heat or the cold of the space or the glint of a light fixture that’s poorly placed. And yet, they give an award to those spaces because the photography was so excellent as to make us believe that that space was good. And if you don’t believe that, just go watch “Star Wars” again. Go watch a “Star Wars” movie, and see what the technology can make us believe.

And we have a faster-paced productivity in buildings. We’re less patient. Here, we have building traditions that some of them have gone for thousands of years: [from] classical architecture to Beaux-Arts architecture at the turn of our century. It’s a 2,000-year tradition. Now, of course, it’s changed over that period, but you see a tradition that has developed and had time to gestate as a building and design tradition. And yet, over the last 120 years, we have been through as many design labels and stylistic labels as there are pages in an encyclopedia.

We’re constantly changing. None of our traditions are having time to gestate. And the way we produce projects, it’s faster, faster, faster, and lower costs, and now give me the most excellent design possible. You get what you pay for.

And then there’s project accountability, and maybe some of it should be are we honorable? There are actual societal traditions that look at, you know, the honorableness of what you’ve produced. Now we depend on lawyers to fight it out, and hopefully the language is a variance.

Problems with Daylighting (slides 5 and 6)

Examples of Problems (slide 5)

Here are some spaces that were wonderfully intended, but here are the worst cases.

On the right we see this enormous atrium. Look at this uncontrolled light.

Here is a courtroom on the upper left-hand corner, where that swath of light is overpowering. I think this was either taken by my father or you, Jim, but that’s how my father encountered it, much worse than that. You’re looking at just a beam of light. Imagine your fate as a person [who is being tried in] a space like that.

Comment by Earle Kennett: I’ll tell you the argument about that, because I know this courthouse pretty well, and you’re looking from the jury [box] here. The jury [was expected to feel] more comfortable being able to look outside. That was the design intent.

Response by Greg Knoop: Did the intent drive the solution or did the solution drive the excuse of the intent?
And then, finally, a comment on office space in any one of our buildings, and it just shows the uncontrolled interior and exterior light – no blinds. I mean, what’s wrong with a mini-blind? It may actually help dissipate some of that harsh contrast as my father looks at the person and says, who the hell are you?

Photographs can’t always hide the Problem (slide 6)

All of us architects here, and I’m sure many other professionals, are guilty of not realizing some of the things that we bring into projects. Here, from our collection in our office, [we are] trying to photograph a space that we designed well-intended. This is for a health-care client:

In photograph one [upper left], ‘I don’t like all [of] the glare that came from that one light at the end.’

So then another day we come up there and, ‘oh, well, that’s very dramatic but, ooh, that’s a little bit harsh’ [photo at bottom].

Now, of course we were harvesting it for the interior spaces that were using it, all well-intended. ‘Let’s just photograph it at night [photo at right]. That looks a lot better.’

But, you know, here’s an example of, ‘hey, we’ve got to show our great space.’ And so, the photographer goes to work. And, we didn’t do that with any ill intent, but we missed something.

We needed to be better informed, and that’s why we’re here, actually: as leaders in this process, to bring an impetus for a better mode of practice [and] to create a new layer of understanding for practice of architecture and engineering instruction.

Comment by Tom Williams: I think one of the major faults in architects now comes out of the mentality of architectural schools. The jury system at architectural schools was always geared to the visual image that you produced in a project. When I was in school we used three-dimensional models as well, but still, people knew very little of that kind of back in the ‘60s when I was in school, about the effect of light glare, et cetera, on an interior space.

We were looking at passing the buildings and, you know, making a slick-looking presentation to wow the judges with. And that’s what happens with our jurors, our peers. We had peer reviews and we had our fellow classmates sitting there while we were being embarrassed by our professors.

The bottom line of this is this kind of mentality still prevails, and it prevails at GSA, our agency, where we have these peer reviews in the design excellence program. It’s all about what the peers say. Well, they’re all oriented to this visual image of the building, like you said. A lot of times they never go to these buildings and never experience the actual space. They look at all these slick presentations and decide what they like and don’t like. And that’s not the way you can judge whether a building is successful or not.

Response by Greg Knoop: Because the tradition was born out of the art tradition. Architecture is art. But it is a unique art; it’s more of a craft. It’s a special form that is for a user. First you provide shelter, safety. That’s our primary mandate – safety and shelter. And yet, we are letting abstract art drive the tradition.

Comment by [Participant]: I’d like to say that we have overdone shelter by blocking so much of the daylight. You know, we think shelter from the elements.

Response by Greg Knoop: Well, again, my point is that, regionally, we have to look for the regional architects who are living in [those] climates: they need to harvest and make use of the world around them. And we can encourage the [development of] code systems [and] other means, not just simply to do it because you get LEED™ points, but actually to improve the use of the elements around us.
Designing for Persons with Low Vision (slides 7-12)

If we’re designing for people with limited vision, let’s just give ourselves some reminders (slide 7). It’s not designing for the blind. We’re not designing just to be dull. You know, we’re not saying take all the art out of it; we’re saying put a little bit more sophistication in the approach. We’re designing to control light, not just to give it up, not to turn it on full blast, but to actually to manage and control it.

We’re designing to let the daylighting become part of a high-definition environment. And that’s really what we need to do for our group – a high-definition environment so that people can see as their vision is degrading. We’re raising the bar and we’re endeavoring to create new high-definition architecture.

Historic Examples (slides 8 and 9)

There are historic precedents for ways to manage our light and do so very beautifully. In the Middle East, for instance, light is overbearing, intense. They live in climates – at least in the desert areas – that are overwhelming. They use courtyards, mashrabiya screens, deep overhangs, and all sorts of means to manage light as well as other elements and actually to harvest them and make them beneficial to the buildings, including privacy and other issues.

This is our National Cathedral [slide 8, left photo], and just a reminder that even the ancient cathedrals of Europe, stained glass and other elements, although they might seem like they could be a dark space, they did provide inspiring, interesting and varied light.

Whether classical architecture – here is a close-up of a mashrabiya screen [slide 9, left photo] – classical architecture with layering of the façade in order to create sort of a transitional point between the light source – this is our embassy in Chile [slide 9, right photo].

Modern Examples (slide 10)

Here is [transitional] space, a successful part of that design (upper left photo). Here is the Louvre over in Paris (right photo). They just used technology by putting a screening cloth in there, these giant pyramids, to create a really beautiful space.

Curtains, used smartly, can be effective (lower left photo). Now, that might be a little bit of a glare spot there, that’s probably because it’s uncontrolled back there.

There’s lots of technologies for overhangs and other things to assist in managing light as it hits the façade. But, again, they’ve kind of created the need for that because of the way they used glass: ‘Let’s just use a ton of glass until it hurts.’ Now we’re going to have to manage it. All right, let’s step back; let’s take some value managed concept on that. What’s getting us the best value?

Design Processes and Tools (slides 11 and 12)

We need to [incorporate] smart design and worthwhile investment (slide 11). Let’s get the best value solutions. Let’s start with an inclusive design concept, not just ‘I want to be a sculptural architect and do something really wickedly cool,’ but ‘I am addressing an owner and a population.’ Design for our population. Go back to basics.

Building orientation: Address it, not just with the whole building but even the details of the building, how they [should] address orientation, planned fenestration, holistic design.

Seek out technologies that support details that help the design aesthetic. So, it doesn’t mean that we just -- okay, we wanted a big glass; now we’ve got to stick something on it. Now we integrate those things and make it part of a better aesthetic.

And then there are available tools in computer modeling, and I’ll just show you this (slide 12). We did this space for Kaiser Permanente. This little one here (lower right photo) is the computer model of the space, and this is the actual space (left photo). And we did actually
several views here, including looking at how daylight went through some skylights where the light hit in certain scenarios so that it wouldn’t bake people who were sitting in the waiting areas.

**Summary: The Way Forward (slide 13)**

So, the way forward is to understand the parameters of our problems, understand our population, understand how to manage daylighting and what daylighting brings in positive ways and what it brings to projects that need to be managed. We need to educate designers. And we were talking about this at the outset.

We need to establish guidelines that appropriately guide the designers and guide the people who are reviewing the designers’ work so we can be good customers as well.

Promote creative solutions. So, those guidelines shouldn’t tie the hands, but they should actually facilitate creativity.

Advance the technical tools that help us, both in the construction world but also in the designer world. Model things – and we’re going to talk a little bit about some more sophisticated tools both for designers and for engineers – and promote successful technologies so the government has to get behind some of those the way they’re doing with the American Recovery and Reinvestment Act (ARRA); actually get behind it and promote smart technologies to groups like this.

And then leverage the government and other big industry as their buying power, meaning – we’re here with several agencies and we’ve talked about ways that we can transform the built environment. Well, put some money behind it and say: I’m going to seed this project and this is the actual – this is the actual requirement I’m going to put behind that seed money. I don’t have to wait for a guideline. I’m going to actually seed a project that I require this, this and this. This is the purpose of the project.

**James E. Woods, Ph.D., P.E. Natural Lighting for Persons with Low Vision**

**Introduction**

I’m going to take a little different approach and look at [natural lighting] from an engineer’s perspective. I’ve been hearing a lot of architectural perspectives around the table. So this may be somewhat different, but I do want to get this point brought forward.

Comment by Tom Williams: Can I make a comment first? We’re not ignoring engineers’ lighting in buildings at all. And there is an interface between nature and harvesting daylight, as Greg was talking.

Response by Jim Woods: That requires an engineering [i.e., quantitative] solution.

Comment by Tom Williams: And then the engineering solution for the interior space where daylight can[not penetrate], which we’re not ignoring that, and that’s part of the equation.

Response by Jim Woods: We’ve got an [engineering approach for] the envelope, too.

**Primary Design Issues (slides 2 and 3)**

**Function**

The first thing we have to understand is what’s the *function* of the occupied space? If you look at the two photographs on the side here (slide 2), these are from Post-Occupancy Evaluations. One is a library area in the courthouse, and the other is a courtroom – two very different functions that are not necessarily [the same as] for office spaces.
View

Viewing outside is important, but if you look at those two pictures, you get a distorted or veiled view from the courtroom which you may not want to have because people are trying to concentrate on what the issues are in the courtroom. Lawyers are facing a little bit of glare there and so is the judge. In the library, depending on how rare the books are, daylighting can be a real problem.

From a thermal aspect, the upper right photo shows a huge curtain wall with the shades pulled and with fluorescent lights turned-on all over the place. Now, how much energy are we saving with that, and what good are we doing with that kind of a design?

Those shades – there’s a point I want to make that’s really important: When you do daylighting and you resort to shades, the heat gain is being transferred inside the building, and that’s got to be dissipated and the view is distorted. There is no energy savings from that daylighting when you’re just transferring the heat in a different way. There is so much myth about energy savings with daylight. There’s plenty of reasons to use daylighting, but daylighting is not a method to save energy. The other issue is: what happens if you don’t have daylight and you need the function? You still have to have lighting provision for the functions. So we need to get to the first issues.

Design criteria

We talked about criteria a little bit yesterday and I’m going to talk about it a little bit more in a few minutes, but I think the three parameters (i.e., luminance, contrast, glare are very important). Now Mariana has brought a fourth one in, and I’m thinking that’s critical, the brightness of the light, whether its luminance or illuminance. And timing: I think timing is a big issue that has to be brought into consideration.

I have a fundamental design question: How would you design differently if you knew the people in the space were going to have low vision? I don’t know the answer to that. I don’t know whether people are going to have low vision in the space or not. So, what criteria do you use to accommodate low-vision persons?

We have to integrate daylighting with electric lighting, for obvious reasons. There’s going to be impact on health. And thanks to Mariana, I think we’ve seen some additional issues with regard to health and circadian patterns.

Impact on thermal and energy consumption

Basically, we’ve got to look at the whole picture, and daylighting is one aspect that’s got positive and negative attributes that we have to understand.

Federal Requirements (slide 3)

This is a statement of the Guiding Principles that are mandated now by federal law. EISA 2007 requires [incorporation of] five Guiding Principles. But read this one: “Achieve a minimum of daylight factor of 2 percent, excluding all direct sunlight penetration (whatever that means) in 75 percent of all space occupied in critical visual tasks” (whatever that means).

Also, “Provide controls, or accessible manual lighting controls, and appropriate glare control”. Now, how can this Guiding Principle be achieved while accommodating for low vision?

I know of at least two fundamental definitions of daylight factors. Somebody questioned a minute ago: What is the ratio of daylight on the surface, horizontal surface, to the lighting level that you want inside? That’s a daylight factor.
If you've got 10,000 foot-candles on your concrete outside the building, with the 2 percent daylight factor, you're going to have 200 foot-candles inside. Now, penetrate 75 percent of your space with 200 foot-candles and you're going to have a lot of glare.

The other definition is the amount of light available on the glazing, compared to your surface area. There's a big angle [factor] difference there (e.g., 90 degrees).

We've got to be able to come up with consistent measures, but this kind of thing is going to kill us. Think of a 50,000 or 100,000-square-foot footprint of a building and try to penetrate 75 percent of that area. Okay, you can do it in a residence, you can do it in a small space, but try that in a big space. It's practically impossible. And yet, that's federal law.

Comment by Tom Williams: One of the things that used to happen in the days before central air conditioning was, our [GSA Headquarters] building, which is on the Historic Register, is designed [around] a series of courtyards. The office space itself, from the corridor line to the window line – the windows were large. The doors had transoms and natural ventilation. There was a large number of windows. You've got with Washington – much of it is sweltering during the summer, high humidity. But the courtyards provide a source of cross ventilation and enough light to enter the space, so that every office space, I mean, this side [of] that main corridor line, – the building's shaped like an E. So you have two interior large courtyards, and the corridor lines were aligned so offices on both sides could all have windows, which allow natural daylight to come in and the cross ventilation.

Without having the mechanical systems, without having all the sophisticated lighting systems, there still were ideas in the way the building was designed that expressed, that captured [the daylighting concept]. And I think, to a certain degree, we've changed that building in hideous ways over the years. I mean, we've dropped the ceilings, we've closed the windows, we've gotten rid of the transoms, we've made the building something other than what it was intended.

Response by [Participant]: You've got huge thermal implications of that in the Washington, D.C., area. Try naturally ventilating the space in August and see what happens to the humidity level.

Comment by Tom Williams: With transoms, there was air movement. It wasn't stagnant.

Response by [Participant]: Even though it was so humid there.

Comment by Tom Williams: Right.

Comment by [Participant]: You know, architects then, they had a better understanding of how nature interplays into design of a building. That is a big challenge.

Let me bring up a couple points again (slide 3). The top picture here was from a walkthrough that we did during one of the workshops that the GSA HVAC Excellence Program sponsored. The photo is focused across what was called a "security pond" in the front entrance of a courthouse, [with] about eight inches of water in it. Notice there are no hand rails around this thing. Also notice that somebody could walk right into that pool of water. The disorientation is caused by a reflection in that pond of the buildings from across the street. Now, that's the kind of daylighting I think we need to figure out how not to do.

I want to point out the lower picture, because this is really important. Greg showed one very similar to this. Notice, this is an office. We're looking outside, huge glare. You notice the shade is pulled down to about eight inches from the desk. Now, the reason for that is it couldn't go any farther because the full extension of the shade was "value engineered" out of the project.

There was so much solar gain coming in those windows that people kept those curtains pulled all the time. And talking to the occupants, their offices were almost unworkable.
Glare Criteria (slide 4)

All of the measures, with which I’m familiar in environmental control, are based on psychophysiology. If we look at thermal conditions, we consider operative temperatures, which is a function of the perceived dry-bulb and mean-radiant temperatures. If we talk about sound, we consider decibels related to the sound pressure of the ear. If we look at some of the work that has been done on air quality, we consider decipols, which are perceived units of odor. These parameters are all based on perception.

We don’t have very much in lighting, but we do have some. As shown in slide 4, I found at least three references and I think we’ll find a whole lot more when we look at that. You’ve got the references in your handout (Appendix D) of what is called the glare sensation vote.

The other factor is the Daylight Glare Index (DGI). The work that came out of the British Research Establishment in the ’50s and ’60s resulted in the Hopkinson Glare Index, which is basically part of that equation (slide 4). Cornell University expanded that to include a daylight component. Although the equation does give quantitative information, there’s a problem with this definition because of terms in the definition must be resolved.

Now, Bob Massof mentioned yesterday three kinds of contrast ratios, he used the Weber equation and the Michelson equation. This brings up a big issue. When we start dealing with psychophysiological relationships and the glare index, look at the equation just generally. The numerator is the luminous level from the source. The denominator primarily is the luminous level from the background. So that is like a contrast ratio. It’s not like the Weber equation. It’s not like the Michelson equation. We need to be consistent in our terminology.

The other thing is the little term “omega” in the equation. It’s almost mythical from the standpoint that it is the solid angle between the eye and each source of light divided by a position index. And, according to the references, you can approximate the position index with the inverse square law: the area of the source divided by the square of the distance to the eye. But it is the solid angle, which is measured in steradians. The denominator is the steradian. It’s not the tangent function that Dennis was dealing with; it’s the solid angle.

Comment by Bob Massof: I don’t understand how you’re summing logs.

Response by Jim Woods: Well, there’s summing across the sources.

Comment by Bob Massof: There’s summing across sources, then taking the log with that?

Response by Jim Woods: Yes. Right.

Response by Jim Woods: But what’s the 1.6?

Comment by Bob Massof: Fudge factor.

Comment by [Participant]: Fudge factor, yeah. They’re playing around with these terms. They’re empirical. They’re not all first principles.

Comment by [Participant]: So is that [exponent] 1.6 supposed to be a brightness representation?

Response by Jim Woods: Yeah, right, exactly.

The point I want to make here is that in some of the references, a correlation has been reported between the [glare sensation vote] and the [glare index]. So you can calculate these indices, and you get up to a number like 24, which is a threshold of discomfort, or 28, which is the threshold of disability glare. Yesterday, Dennis was talking about the ratio of the light that’s being received in the cones divided by the total amount received by the rods and cones.
So physiologically, I think there’s a relationship. That’s a research gap that needs to be worked on. But we can begin right now by saying we have some understanding, and in Europe and in Great Britain, they’re actually using this procedure for design.

Now, with our computer power, we could take this on a point-by-point analysis, and we can spread that across the space and do the analysis to understand what kind of glare we would anticipate in a given room.

The CAD models and the Radiance models apparently are informed by this equation, and EnergyPlus and a couple of the other energy programs apparently do have this equation incorporated into them.

So, from an objective standpoint, if we want to get repeatable, reliable, valid data, we can do it. It’s going to take some research, but on a guideline basis, I think we’ve got enough information right now to say we can get started. And you can look at the criteria that are established by the CIE in Europe.

Examples of Occupant Responses from Post Occupancy Evaluations (slide 5)

The last slide I want to show you is a composite of some data that we took during four Post-Occupancy Evaluations. In these POEs, we conducted surveys of the occupants and then we walked through the spaces. We tried to understand how the systems were actually performing. These are the four different buildings. Some of the factors that we looked at were overall satisfaction, daylighting, artificial lighting, accessibility, view, aesthetics, acoustics, security and temperature.

The goal is have a minimum of 80 percent of the people in the space find the environment “acceptable,” which gives us a 20 percent area to play with. But if you look at the numbers, the only factor that came through at 80 percent for all four buildings was security. People felt very secure in the buildings.

Comment by Marsha Mazz: Just a point of clarification. You said the only one that came in at 80 percent was security. Did the others come in above or below?

Response by Jim Woods: They’re [mostly] below.

Now, we’re badmouthing daylighting and artificial lighting and stuff like that in this workshop. Put in perspective, we’re supposed to know what we’re doing with the thermal environment. Look at that last column, last set of data.

Comment by Marsha Mazz: For those of us who can’t see the last column, please describe it.

We’re running somewhere between 30 and 70 percent for thermal acceptability in those four buildings. The daylighting is running somewhere around 60 to over 80 percent. Artificial lighting is running somewhere around 60 to 90 percent. So people are not thrilled. We’ve got room for improvement in all of these factors.

The other point I want to make here is we can only get that information in Post-Occupancy Evaluations. And partly, the architects don’t like us because we go back. I was interviewed one time for a professorship at a famous university that shall remain nameless. We got into one huge argument about the concept of design: “where does design end?” My point was design is not complete until you’ve done a Post-Occupancy Evaluation, until you get feedback to know what you did is right. Grand Rounds, right?

Comment by Dennis Siemsen: Yeah. In medicine, we do what we call M&M’s, mortality and morbidity conferences. You know: What’s your outcome? What did you achieve and what you wanted to? If something didn’t work, why didn’t it work and how are you going to fix it next time?
Comment by [Participant]: And we [designers] don’t. We go onto the next project and ‘know’ that what we did was good.

Comment by [Participant]: It’s a major problem at GSA– I don’t want to be quoted on this -- but the leadership on excellence and that part of our organization is more concerned with appearance and with awards than it is with whether buildings work. The bottom line is, a lot of our buildings don’t work. And the way you can find out if they work is by doing POEs.

Comment by [Participant]: So therefore, the way you suppress that, so that you don’t know whether the building’s a success or not, is simply not do one, or you commission one to be done, then you take the results of that POE and you put it on a shelf or lock it in a closet and you forget it was ever done.

Comment by [Participant]: And I’ve seen that -- I saw that happen at GSA because of the attitude of the leadership. The POEs were commissioned -- and Vijay’s very much aware of this. The bottom line is, POEs are supposed to generate lessons learned. You’re supposed to take what you learned about your mistakes in design, apply those to the next building you design, so that you have some markers there of things you don’t want to do and repeat again.

Comment by [Participant]: In the central government, we tend to repeat the same mistakes over and over again because we don’t learn from our mistakes and grow from them.

Comment by [Participant]: But that also works into the way you actually produce buildings. I mean, you have a funding cycle, which may start seven years before you start laying bricks. Decisions are made there. And then by the time you actually want to apply lessons learned, you’re so deep into the committed process that there’s no way -- the government doesn’t allow itself to stop.

Comment by [Participant]: OBO ran into the same thing with the standard embassy design, things like the giant atrium that they had between the two big building bars. And we told them – they did about 50 of these things when we were telling them in value engineering workshops this thing is more of a liability from a space use and energy and other things than it is a benefit. And it took them about 50 of them to finally cycle through and say we’re going to take that out, we’re going to make a gallery and take out the atrium because it’s not very useful to us.

Let me mention one other thing that is really bad, and this is the misrepresentation of data. What I’m showing you here are real data from real buildings. What we’re seeing is a preponderance of right now -- primarily, I think, the GSA work, but a lot now is coming out of FEMP in the Department of Energy – they’re normalizing the results from specific buildings and comparing them to normalized national averages. Therefore, you have no clue on a building-by-building basis what’s happened. So there’s no lessons learned. What it does is, it justifies what they wanted to hear.

Comment by [Participant]: Well, it’s even worse than that. They compare it to a database called CBECS, which represents everybody’s buildings. Private sector includes old buildings, new buildings. And, of course, energy performance [i.e., consumption] in that [database] is much higher. What they don’t do because the four agencies – the great thing about four agencies is they all have criteria. They’re not commercial buildings that just depend on the building codes and the design team to develop whatever the performance requirements are. [The agencies] have criteria that you have to meet, and they can move that performance up or down, depending on what the necessity is.

If you compare these new gold and platinum [LEED™ certified] buildings to other GSA buildings, there’s no increased value.
But if you compare energy consumption data from GSA buildings to CBECS data, there’s dramatically increased value. But GSA has been doing good buildings, energy-wise, for many years because they had good criteria. If you follow their criteria, you’re going to end up with good buildings. It’s where the criteria are void that you have issues.

**Open Discussion**

**Issue 11: What environmental and perceptual data on natural/daylighting are available from buildings with low vision occupants?**

**Question by [Participant]:** Jim, can I just ask one quick question? So did you actually survey persons with low vision to come up with this information?

**Response by Jim Woods:** We didn’t ask that question. That was the general population. We had 50 to 70 [responses from employees] in [each of] the buildings.

**Question by [Participant]:** Were these GSA-owned buildings or were these the leases?

**Response by Jim Woods:** These are GSA-owned. These are all federal courthouses.

**Comment by [Participant]:** I just looked up a COB [acronym was not defined] study from 1928. This thing had 90,000 observations of glare. They can tell you the angle, the contrast ratios. The point is, try to write a law around this. It’s impossible. It’s all depending on that room, that architecture, that brightness, that view angle.

**Response by [Participant]:** We don’t need a law; we need guidance.

**Issue 12: What design guidance on natural lighting for low vision persons can be provided in the short term?**

**Comment by [Participant]:** Yeah, but we could come up with a list of what are good practices and designs (in the space) to try and avoid these issues of glare. It gives architects at least something to feed on, so we have more of a chance of making things better.

**Comment by [Participant]:** Right. That’s what we have to do.

**Comment by [Greg Knoop]:** Again, going back to the glass gluttons of America here, ‘but we want a big glass atrium. Ooh. That’s what I want.’ Okay, but you want all the problems with it? ‘I don’t care to hear about the problems that happen with the glass; I want my glass atrium.’

**Comment by [Participant]:** We had very successful atriums of 5 percent and 10 percent transmission glass in the ‘60s and ‘70s. The problem is, people tend to forget why we did that. You go to Germany and you walk into a building with clear glass, it’s glairier than hell. You walk into a building that was built here in the ‘60s and ‘70s, 20 percent transmission vertical glass, it’s fine.

**Comment by [Participant]:** But the fundamental problem today is we’re not measuring it.

**Comment by [Participant]:** You could walk in and say, “Is this comfortable or is this not comfortable?”

**Comment by [Participant]:** But they don’t.

**Comment by [Participant]:** But if you take on putting something like a big glass atrium, then you have to manage what you’re putting up there. You can’t do that and have clear glass, and then wonder why you’ve got glare.

**Comment by [Participant]:** If we designed architecture like airplanes, we could all define it and they’d all look the same and it would be fine. But architecture is an ever-changing cycle.
Comment by [Participant]: Well, site specific. You have to respond to every site, every climate. Every project is a research and development project.

Comment by [Participant]: Our agency has had a habit getting award-winning designs on buildings that don’t really fit the environment they’re designed for. Why would we put a glass box in the middle of the Arizona desert and think that’s good design? And yet the AIA was convinced that it was because it gave the building an honor award. It was a courthouse. And it’s a glass box in the desert. I mean, what the hell is that about?

Panel 5: Artificial Lighting (James E. Woods, Moderator)

Jim Woods. Introductory Comments

The next panel is on artificial lighting, which is a term I hate. I don’t think there’s anything artificial about real lighting. It’s just from a different source.

I would like to raise four issues to begin with:

The first one is the integration of lighting with other systems. Where does lighting fit into the integration with other systems?

The second would be criteria and design evaluations. In lighting, where are we today and how do we deal with these?

The third would be how well current lighting criteria satisfy occupant responses and needs.

[And the fourth would be the] political realities. There are many changes going on. Mary Ann and Eunice both addressed some of those earlier; specifically, conflicts with energy policies.

Now we’ve got four panelists that I’m really excited about hearing from because they’re actually lighting designers. That’s what they do as their primary professions: deal with lighting issues.

Robert Dupuy, IALD, LC. Problems and Solutions

Historic Basis for Lighting Criteria

I think, first off, a little-known fact about the lighting levels that all of us use daily to do our work and that we also find in lighting codes is that they were based on a study done many, many years ago, over 20, 30 years ago. And the study used young, normally sighted people to develop the [illumination] levels that are found in the Illuminating Engineering Society’s lighting levels.

So from the very beginning, the lighting levels really need to be questioned because they were not studied from a perspective of, you know, a large portion of the population, from older people to younger people. But we’re currently stuck with that, and it’s nothing that this group can change. But I think it’s important to note that the constant lowering of the lighting levels is based on false information.

Conflicts with Energy Codes and Standards

Another really difficult issue are [the] competing energy codes. And there’s just a ton of those. Most energy codes in the country are based on ASHRAE/IES 90.1. And then individual states — and I’ll take Oregon, since it’s where I live — by mandate of the legislature, [the] Oregon energy code must be a minimum of 10 percent below ASHRAE/IES numbers.
As we said earlier this morning, when you factor in LEED™ and also some requirements from other areas – some large hospitals have their own requirements, et cetera, – you can get down to 30 percent below energy code.

When you’re looking at like one watt a square foot for an office, for example, that’s a really tough thing [to design to]. I mean, I do on a regular basis ambient lighting levels in office spaces that are 20-foot candles and have to be supplemented with task lights because 20-foot candles is simply not enough light.

But that’s the reality of where codes are taking us. And LEED™ in particular has been egregious in this area, striving for a good purpose, but basically making it very difficult for us to provide the kind of lighting that’s required for people to do their jobs, basically.

So these competing energy codes are a big issue for this group because it goes right down to individual cities, where codes are even more strict than the state code or ASHRAE, and you have to comply with all these things. It makes it real difficult to do your job.

If you’re looking at low-vision people, elderly people, and you want higher lighting levels, the codes are not allowing you to do that. And it’s an issue that we can’t ignore if we’re going to move forward and try to have some impact on all of this. So that’s a big issue for me.

**Code Enforcement**

The second part of codes is enforcement. There are a lot of places where there is an energy code, but the energy code is ignored. So New York, for example, has an energy code. If you’ve been to New York City, you can tell that the energy code doesn’t really function there very well.

Comment by [Participant]. That’s changed, though. Cracking down seriously.

Response by Robert Dupuy. Oh, it has? Well, that’s good to hear.

But you take California, Oregon and Washington, where those three states have had energy codes for a very long period of time. The enforcement is all on the front end. It’s a bunch of forms that you fill out. And it’s all based on the fact that you’re an honest person and that you’re not fudging those forms to make it work. There is little or no enforcement on the back end. So what you install or what actually gets put on the job may have no relation to what was on the drawings.

And to me, if we just had enforcement, we could stop lowering lighting levels. And if you take the South as another example, there’s hardly any enforcement of lighting codes in the South. So -- and again, this is outside of this group’s work, but it’s important to understand that these are the kinds of things that are impacting our work and requiring these low lighting levels.

**Examples of Integrating Daylighting with Electric Lighting (slide 2)**

The first photo on the top is about lighting controls, which are being now mandated by energy codes. So the state of Oregon, for example, requires controls for daylighting.

The second photo shows a medical office building, where we have daylight coming into the space. The first few fixtures are off because they’re on automatic dimming controls. And then the electric lighting is contributing to the people that are not within 15 feet of the window wall, which is the pretty much accepted standard for how far daylight will penetrate into a space, which is another big issue. How do you get daylight further into office spaces and so forth?

And you take Germany as an example: all the new buildings in Germany are skinny because the law in Germany requires that workers have access to daylight. They must be able to see daylight. The only way to really do that is to skinny up the building so it’s not very deep, to allow that light to penetrate all the work areas. That’s my presentation.
David K. Tozer.

Introduction

Comment by Jim Woods: Let me just quickly introduce David because he’s taken the challenge to substitute for whom we originally had here. David is Senior Designer at George Sexton Associates. He’s a design consultant. He’s been there since 1985; managed many large projects, including the British Art Center at Yale, Peabody Essex Museum, Cleveland Museum of Art, et cetera. He did his graduate work in art at Carnegie Mellon University. So we’ve got a big contingency here from Carnegie Mellon.

I played on the hockey team and the – (inaudible). In addition, I worked on MOMA downtown expansion and what we called the Swingline building. That was the MOMA Queens, and the Boston museum is about to open, early November.

I have several low-vision clients. And there are some here in town that we’ve been working with since 1988. They’re very faithful, energetic clients that have always seemed to have projects. And I met them when they were in their 50s. So now they’re experiencing problems with low vision. And they have said, use us, experiment with us. We’ve done some very unusual design with them. They own an art collection, American art, and they own glass, Tiffany glass, American paintings. And as you can probably tell, one of my specialties and interests is museum lighting, art lighting, and building environments related to art. So I’m going to tell kind of parallel stories here.

Museum Lighting

We’re helping preserve the Louis Kahn’s British Art Center at Yale. And I’m involved with three projects up there. Recently completed was the photo studio. And the challenge that they had was re-photographing the entire collection, digitally. And they needed to have a design so they could color-match the actual painting to the monitor readout. And I hadn’t done anything like that before. But in interviewing the clients, which were five people, the photographer, the registrar, I began to understand what they needed.

So I designed a series of custom fixtures and we customized the [lighting] for these fixtures. We elevated the color temperature. These were all MR-16-based lamps, banks of fixtures that roll on racks. The photo studio [is in] a basement area. That’s another thing to point out, because usually the photo studio’s in the basement. Very gutsy, all the structures shown. So we designed this, what I thought was a really neat system.

I got feedback after the installation. People would walk by the door and just do double takes. And the common comment would be, “when did you get a skylight, because just a beautiful quality of light -- basically, the whole back wall of the studio.” They’ve got large portraits, small portraits, large landscapes, varying sizes. So basically, the entire back wall of the studio is magnificently lit with this quality of light that was evocative of daylight.

So I finally went up and saw it and they were doing a photo shoot. And I don’t know if it was a Rayburn or a Joshua Reynolds painting on the easel, a beautiful woman, this scale. And when they flipped on the photo lights, it’s a warmer color temperature. But when the monitor check comes on, elevated color temperature is available. And it was amazing to see the difference in the rendering of the painting. You saw the whites and reds more vibrantly when the new lighting system was on for monitor check. So I registered that. I said there was all sorts of definitions that I hadn’t seen before. And it became intriguing to me.

Application of Museum Lighting Principles to Low Vision Persons

And so I’m going to switch stories back to the collectors. One of them said – there’s a couple in town, and one of them said I just can’t see anymore; I’m having a problem shaving. And I said we can add more fixtures in your bathroom. So we ordered another series of high-
quality adjustable fixtures. And I kept in mind that he said [to] experiment with these. Think about how to solve this problem.

And so I spent about an hour, hour-and-a-half focusing, and I did all sorts of arrangements with the lamps, used different wattages, beam spreads and color temperatures. So I got the mix that I thought was appropriate. Then I went away and let him use it. Interviewed him. So, just to let you know, I’m going to jump around here as well.

**Importance of Post Occupancy Evaluations**

George [Sexton] has a strong feeling – or a principle - that as we finish the project we need to go back and visit the users after about six months to a year to see how everything is working. And we do these interviews and we ask how things are going and how things could be improved, so it’s for their benefit and ours that we learn how to better our designs.

The point I’m trying to make is that I picked up on details that I couldn’t see under just normal tungsten halogen lighting. It’s an ongoing experiment, of course. But this mixing is a very interesting, intriguing facet of lighting for me. What I saw at Yale, that reds were vibrant -- there was a vibrancy that I experienced at Yale and I brought that to this client. And so he gets -- so total facial illumination was better than just distinction – (inaudible). So that’s a direct experience that I wanted to share with you all.

**Balance of Glare and Brightness**

In the museum environment we deal with all sorts of issues that relate to glare, to balance, brightness balance. When we light an exhibition [in a gallery], we attempt to light the perimeter to offer generosity with space [and to] balance the lighting that aims on the objects with that backdrop. So we’re building more or less a tableau, you might say. So it’s all about the sensation of well-being, comfort, protection against glare. Just building this total environment wrapper.

There’s a great publication by Gary Thompson, who is the head of conservation of the British Museum; it’s called “The Museum Environment.” And he goes into all the components that make up the museum environment – lighting, temperature, humidity, and so forth. There are some great passages that he’s written about lighting that kind of dissects the glare and ways to control it.

And one thing that I think is intriguing is that when you want to wash a wall then you’re working at cross-purposes because in terms of glare and comfort, that to light a wall you might need to use lenses and reflectors that are naturally glare-producers. So it comes down to design, fixture design to be able to offer the most sophisticated fixture to deliver that ability to wash a wall [that] makes an environment feel comfortable and balanced.

When we’re lighting an exhibition, we’ll typically say that a painting should be [at] a value two in terms of illumination, and a wall should be a value of one. So that ratio is very important to us. Gary Thompson even writes about all that and he says that the best and sharpest viewing relates to that general ratio, meaning that if you were to spotlight, purely spotlight, your viewing ability drops off because you’re actually comparing it to a dark wall, comparing a painting to a dark wall. So he talks eloquently about balance.

In the museum environment it’s about balance and keying. So I think that there are applications in the other built environments that relate to what one can do in the museum environment. I mean, you can think of your favorite museums in town and nationally and internationally, and you might relate your comfort that you experience in these environments somewhat to light. So next time you experience an exhibition, just pay attention to what you think is being done with the lighting. I think there are things to learn from museum applications and museum lighting.
Eunice Noell-Waggoner, IES, LC. Lighting Issues

Introduction

Before I start in, I’d like to kind of pick up where Robert ended relative to energy focus. Right now people are designing buildings for security reasons, although they are not on top of the energy savings that we can have by controls; not having to light buildings when they aren’t occupied is also a factor. So we need to start shifting the view as to how we use energy.

For those of you who may not know the lighting power density that Robert referred to, or the LPD as we use for shorthand, and just being how much energy we can use for the connected load for our lighting. It’s very easy from a code official standpoint to say, “Uh oh, the total has exceeded the loss per square foot that you can have.” However, [the LPD] really discriminates against people with low vision, and also doesn’t take into consideration the amount of energy that’s used over the day. We need a different formula and the Department of Energy needs a different formula to start regulating energy use, and then I don’t think we’ll be handicapping people quite as significantly as we are now.

Low Vision Standards (slide 2)

ANSI/IES RP 28-07: Lighting and the Visual Environment for Senior Living

Several times I’ve heard the reference for this document that I’m going to hold up. It’s an ANSI standard developed by the Illuminating Engineering Society of North America, the lighting for the aged and partially sighted committee. Robert, Jeanne Halloin and I serve on that committee but it was first formed back in 1992, to give you a sense of how long we’ve been dealing with that. Then Mariana has joined the committee later on. This is actually the second publication. It was first published in ‘98, then it became an ANSI standard in 2001, and in order to keep the ANSI [status], [it was updated in 2007]. I have one copy here with me. I will put it in whoever’s hands will make the best use of it.

[This standard] was developed for the senior housing market, where we have a lot of people with low vision. In your own home you can make whatever modifications you want. But in a care environment you are not free to add lighting, take lighting out, whatever it was. So what we needed to do is come up with a general standard that would apply to most people who are low vision, living in these care facilities, from nursing homes, assisted living, [and] residential care.

It should be noted that it’s more of a function of age. The average age for living in care facilities is like 85, and you have people who are 85 living in independent living and you have people who are 85 living in nursing homes and assisted living. So it’s not the level of care. It’s based on age of the end user, not the adult children of the aging parents.

And so, you know, I offer this up to you. It’s been fully vetted as an ANSI standard. It’s a consensus document. And we do go a lot into low vision, glare, [and] contrast. All that kind of stuff is already in here, so if there’s parts of it that can be gleaned for this next step of the group here. It’s not my document, I can’t give it away, but you can certainly talk with the IES about incorporating some of the findings that we have here.

Need for Additional Standards

I strongly urge both the VA and Centers for Medicare and Medicaid Services to start looking at [ANSI/IES RP 28-07] because it does talk about light levels. It [states]: this is desired light level[s] measured at 30 inches [above the floor], on the floor, in corridors, how much light you need on a dining table, and how much light you might need on the face for shaving and make-up. It goes through, task by task, selecting clothes [and] all those different things. There is a section on circadian rhythms, to play into what Mariana was talking about.
One of my biggest frustrations is that the Center for Medicare and Medicaid Services does not have a lighting recommendation that is measurable in nursing homes. And they’re writing the code for nursing homes all across the country. [The visual environment] should be comfortable. But who makes the judgment of what’s comfortable? The administrator who’s 24 years old, who’s been trained for six weeks? I don’t think so.

So it’s just that there’s a big disconnect between the understanding of age-related changes in general on the part of the people who manage these facilities. So we need to stand up for them as a subgroup. And, you know, when we came here, I thought we were going to be talking about office environments, so I’d say, yes, the principles that are in here could apply to low vision in the workplace and in public buildings. But we also need to stand up for the older people.

The way I got to this, and Jeanne and Robert too, we were all facing similar kinds of situations where we were very interested in the lighting of care facilities and there really wasn’t a document like [ANSI/IES RP 28-07]. And actually one of the engineers from Robert’s own office was the one that drove me over the edge, and I was trying to talk about how he needed to be doing his lighting. I was doing interior designing and he was the lighting administrator, so I was kind of explaining how we had done it before. I was working with their company, that engineer, and he was saying, finally, “Well, until it’s written where an architect, a lighting designer or lighting engineer can find it, I’m going to ignore you.” I did not take that lightly.

But I mean, as much as I hated the guy, wanted to strangle him, try to get him fired, it was a good statement because until this was published. So when we first published in ’98, I thought, done. Well, we’re still fighting it today. Robert and I advised the state of Oregon on what was needed for people in memory care. Here you have the most disadvantaged people possible. There are special conditions relative to their vision. They kind of have tunnel vision. They don’t have the peripheral vision, and a lot of different things like this, and yet it was coming back to us by the for-profit administrators that there’s not enough evidence to state that older people need higher light levels than young people. Not enough evidence.

I encourage you to get a copy of this if you don’t have it. See what can be applied. It’s already here, already vetted.

Design Issues

Glare and Shadows (slides 3 and 4)

Okay, these are some of the problems that I see. Shadows in the foyers (slide 3). This happens to be an Alzheimer’s care facility; I didn’t intentionally bring senior care facilities, but I have a lot of good examples of [glare and shadows]. So we’ve got clear glass, we’ve got glare, we’ve got heat. But then what is that pattern on the floor? And here these people have [difficulty in deciding] ‘is that a beam that I’m supposed to step over on the floor, or what is it?’

The other thing that I see is uneven light distribution, where Mariana says ‘cave light,’ you know, lights the lower part of the wall that doesn’t hit on the side, or gets you that kind of cave environment. Again, the glare coming in from the daylight, highly polished floor, the light just on one side bouncing up. It isn’t being distributed very much down the wall. So these are problems that we see.

Adaptation: Transition from Daylight to Interior (slide 5)

[Another] thing that I think is a problem is this adaptation, which has been raised several times. [In slide 5], you can see how bright it is outside and how dark that intersecting vestibule is that you have to go through. The glass doors have a chrome bottom so you can’t really tell where they are. [The] front doors don’t align with the next [interior] row of doors, so
you have to know that you have to jog over a whole door panel, and the handle is chrome. So it's like this is all reflected. Your eyes [have to adjust to] this transition; a real hazardous situation trying to go from the outside to the inside.

**Direct – Indirect Lighting: High Light Levels without Glare (slide 6)**

Since we are talking about lighting, I just took some photos in Robert's office of indirect-direct lighting fixtures. What we have found with older folks is that if we want to get a higher light level, we have to have the indirect or the general illumination bouncing off the ceiling and the upper walls to kind of light the space, and then have more light coming down.

**Stairwell Lighting (slides 7 and 8)**

So we need the NFPA at this table. We need to get them to understand that not everyone has perfect young eyesight (slide 7). Currently they allow an average of one foot-candle – and that's an average, so that's not a minimum – of one foot-candle in stairways like that. And the ratios they will accept, you can't exceed the 40 to 1 ratio. Well, you know, the 40 is going to be on the landing where there's no hazards, but there's a lot of hazards going down to that. Low-contrast definition for the handrails or the – (inaudible) – from the stair.

Another [issue for] stair lighting [is] pattern (slide 8). Here's the pattern going down (left photo). This happens to be a theater. So you're going down, you can't see, but then if you turn and look up, you will see that every third step is lighted (right photo). So what are you supposed to do – trip over the two in between?

**Mary Ann Hay, IALD, LEED™ AP. Artificial Lighting**

I use the term artificial lighting, but electric lighting is a very powerful tool and component in our built environment.

**Influences of Artificial Lighting**

[Artificial lighting] can be very influential in the way we behave within the environment, giving us spatial clues. And I'll show a few quick examples.

**Behavior within the Environment (slide 2)**

This is a breakout area from an office space. The client, Lifetime Entertainment, wanted to create a very interactive, more casual environment for the office space, let people do more teaming in the space, and the lighting helps to transform that office environment into a more casual space.

**Perception of the Environment (slide 3)**

It can change our perception of the environment. This is a completely below-grade executive conference center. The prime objective with this project was [to light the space] so that you do not feel like you’re below grade, that you get some sense of brightness; not really emulating daylight but [giving] some sense of volume.

**Sense of Well-Being (slide 4)**

It can influence our sense of well-being. It can, in creating entry areas for this spa and making the space feel very inviting.

**Visual Comfort (slide 5)**

It also can influence our visual comfort in terms of seating area, reception area, having people feel like they want to go into the space and sit in the space and have the space feel comfortable.
Navigation throughout the Environment (slide 6)

It also can assist with our navigation through that space. This is a back-lit translucent wall, which is actually the base of the escalator going into the below-grade conference center, so that you don’t feel like you’re going down into the basement of the space. So as you’re entering the space, you’re looking at illuminated surfaces.

Productivity (slide 7)

It can influence our productivity, although, as in earlier discussions, that hasn’t really been substantiated with scientific studies. But if you create a comfortable environment for the people who are occupying it, I don’t see how it can’t influence productivity.

Safety (slide 8)

It also can influence our sense of safety and wanting to go into a space and having it feel welcome.

Basis of Lighting Design (slide 9)

Having said that, I think it’s really critical that the lighting design has to be developed in concert with the requirements of the occupants. It is so critical to understand who’s in that space and what their needs are. We were just talking about something that may seem very fundamental, like office lighting. We would certainly provide a very different environment for a law firm than we would for a creative media client. It’s very important to understand what’s happening in the space.

We were just recently awarded a new project. There were three other lighting design firms involved in the interview process. The feedback I received was first of all everybody was equally qualified in terms of their basic experience and the fees were all very similar. But they said that I was the only one who really addressed what their needs were and wanted to understand how they work. The first thing we do when we get a new project is look at their existing facilities, see what they’re doing, and try to make sure that the lighting really supports their business and their culture.

It’s also important to understand the requirements of the owner. If they’re really focused on trying to streamline their capital operating expenses, they’re going to be trying to minimize different types of lamps on the project, so that they can really look at their maintenance and controls, and how the space will operate.

Involvement in the architectural and interior design is so important very early in the process, so that we can really integrate the lighting into the space, not have it look like it’s an after-thought.

There’s nothing worse than getting a blank RTP and the job is going out in two days, and they say, here, design the lighting. Well, what’s happening in the space? I need the furniture plan. I need to understand what’s going on in the space.

It’s not, you know, putting dots on a drawing or putting lines on the drawing. It’s really thinking three dimensionally and what’s happening in that space. That really influences the whole perception of glare in the space, the issues of contrast, and making sure that we are providing the appropriate --

I know everybody’s probably tired of hearing about the energy code, but it’s the law and we all have to abide by it. Is the law flawed? I think it’s certainly flawed and it really needs a lot of reevaluation, and this is certainly influencing the way that we design.
Trends in Lighting Design (slides 10 and 11)

A lot has been already mentioned about the drive toward sustainability. And sustainability is not a bad thing. I think it's a good thing, but it needs to be implemented thoughtfully, making sure that we're not compromising any quality-of-life issues [while] providing a sustainable environment.

There is a drive to improving color rendition [in] the lamps that we have available. We do have very good color rendering qualities, and so that's been a tremendous plus in the lighting industry in terms of having things rendered and people rendered much more accurately.

What is very detrimental right now, and in some ways it's a good thing, physical bulb size and shape [of lamps are] getting much smaller. [These bulbs and lamps help in terms of trying to reduce energy consumption but they create a tremendous glare bomb with these small lamps. They really need to be controlled carefully, and we really need to make sure that the luminaires that they're going into are thought about in terms of controlling that glare.

Approach to Lighting Design (slide 12)

So some of the things that we really need to consider are making sure that we have [consistent levels] of lighting in circulation zones, with the exception of major intersections or decision points, [where] actually increasing the lighting levels can assist with the Wayfinding process.

As I mentioned yesterday, task illumination [is] such a critical component in space, giving people control over their environment.

And we've been talking about the transition zones again. Now, it's very regulated in tunnels, when you're driving. It's not thought about in terms of architectural spaces [but] it's very important for pedestrians walking through.

Vertical illumination is an important tool in defining a space and assisting with Wayfinding and just how your sense of comfort is in the space. If you're in a space and you're looking up constantly at a darker wall surface, it really creates a lot of difficulties with your eye transitioning in terms of the lighting.

Open Discussion

Issue 13: How can energy codes and LEED™ “Points” be made compatible with lighting design criteria that accommodate low vision persons?

Comment and Question by Greg Knoop: It's my experience that we program buildings and lighting levels according to spaces, but we don't have a program transition. So that space just outside that last door could be programmed with many times the amount of light level that this space is, or vice versa.

Is it possible to start to program defined transition between spaces? Is that realistic, are you seeing that in any design, or is that simply good design practices and so therefore we should write the transitions into the code?

Response by Mary Ann Hay: It's good design practice. Unfortunately right now [codes are] causing some limitations on addressing transitional areas. A lot of transitional areas are public spaces or circulation areas, and the energy codes are restricting you to half a watt a square foot, so it's very restrictive in terms of light levels that you can provide in entry areas and in transitional corridors. The energy code is creating a tremendous challenge in doing that.

Comment by Richard Dupuy: I think the energy codes view that as superfluous lighting and you don't need that. It's art and it doesn't serve use of the space. So that's why you see the
lowering of lighting levels in corridors and lobbies, because they're not important, when in fact it’s just the opposite. So we are restricted by the code to do some things.

Now you can trade off when you’re doing the code. You can take lots from over here and put it over here, and we do that as much as we can. But there’s definitely a limit as to how far you can go.

Response by Mary Ann Hay: You’re compromising someplace else.

Comment by Richard Dupuy: Right. I mean, the code even deals with lighting levels in mechanical spaces [safety issue]. Those spaces are infrequently used and, in Oregon you have to have controls - like occupancy-sensors - so when someone leaves, the lights do go off. But why would you have so many watts per square foot specifically for those storage rooms, things like that? It just doesn’t make sense.

Response by Mary Ann Hay: The danger is that they’ll realize the stupidity of offering those watts per square foot in those spaces and eliminate them without adding back –

Comment by Richard Dupuy: The [new] Oregon code goes into effect tomorrow. Last week I was contacted by the Oregon Department of Energy talking about the 2012 code, which they are already writing. I go, "But the new code hasn’t even started!” They go, “But yeah, but we have to lower those numbers. Now what do you think, 10 percent? What can you do?”

Question by [Participant]: Just pull it out of the air?

Response by Richard Dupuy: Exactly.

Comment by Mary Ann Hay: It goes up for public review. But first of all, you have to be tuned into the fact that it even went out for public review.

Question by [Participant]: There’s no notice?

Response by Mary Ann Hay: Yeah, there’s no [industry] notice. You have to constantly check the [public] notices.

Comment by Richard Dupuy: But if it was in the classifieds, [it was a] little tiny advertisement. Fortunately for me, a person who used to work in my office went to the Department of Energy and so he calls me and he goes like, "This doesn’t make sense to me but what do you think?” But generally speaking I think across the country, codes are written inside a room like this. There’s no consultation.

Comment by [Participant]: This is the same with federal government agencies. I mean, I’ve gone to meetings with staffers up on the Hill, who said, “Okay, how far can you go with the numbers?” I mean, that’s the mindset, at least it passed the House. About eight associations got together and in that meeting said, “Here are some things you can do that don’t deal with numbers,” one of which was to require that the engineers within federal buildings, GSA – most of them are contract [personnel] except for VA – had some required certification [to demonstrate that] they at least know how to operate buildings. And that piece passed through.

But there’s a range of things that they can do, including we tried to get them to require, in legislation, POEs at the buildings. That didn’t make it; their mindset is either LEED™ Certification or reduce the numbers.

Comment by Jim Woods: To a great extent, the Illuminating Engineering Society is silent about this issue. I’ve watched the evolution of ASHRAE Standard 90 since its inception in 1975. Yes, the first version of the Standard 90 was 1975. And it evolved in ‘80 and ‘89, ‘99, 2004, 2007 and 2010. IES came into the picture I think in 1989. What really bothers me in Standard 90 is that there are no [illumination requirements].

Question by [Participant]: Illuminating is part of the ASHRAE [90.1] Standard, right?

Comment by [Participant]. But Standard 90 is the one that’s driving [the energy codes].

Response by [three Participants]; DOE is driving it, not ASHRAE. They’re using ASHRAE’s standard. Right. They’re writing the standard.

Comment by [Participant]. There has to be far more input [on] the illumination issue in the ASHRAE process: ASHRAE 90.1 [and] ASHRAE 189.1, which is becoming the standard for all other codes.

Comment by Jim Woods: At least 189.1 is addressing illumination. Not well. I don’t know if you’ve [evaluated] 189 or not. It’s scary because it basically says that your energy consumption has to be reduced 30 percent below 90.1; your ventilation has to be at least 15 percent above ASHRAE Standard 62.1, and it varies from ASHRAE Standard 55, so there are inherent conflicts.

Comment by [Participant]: As far as involvement, that’s where there needs to be some involvement by IES.

Responses by [three Participants]. That’s changed. There are more IES representatives now involved in the ASHRAE process, but it’s still a small voice. Yes. So we need to get lighting people involved into that decision-making process. A lot of the IES members are involved in that [process].

Response by Jim Woods. Three or four years from now ASHRAE Standard 189.1, or some similar version, is going to be the standard that government agencies use for design and construction. I mean, the agencies are rapidly moving in that direction.

Comment and Question by [Participant]. [In] the LEED™ point system, usually about a third of the points are on energy, [approximately] 29 available points. [For] the indoor environmental quality [category], are there any points that are available for lighting quality?

Responses by [four Participants]. [Yes, for] controllability. That only [affects] energy. There’s nothing about improving the quality of light. So LEED does not address that aspect. Maybe this is another component that needs to be brought in as we move forward. Well, it seems like this whole standard is built around energy.

Comment by [Participant]. In my humble opinion it’s driven from DOE, [whose] purpose to is to reduce energy, which it probably is doing very well. That’s what it’s supposed to do, so it’s driving energy. And I think on the environment –

Comment by Mary Ann Hay: What they really should be looking at is [energy] consumption, not just connected load. In other words, you should be given latitude of providing appropriate levels of light if they’re controlled appropriately, so that you’re really controlling the consumption [by] taking advantage of daylight opportunity, not having lighting on when a space is not occupied, and looking at the whole building model and how it works.

Response by [Participant]: So it’s like demand.

Response by [Participant]: That would be another way of dealing with it. The state of California is looking at that as a possible way of controlling energy use. So the building would be metered, and you know, if you use more energy, you pay for it and then that sort of self-regulates back down to not having controls. That seems to be a more fair way of dealing with the energy thing instead of always talking about how many watts and LPDs and all that stuff.

Response by [Participant]: I remember years ago when we were looking at a federal courthouse in Sacramento, and it was just about the time that the rolling blackouts were starting in California. Our federal building was lit up outside like the 4th of July, and with rolling blackouts, that’s what we were doing. The building managers were trying to get
the courthouse judges to accept half-lamping fluorescent lighting in their areas of the courthouse. And the chief judge absolutely said no. He wouldn’t even consider half-lamping in lighting in that area of the courthouse. How can [the federal government] impose these restrictions on people and then not practice itself?

Comment by Kurt Knight: Five years ago is entirely different than what you’re doing now. So we really can’t think much about what we used to do. First of all, there’s a 30 percent incident. We don’t give specifics. We say, you, designer, build us a building at 30 percent better than ASHRAE. I mean, that’s what the law says. But we don’t stipulate that it has to be lighting, it has to be this. It’s a holistic approach of trying to achieve the 30 percent. Use design in an integrated way to do that.

Another thing is that commissioning is now required on all projects. Retro-commissioning is now required on all projects. Metering is required on all projects. So you’ll not only get the initial design, it’s going to be metered to see if it does perform in accordance with its [energy targets]. Again, this is all going to be driving on the energy side. You can’t measure lighting controls. You can put a meter on the electric bills, hook up and say, “You’re using X number of BTUs,” which is going to say there’s demands on all existing buildings to reduce energy usage 3 percent every year to a maximum 15 percent. That’s what the law is now.

There’s a drive to reducing old building energy, there’s a drive to reduce new building energy. There’s going to be metering in those buildings to see if they’re compliant, and the records on the medical centers at VA are not going to sit back and say, “Wow, we really don’t want to do this because we didn’t meet our energy goals.” VA’s policy secretary says, “We’re going to meet these goals, and by God you’d better meet it or you’re organizationally not going to go very far.”

Comment by Jim Woods (as Moderator): Let me bring it back. We’ve got about five minutes max, so I think I want to bring it back to low vision, of designing for people with low vision. We’ve pushed on this energy thing pretty hard. I want to frame it in two ways.

One is, as we move forward with this zero net energy and we begin to look at how many people with disabilities of any kind are in the buildings. I would like to have Marsha lead a little bit of discussion on this.

The other related issue, Kurt, I’d like to have you address, and this is in health care, as we begin to look at this. I don’t know if you want to call it healthcare disabilities or not. As we try to improve health care, improve lighting, as we look at the zero net energy, how do we deal with this issue as we move forward?

Issue 14: How can improved lighting and zero net energy goals by achieved while improving health care?

Comment by Kurt Knight: [As an] initial goal at VA, we stipulate some energy lighting criteria, but we’re not willing at this time to go to that as a significant issue. Again, we try to do it in a holistic way. We have some of our standards relative to lighting that we think are appropriate for whatever function that we’re doing; it’s different needs for different functions. And that’s the minimum.

So when they do their energy analysis, they can’t go below those minimums, which are not necessarily as low as some suggestions around here. I’d have to look at them specifically. I’m not an expert in that area. But we are establishing them on some lighting.

Question by Jim Woods: So you have lighting minimums?

Response by Kurt Knight: Right. But we still demand that the AE design the building holistically to meet the 30 percent. In health care that’s a challenge because it’s a 24/7 operation. It’s entirely different than an office building. We’ve raised that up the flagpole numerous times and nobody’s – at least in the regulatory area – seems to care. Or they’re simply not doing anything.
So I think from our perspective, yes, we’re going to establish some standard relative to a wide variety. Now have we done that well in low vision area? I would say no. We would probably need to do some work on what should those standards be in a low vision area, in certain types of areas. Our community living center we’re doing – (inaudible) – but -- and by still demanding 30 percent. Now that 30 percent’s going up.

Question by Tom Williams: Did you see the new FEMP standard (a white paper) that came out last week? I can’t believe this: fifty percent [energy] reduction requirement in large hospitals.

Issue 15: How can the potential conflict between the goals of zero net energy and accessibility for low vision persons be resolved?

Question by Jim Woods: Marsha, from your standpoint, from the accessibility perspective, what can we do about this potential conflict?

Response from Marsha Mazz: I don’t know yet. In regard to some of the concerns about involving the [accessibility] community, absolutely we have to. And I’ve already sent Eunice a contact for someone who certainly advocates with NFPA on stairway design issues, including lighting.

But we do have to work together with the competing interests, and if we don’t, we are going to be spinning our wheels. And they’re much bigger and much stronger than we are. They have far more influence than we have. And whenever we attempt to establish a standard – and I’ve said it 100 times already; I’ll just say it one more time – whenever we attempt to establish a standard that in any way impinges on the directions that those competing interests want to go in, we’re challenged on the basis of our support for that standard.

We are, I think, in the accessibility world, more and more being held to higher standards than the codes developers typically.

Question by Jim Woods: How about the responses [by the code developers]?

Response by Marsha Mazz: Just spend five minutes with me and the National Association of Homebuilders and you’ll see that. They demand substantiation for accessibility criteria when their own substantiation for what they want to do is [based on] opinion. And [their] opinion, seems to carry the day until you want to bring forward accessibility criteria.

Comment by Tom Williams: One of the things that I see happening is that there is no accommodation to build functional requirements throughout. And Kurt, you talked about the demands on hospitals and health care facilities. What I’m almost certain is going to be the wave of the future is finding ways of creating less efficient facilities by decentralizing, in order to reduce the energy consumption in a hospital, for example, is to move out services that are high-energy demand into new facilities that start from scratch. Although these requirements may be stringent, at least it’s a way of addressing it.

What it costs us in other energy consumption issues – travel between them, general efficiency of actually providing the service, and so on, is going to go by the wayside. My suspicion is that Congress’ rationale, other than looking good, is to inspire research into new products and materials that will provide or allow us to produce facilities that can respond to those reductions. I think the timeline is probably unrealistic, but that’s what I think is probably their justification for coming up with what appear to be some unreasonable requests.

I see a whole new way of providing healthcare services, not only for the VA but for others in areas where high energy consumption is required just to provide the service.

Response by [Participant]: Interestingly enough, the latest executive order on greenhouse gas reduction requires trying to calculate travel costs associated [with the]
separate facilities. The environmental impact of car travel, as well as flying to different sites for staff, or paying people to come in and design projects, all that supposedly eventually will be tracked. How much environmental impact or greenhouse gas consumption that is.

Response by [Participant]: And then you have the low-vision consumer who has to get there with no transportation.

**Issue 16: What environmental and perceptual data on artificial/electric lighting are available from buildings with low vision occupants?**

**Question by Jim Woods:** I do have one more question for Eunice. Is this [RP 28-07 ANSI/IES Standard: Lighting and the Visual Environment for Senior Living] based on some hard data research that was done?

**Response by Eunice Noell-Waggoner:** Right.

**Question by [Participant]:** So when somebody comes to you and says, “Show me the study,” that’s the mantra, “show me the study, where is the study,” you can point back –

**Response by Eunice Noell-Waggoner:** Well, I can say, based on what younger people may need, what the median [values are]. Dr. Allen Lewis – I don’t know if you’re familiar with him – he was on the committee that helped develop it. So we had a lot of experts.

**Response by Jeanne Halloin:** [The draft standard] had to be reviewed by the technical committee, by us and then rewritten, and it had to be reviewed by the board, and a lot of times we had to substantiate things or take them out. So it went through a lot, and that was before it went through ANSI reviews. So it went through a lot of reviews, which is why it takes that long.

**Response by Robert Dupuy:** But even so, we have people who, looking at that document, tell us that there’s not enough scientific evidence that low-vision people need more light.

**Response by [Participant]:** From a federal perspective, there’s a federal law that says we’re supposed to use national standards where appropriate for our needs. So an ANSI standard means that they [are to be used] where we feel appropriate. And because it’s there, it’s a federal law that says we should be adopting those types of standards.

**Response by [Participant]:** There are lots of people who, for monetary reasons, disagree with that document.

**Issue 17: What design guidance on artificial/electric lighting for low vision persons can be provided in the short term?**

**Question by [Participant]:** The other question I have is: [are there state chapters of the IES]?

**Response by Robert Dupuy:** Extrapolating from my need, the staff at my state organization [of IES] is monitoring stuff like a hawk, anything that’s coming up that might potentially impact our profession. I mean, they’re on this; they’re lobbying, so on and so forth. I mean, you have state associations or state providers that can look for this stuff, like this little classified here. Or they [are] linked in so that the rule-makers in the state government, know their contact at IES and say, “Hey, let’s take a look at this.”

**Response by Jeanne Halloin:** Right. What’s happening right now relative to ASHRAE 90.1 is that we got a hold of them and we said, “Look, right now lighting for care facilities is exempt from the energy code because we’re asking for higher light levels than typically you would find in an office environment. And so when they started ratcheting down the energy, they snuck it in there that [health care facilities] were exempt.

Now we have people who are trying to light the spaces with incandescent light because it’s more residential. That’s not where we wanted to go with it. So we’ve got to head...
those guys off at the pass, and so ASHRAE has said, “Look, we want to establish appropriate lighting power density for older people with partial sight.” So they are going to be meeting the light levels required in this, and then they've got probably 25 different facilities that they're looking at that are well designed lighting-wise for this population group. So they're going to establish an appropriately higher density [LPD] for senior care.

But the very person that took that on and was willing to do it [for health care] says, “But I can't be doing that for the office environment because it's like – they'd just be throwing it all away.” But because we have a restricted population group in the senior care facilities, they're willing to do it for them.

Comment by Vijay Gupta: I wanted to say something on the low vision lighting level. From my experience, not including the recently experienced conditions, has been bad. But earlier, five years ago, the best time for lighting [for me was] outside dusk time, before sunrise or after sunset. Or not after sunset but close to sunset, that's the outside best lighting, gives the best contrast. But inside, the contrast in here today is a lot better for me than it was yesterday. I think because lighting levels have been dimmed. But I don't know what candlepower this is.

Question by Jim Woods: I'd like to [hear opinions] around the table: How good is the correlation between illumination level or luminance and power density?

Response by Jeanne Halloin: There’s not a good correlation, because it’s again, it’s still related to the three-dimensional qualities of the space, the finishes in the space.

Question by Jim Woods: So how can ASHRAE make these changes in LPDs if they don’t know what the consequence is going to be with regard to illumination?

Response by Jeanne Halloin: That's one reason why you have to get in really early [during the design process] because if they have dark flooring or dark walls, there’s no way you’re going to get there [i.e., lighting levels for the assigned LPDs]. So what you have to do is get into the project really early and start telling them that we need light reflectance values on all the large spaces. So that’s why a lot of recommendations that you hear lighting people say for low vision people, but they're really the only way we can get the light levels up. You have to actually change things in the building itself.

Comment and Question by Jim Woods: Let me push on a little bit. Everybody's been talking about 30 percent below ASHRAE. I've played this game plenty of times. I can make that ASHRAE number go about anywhere I want it to go so I can get 30 percent below my “baseline design.” I can do that. So I think what you’re saying, Jeanne, is if we get in early in the design process, you can influence what the lighting level is for the baseline ASHRAE design, because now you have a level that includes the power density level on the base.

So the baseline ASHRAE number would also reflect the illumination that’s necessary for low vision or for other aspects. Is that kind of what you were thinking about?

Response by Jeanne Halloin: If you get in on it early enough, you can do better in the design process. Yeah, and early in the design process, not the building. Early in the design process you can affect the power density.

Comment by [Participant]: Lighting is often an afterthought. It's not part of the initial [project budget] breakdown.
Panel 6: Interior Design (Gregory Knoop, Moderator)

Eunice Noell-Waggoner, IES, LC. Value, Contrast and Reflections

(Note: A transcript of this presentation was not available. These edited Proceedings are based on notes by JEW and TOS, and slides that accompanied the presentation)

Exterior Considerations (slides 2 and 3)

Contrast is needed at ramps & curbs to alert for trip hazards. A negative example is shown in slide 2, left photo.

Steps or raised areas should be defined with value contrast. A negative example is shown in slide 2, right photo.

Edges should be defined by added contrast. A negative example is shown in slide 3, left photo; a positive example is shown in slide 3, right photo.

Reflective & Transparent Surfaces can be Dangerous

Vertical Surfaces (slide 4)

Two examples are shown of hazards from reflective and transparent vertical surfaces.

Polished Horizontal Surfaces (slide 5)

Disability Glare can distort pathways.

Reflected glare can result from windows, skylights and electric down lights.

Stairs can be Dangerous (slide 6)

Main stairs and emergency egress stairs must be highlighted. In slide 6, a negative example is shown in the left photo for the emergency egress stairway; a positive example is shown in the right photo for a main stairway.

Erin M. Schambureck, IIDA, CID, LEED™ AP. Vision and Wayfinding: obstacles to spatial orientation and navigation

Wayfinding is more than just graphics (slides 2 – 4)

Cognitive process (slides 2 - 4).

[Wayfinding is] really more of a cognitive process. You gather information at the beginning. You cite and execute a path to take. And then you continue to process information on the way.

A good analogy for sighted people is when you’re explaining to someone how to get to your house, you say, “Get off the highway at – they give you those three exits. Take that street west. Turn right at the first stoplight. Go through the stop sign. Take a left. It’s the second blue house on the left.”

We don’t get those kinds of cues, necessarily, in buildings very often because we don’t have street names, you know, so we’re still trying to use those same identifying cues from the architecture or from the signage or from the finishes applied to that space to help us navigate space. And that’s even harder when you can’t see what you’re supposed to be using as those visual cues. So a real cognitive process.

Some of the cues that we use in way finding, a lot of these are sort of self-explanatory.
Audio Cues (slide 3)

We use audio cues to know that the elevator has arrived. It makes a dinging noise. Now, whether or not you just got an up elevator instead of the down one you wanted isn’t always obvious when the tone is exactly the same. Some newer buildings are going to vocal tones that say, “Going up,” “Going down,” and announcing the floor number as you reach it.

Emergency warnings. I was reading the emergency exit plan in the hotel last night, and it had a line that said, “The emergency warning sounds like, ‘Woo, woo.’”

So we expect those audio cues –

Question from [Participant]: Was that with a Washington or Minnesota accent? Many languages have “Woo, woo.”

Response by Erin Schambureck: You know, so sometimes, they’re kind of humorous, but they do provide some information. Again, an audio warning that is a noise, a loud noise, will tell you that something is wrong, but may not tell you what is wrong and how to proceed. My mom was saying that the smoke detectors in the house went off while my dad was out of town last week, and it was a female voice telling her that the battery was dying at 2:30 in the morning. So it’s helpful to know what’s gone wrong.

And so we could be a little more clear about the audio cues that we’re providing in a way finding system.

Tactile Cues (slide 3)

Floor texture changing is a really big tactile cue. If you’ve got floor material that is of a similar tone or hue and you change that floor texture, someone’s going to know that something has changed.

Braille and tactile maps. Braille is a great tactile cue, but as people have pointed out, you have to find the sign first and then you have to be a part of that five percent of the low-vision population that can actually read Braille in the first place. You know, that’s a pretty small number. So how can we use tactile maps, other raised lettering, or other things that will provide better information?

Visual Cues (slide 4)

We’re also looking at visual cues. This is what everybody, for the most part, understands, that we’re looking at the signage that says which direction the elevator is, a visual texture change, whether it’s a change in the color of the flooring, the color of the wall, that you’ve got an accent paint color to identify the elevators.

The lighting. You can have consistent lighting throughout a hallway and then have a highlighted spot on something to highlight that there’s something different going on there or a change in the type of lighting at a location.

The signage. If you see a door that says, “Authorized personnel only,” you’re not going to go beyond that door and you know you’re not authorized. Flags for alarm pulls. And then on the right you’ve got the stair. It says, “In case of fire, door will release.” Well, okay. So then evidently I’m not supposed to use that stairwell on a normal basis.

Obstacles to Navigation

I love these pictures (slides 5 – 7), because I’ve worked in places like that and have unfortunately been forced to design places like that when there’s no budget and I’m reusing existing furniture and repurposing an existing space to put things into.
Cubical Layouts

But in a space like the one on the left (slide 5), where [compared to] the one on the right, you have an absence of color and shadow. It’s a sea of cubicles; a cubicle farm, as one of my friends call it. There’s no way to navigate those spaces.

You look for things -- like, in the very back of the [right] picture [in slide 5], somebody has a potted plant on their overhead, and you look for that potted plant as a way of orienting yourself in that office space. So cubicles and things that are not fixed architecture can be just as big a problem to navigate as other options.

Furniture in Space with Clutter

This (slide 6) is a blowup of a plan from, like, a 1940s or ‘50s German office building. This was the idea of an open office plan where you could be flexible and you could be within reach of all the pieces that you needed, and someone else could be off over in their own world. But this creates spatial clutter. Freestanding furniture is going to be just as much an issue to navigate through as the architectural walls and the space.

Floor Naming and Numbering.

This is a little abstract one, but if you look at those elevator buttons, whether you’re in a building in San Francisco and you come in on the east side of the building and it’s Floor Level One; you come in on the west side of the building and the road slopes, and you’re now in B-2.

So how do you know what floor you’re really on? How do you orient yourself within that building? We have no system that says, “Here’s how to number a building.” There are certain conventional standards, but there’s nothing that says, “This is the best-practices way to do it.” And you could confuse people between M for Main, L for Lobby, 1 for first floor. Well, in some cases, you’re -- for example, one is actually the second level above ground. How do you name them? How do you number them?

The numbering system, too, when you’re looking at a plan, an architectural drawing -- I’ve been part of projects where they’ve laid a grid over the floor plan, and the upper left corner is one and the lower right corner is 100, and we do a left to right down the grid. And that’s how they number buildings.

Comment by [Participant]: In defense of architects, that should change when the signage comes through, to be logical.

Response by Erin Schambureck: I hope so. It’s meant to be for the mechanical systems and labeling those into the AC systems and [other construction coordination]

Comment by [Participant]: It should never be the numbering system afterwards.

Response by Erin Schambureck: But it gets done. So looking more intuitively at how we number a building, can we come up with a better process for that?

Protruding Objects

We do have some guidelines in the ADA about where you can protrude objects into a hallway, but we don’t necessarily say that the objects protruding need to be of contrasting colors. So you may miss the object or you may not even see it altogether.

Comment by [Participant]: Well, that standard was specifically written to address people using a cane.

Response by Erin Schambureck: A cane, right.
Comment by Participant: Essentially, the 27 inches is a magic number where [the cane of] an average-height person will intersect with the object, giving that user sufficient stopping time to avoid the object.

Comment by Participant: So there’s nothing for people with low vision.

Response by Erin Schambureck: Exactly.

Comment by Marsha Mazz: And, in fact, if it’s below 27 inches, it’s not a “protruding object.” So for those of us with low vision, you’re more likely to walk into it, exactly. So again, it’s a situation where we addressed a problem for one user group, but it doesn’t in any way imply that another user group is [accommodated].

Question by Erin Schambureck: So is there a way that we could address “protruding objects” and modify the language in some way that would make it more universally friendly?

Response by [Participant]: The state of California attempted to address that by requiring what are known as detectable warnings, the bumps on the curb ramps, underneath drinking fountains.

Question by [Participant]: Did it work?

Response by [Participant]: Well, using detectable warnings to mark protruding objects would dilute their effectiveness to signal that we’re about to enter traffic. People come up with good ideas, but sometimes, they’re not as well thought out as we’d like them to be.

Disorienting Spaces (slide 7)

These are two images from the [research] project that Dennis talked about yesterday, where they were analyzing interior spaces that visually say one thing but really mean another.

In the [photo] on the left, which is from the Bellagio [Hotel in Las Vegas, this is a reflective glass wall next to the two gentlemen. It looks like there’s four people standing there. There’s actually only two. And the flooring pattern is such that there’s a little offset, but it continues on in through the glass. I would walk into that wall.

You know, it’s hard to tell. If you imagine Las Vegas lighting, it’s a lot of really warm lights and it’s a very uniform – (background noise) – of color temperature of light. There’s not a lot of distinguishing [features]. It is all just sort of orangy, runs together, very disastrous design change.

[In the photo] on the right, it looks like steps. It’s not. It’s actually a flat surface, and then going into the lovely, also very easy-to-navigate checkerboard flooring pattern. So we’re creating in an idea something that was supposed to identify what is probably an elevator lobby, but it’s creating navigation difficulties.

Solutions to Enhance Wayfinding (slides 8 -15)

Use color and design to create architectural landmarks to aid in spatial orientation (slides 8 – 10)

We can use color and texture to facilitate wayfinding. We talked yesterday that thinking about it in terms of gray scale. For example, in the space on the left [in slide 8], there’s a color definition behind the main reception desk. Now, yes, there’s a lot of glare in this space. It was an east-facing wall looking over the Mississippi River. But there is some sense of orientation of where you go when you need to find information and also spatial orientation.

Then also, looking at vertical wayfinding, where you’ve got a set of stairs [right photo in slide 8], the same color continues up, denotes that spot on the plan where you are. Using those
things on a larger scale can help people navigate vertically through a building and then also horizontally [in those areas].

Again [slide 9, left photo], color denotes areas of plan. We’ve got a glass wall in front of the YMCA building that continues the entire length of the building, and they’re denoting where that entrance is with a large red stripe. This is where you’re supposed to go to get in.

And then the same thing on the floor-plan signage [slide 9, right photo]. We’ve got different areas of the floor plan highlighted in colors on the map. To the right of that and cut off the [slide] is the list of departments and a dot with the corresponding color to the location on the map. And then throughout that building, the signage corresponded to the location on the map. So if you were in the orange section, all of the signage in that section had a little orange square on it to help you continue your spatial orientation.

And I changed [slide 10] so that this is actually another point that it’s going to make it easier to navigate a building if the main circulation paths on different floors are similar. This plan shows Level One on the left and Level Two on the right. And I purposely gray-scaled Level Two after our conversation yesterday about “can we make it [signage] universal for color deficiencies.”

For the most part, it works. You can’t tell the difference between the gray on the right-hand floor plan and the green on the left. The purple and the red are pretty similar, but they’re far enough away that it’s not as confusing. I was more concerned that the blue and the purple might end up being the same gray-scale value.

Avoid the extremes of surface reflectivity and contrast (slides 11 and 13)

Flooring

[As shown in slide 11 photo, this room is] fairly successful; [it] could use some tweaking when you look at it from that point of view. Somebody asked yesterday about polarizing film for flooring. We can do that with matte texturing. We don’t have to have highly reflective surfaces that will still reflect light but spread it, diffuse that light instead of pinpoint reflections.

Stairways

This one [slide 12 photo], I actually have a question for the low-vision users in the room. We’ve got a picture of a stair. It’s got stair texture to it. It’s different from the carpeting that you’re coming up to and then the white line denoting where the first step down is. Does the white stringer help you identify where each of those steps is, having a contrast color for the vertical on the sides versus the horizontal of the tread?

Responses by [two Participants]: It has enough resolution; somewhat. The orientation of the building structure is actually to teach their clients to look for that.

To look for that, yeah. So maybe in that black stairwell you missed, if it had been a contrasting color on the side, you would see that depth on each step.

Comment by Marsha Mazz: I have some reservations about looking down while I’m trying to use a stair. And because building codes typically require stairs – treads and risers to be regular – you can’t have different heights and sizes. What’s helpful to me is to have a marking on the tread – on the first tread and the last tread. But I will say that I know personally that if I try to watch my feet as I descend stairs, my balance is changed, and I don’t trust my [perception] anymore. And so I think I am better served by keeping my head up and my body erect and trusting my other senses as I descend – in particular, descending the stair. And that’s even more important on an escalator if I’m ever tempted to walk.

Question by [Participant]: Do you think the railing is a clue as well?
Response by Marsha Mazz: Absolutely. In fact, just the other night I had to descend from a dais, and there was no handrail at all on the dais. I had to ask for assistance. It had more to do with fearfulness than anything else.

Comments by [two Participants]: I don’t see a handrail on that stair. It’s there. It isn’t in the photograph.

Response by Erin Schambureck: It’s there. It’s cut out of the top of the picture. It’s from the Johnsonite Flooring website, so they [focused] on the flooring material.

Comment by [Participant]: I’ll tell you, this is subtle. What would be a lot better would be alternating colors on the stairs.

Question by Erin Schambureck: And that wouldn’t provide a confusion for depth change?

Response by [Participant]: I think it could.

Question and Comment by [Participant]: Wouldn’t it have been better to do something with the tread, the edge of the tread so you can see [it]? Even though you have the visual clue along the stringer, there’s still that issue of the tread itself. Everything looks the same.

Response by Erin Schambureck: There’s that helpful shadow, too, where, in this case you have some shadow along the left.

Comment by [Participant]: I would say the goal is not subtlety.

As we’re talking about stairs, one of the worst stairs I’ve ever seen is the main exit stair out of Penn Station in New York. Somebody had this idea to paint graphics on the stairs so that, if you elevated the stair, you’d have a picture [A photo of the main exit stair is not available]. And then it’s painted over each of the risers. And the risers are not equal height. I’ve seen so many people fall down those stairs, fall up the stairs.

Comment by [Participant]: It’s one thing, a stair that would be unacceptable in new construction.

Question and comment by [Participant]: Why is it still in existence? I mean, Penn Station at rush hour – this is Penn Station in New York, the main exit stair. It has so much traffic. And I don’t understand how it is still there.

Question by [Participant]: Why is it different heights?

Responses by [five Participants]: Pre-code. I don’t know. It’s an older stair, though. It’s an older stair, but still it should be torn out and rebuilt. And then to put this graphic image on the risers going up. Crazy.

Comment by [Participant]: I don’t know how the other users would feel, but I have a particular problem on a curvilinear stair because you want to hold on to that handrail. If you’re right-handed, you’re walking on the right side, [and] you’re on that narrow end of the tread.

Comment by [Participant]: I guess if it’s clockwise – but very often you find that you’re on the narrow side of that tread. And if you’re on the wide side of the tread, it’s equally problematic, because you still don’t know where the edge of the tread is.

Comment by [Participant]: You have different cadence [in your walk] at different points.

Comment by [Participant]: Well, I don’t know if it’s ruled out by code now or not, but on landings there are sometimes diagonal steps.

Responses by [seven Participants]: Totally ill-advised. Not allowed in any commercial stair, [anymore]. Except in residential. Well, they exist, and they’re really hazardous, even for people who are sighted.
Furniture Layouts

Repetitive or intuitive furniture layouts are easy to navigate. Avoid “mine-field” layouts. Cubicles can be problematic. In the picture on the left [in slide 13] is the crazy building floor plan from 50 years ago. The picture on the right is taking that to the other extreme; again, that cubicle-farm concept that you get yourself in the middle of this and you have no idea which way is up.

You are hoping there is a window on one [façade] to orient yourself, but there’s no way to get it, especially with the 60-inch-high panels. It might be a little lower, but you still have to figure out where the pathway is. You can see the exit then, but how do you get there?

Comment by [Participant]: I would think [this layout] would be problematic for someone who doesn’t see well.

Comment by [Participant]: It reminds me of a layout, a cubicle layout for [the new] Coast Guard headquarters at the St. E campus. Acres and acres and acres of cubicles. You really do need street signs. It’s three football fields long and has nine elevator cores. You have to enter the building from the front. And if you have the misfortune of being low vision or being in a wheelchair and you work on the other end of that building, which steps down a hill, you’ve got to traverse all those elevator cores, all those corridors, in order to get to where you work, because you don’t have any entry point -- other than from a garage on the side of the building, you have no entry point other than the main entrance.

Audible Information Systems (slide 14)

We can add more audible information. This is a quick graphic of a talking signage system. There’s more research that could be done in adding talking signage. We were working, talking to the U of M folks about – they’re developing a 2-D bar-code system that would go with a hand-held. A low-vision person would wave the hand-held piece back and forth. It would pick up that bar code.

There’s a distance delay of about three feet right now, so you’re actually [be] three feet past the sign before it transmits to a Blue Tooth phone or earpiece that tells you what that sign was that you just passed and what it says. And you can tell it that you want more information.

There’s technology coming out that can be incorporated in specific instances to help you navigate –3-D maps, hand-held.

Location of overhead signage (slide 15)

We can have this wonderful overhead signage, but we also need to have the signage closer to the eye level. The bring it closer and easier-to-read concept. Overhead signage is great for navigating wayfinding; make sure [that it] also [is] at a large scale [and] at a lower level that people can get close to it and really figure out what that sign says; [and] repeat signage.

Implementation Challenges for Interiors (slides 16 and 17)

And then just some different thoughts for how we’re going to implement [these solutions].

Prescriptive requirements are great, [if they are] backed by research, but that also may limit the design creativity and options and force someone to design something somewhere that may not have the best performance. Every scenario is different, so how do we allow for any unique situations for design?

Items that we can work on in the ADA [include]:

- Detectable warnings. Can we bring that into the building somehow and require that strip at every stair in an egress stairwell?
• Protruding objects. How can we improve that so that [protrusions] are not such obstacles?
• Improving egress signage?

Comments by [three Participants]: There’s one other aspect of the detectable warnings that people don’t think about. In the past, [we] have been required to have truncated cones covering the entire surface. For someone in a wheelchair, that is literally hell. And you’ve got to get back up and get out of the street. Exactly. So that’s a really bad idea.

Pricilla Rogers, Ph.D. Making the “Invisible” World “Visible”

I took a lot of my slides out because we’ve already talked a lot about design concepts and interior design.

Vision Loss: A Growing Problem

Best estimates indicate that over 25 million Americans are experiencing vision loss, most with low vision. These numbers are growing everyday as the baby boomers age (slide 3).

[As stated in slide 4]: “Our architectural standards in this country have led to an invisible world, a world in which falls among the elderly cause more deaths than do medical conditions.”

[Slide 5] gives the idea of the [falls and the low vision] issue:
  • People with reduced visual acuity are 1.7 times more likely to fall.
  • They are 1.9 more times more likely to have multiple falls than are people with normal vision.
  • The odds of hip fracture are between 1.3 and 1.9 times greater for people with reduced visual acuity (Legood, Scuffham, Cryer, 2002).

[Slide 6] indicates some major economic impacts, not only on the person, but the caregiver:

  2007 Study by Prevent Blindness:
  • Annual Cost of Adult Vision Problems in U.S. = $51.4 billion
  • Non medical costs=$11.2 billion, most of which goes to nursing home care.
  • Direct Medical costs=$16.2 billion annually
  • Lost Productivity= $8 billion
  • Informal care costs: $.36 billion

I really think we need to look at this aspect of it as a way of getting people interested in getting on the bandwagon with us. The whole [fall issue] is just so major. And it really may be something we could put our fingers on in terms of this lighting issue and everything else, because everybody’s concerned about this in nursing homes; everybody. So I’m just going to put that out here again to think about, because it is a major economic impact, and not just on people with low vision. It’s on everyone.

Designing with ADA

This is a picture (slide 7) of our center in Dallas. We have a lot of design elements there. Like I said, I’ve taken most of them out [see slides 11 – 16], but [as quoted on slide 7:] “ADA doesn’t have to be ugly. Come inside and decide for yourself.” We had two architects involved developing this building, and also DFW Airport, in the main terminal.

And one of the architects, [said in] his closing comments on the video [linked in slide 8—the link did not work, maybe Priscilla can make it available]: “ADA doesn’t [have to be ugly].” So
that's why he's there. And it's true. I think we really need to think of that. It's not just ADA. It doesn't have to be [ugly], color contrast can be nice [slides 9, 10, 16 and 17 – links to videos did not work, maybe Priscilla can make it available]. But more importantly, it helps to [promote wayfinding].

The reason I put a couple of little videos in here is that we actually did a video on design principles with the two architects that I mentioned. And they talked about simple design principles and what they learned from being involved with us, in trying to design our building and the one at the DFW Airport. So I wanted to share these with you just because I think they're neat, and then you might be able to use them in other [applications that] these architects are talking about what they actually learned from the experience.

**Importance of Stakeholders**

The other part I wanted to talk about is the importance of stakeholders and having those stakeholders involved, because that's what happened with us both at our center and in Dallas at the airport is that, before anything was done – and believe we wanted stuff – we still brought in the stakeholders. Who is going to be involved? Who's going to be using the building, and what is their interest in it, and what are their concerns?

And so we take [as] a basis what we do with ABA and all the rest of it. But then you actually have consumer involvement in it. And I know you're talking about how you do your follow-up studies and all that afterwards to find out how the building actually works. You know, it kind of makes sense to talk about it ahead of time with the people who are going to be using [the building].

The biggest point that I'm going to make here today is that we need to think about [bringing in the stakeholders, early in the planning and design process]. And there's nothing that I know of – maybe you all know something – that would keep us from doing that at the get-go.

And then you get to bring in not only the people with low vision, but also, like in the airport, for example, we brought in people with other disabilities because we have to look at all those kinds of issues.

One of the pictures that's in here [slide 11] is how we use, in the airport, design on the floor, the tactile, so that people would know where the gate was – people with visual impairments. What they wanted to do was put murals on the wall in the airport. And they said, “Okay, we can have the murals, but let’s put them on the floor.” And then they used them at every single gate in the international terminal, so that now people will know, when they come to a gate, they'll know it's there. And it's just a very simple concept. We still have the art and the beauty, but we have the tactile surface to help people know.

Well, it wasn’t in the way of wheelchairs. People could go across it and it didn't deter from anything. But it’s a great wayfinding. It worked for everybody. Everybody in that stakeholder group talked about it; they talked about every single design element and how those would help people with different disabilities. And they came to a consensus. So that's my major little thing that I wanted to talk about today.

**Comment from [Participant]:** It's cool-looking.

**Response from Priscilla Rogers:** It's cool-looking. It's really neat. It adds a lot to the environment.

**Summary of Design Concepts that Enhance Wayfinding (slide 18)**

- Increasing “visibility” with high contrast.
- Providing sufficient lighting and glare control.
- Using logical, consistent layouts in building design.
• Eliminating extra/distracting sounds/echoes.
• Using tactile surfaces for flooring.
• Consistently placing signage in LP and braille.

Resources (slide 19)
AFB Senior Site (afb.org/seniorsite)
AFB publications including:


Jeanne Halloin, IES. Interior Design

Importance of Codes
I think it’s important to know that codes are not bad. I can’t tell you how helpful codes have been through the years. I think we should get away from the idea that they’re not good. There are so many mistakes we could have made over the years if we had not had codes. And I remember when I first moved to Michigan, I would go to this meeting. And I walked across the carpet in Michigan, which can be very cold and very [dry; I was] shocked out of my mind. And I’m thinking, “Somebody didn’t think at all about code,” you know, the static electricity in carpeting.

There are all kinds of codes that really are helpful. I taught building specifications for commercial interiors. I tried to tell them, “Codes are really your friend. It helps you so much [to specify the] right thing and to know what to ask suppliers and manufacturers [about] materials that you’re going to use.

Motivational Characteristics
You already know these things because you’ve already agreed pretty much on what motivational characteristics are:

• Low vision makes us more dependent on our environment (slide 3)
• Aging does the same as we compensate for increasing frailty and sensory loss (slide 3).
• Low Vision Characteristics (slide 4):
  o Need more light.
  o More sensitive to glare.
  o Slower to adapt to different light levels.
  o Function better with high contrast on surfaces and tasks.
• Good Lighting (slide 5).
  o Light levels adequate for the visual task.
  o Fixture design to promote glare reduction or elimination.
  o Fixtures placement to avoid direct & reflected glare, and shadows.
  o Light levels that are fairly uniform while still providing areas of interest.

[For example,] when we talk about defining edges of things: white is a better definer of an edge than a dark color.
One reason I feel that way is one of the first facilities that I was involved with was an assisted-living community, and there was an Alzheimer’s area.

What they would do is sometimes, in front of a doorway, there would be a cutout in the carpet and there would be a black circle there. It’s because Alzheimer’s patients wander continuously. A lot of them move all the time. And they were wandering into these spaces and taking things. So if they [staff] put a black circle in the carpet, and even though it wasn’t huge, they [patients] thought it was a hole, and they wouldn’t cross that area.

[Also the patients] had bracelets, but they could still go out [of] the doors and then we’d have to find them. So [staff] would put stripes on a flat area near the doors. [The patients] would think there were steps [at the area] and they couldn’t take their wheelchair out there or they were afraid to navigate them.

So black is not a color I’d use if I’m trying to help people get somewhere, because I know it’s a color that is used to prevent people from going places.

Material Characteristics (slide 6)

Matte Finishes

Other just general things that are important. Matte finishes (slide 6) are always better than specular surfaces or polished granite. And that can be columns, and it can even be lighting fixtures.

When I was photographing assisted-living communities for a research study, we went to this one craft room and there were women playing cards. There were about five sets of women playing cards, but the tables were rectangular. So you would have one here, one there, and, like, two over there.

I knew there was a game room, so I asked them, “Why are you playing [in the craft room] with these tables?” And they said, “Because in the game room, where they have the square tables, the lighting fixture isn’t good and it puts a lot of glare. The table is polished, and it puts a lot of glare on the table. Plus it’s shiny brass. So they had a direct glare vision, and then they also had a reflected glare vision. So they were just accommodating themselves by using different spaces, not for the intended purpose.

That’s what people are going to do in these facilities. They’re going to make [the facilities] work, even if it isn’t as convenient.

Light [Reflective] Values

You [have] already said that’s one way to use less energy, to get better light in the room, because you’re talking about reflected light and how these are reflected. [Light Reflective] Values [LRV] are on every paint chip. They are on ceiling tiles. I mean, they’re on your materials, so it’s not at all hard to find them. That’s why it’s important to come in early [in the design process], so that you have all of the [LRVs] before you start doing [detailed design].

Glass Surfaces

Glass doors, countertops and freestanding display cases should be really defined well. I think they shouldn’t be used a lot, and we should use them very sparingly. And when they are used, you have the problem of really making them visually seen.

This is the entrance to the Brooklyn Museum (slide 7). And this is the one where there were so many steps that they eliminated the steps. But now it’s hard for people to find which ones of those [glass panels] are doors. And a lot of the [glass panels] have black vertical graining in them but aren’t doors, and some of them are. So by the time you find
the sign, you’ve gone to several different areas to find them. But then when you come in, you see you also have the glare [from] the door[s and glass panels] (slide 8).

On the other hand, look how easy it is not to walk into those statues. I mean, they’re a great contrast. They’re right out in the middle of the space, but they’re very easy to see. And the bases are [raised and] a little bigger than the [statues] themselves, but still [present a stumbling] problem.

Value Contrast (slide 9)

Fixed Surfaces

To show where vertical and horizontal surfaces meet is very important. To show edges is very important. And one place where this is really important, even though you’re no longer allowed to run carpeting up to become a baseboard because of cleaning or health issues, a lot of times the baseboard will be painted the same color as the flooring.

And when you do that, even if they have pretty darn good vision, [people have] the feeling that that wall, which they may be leaning toward or using to help them become stable isn’t where they think it is. So [through] peripheral vision, it [appears to be in] a different place.

So it’s really important to make that definition of where the change is, not from partway up and then make the change. And so very often you’ll see a handrail that’s darker than the wall, and then they’ll make the baseboard darker than the wall too. But then it matches the value on the floor. So it causes a problem.

Furniture and open spaces

There are so many cases of dark furniture on dark carpeting or on patterned floors, and also white leather furniture on white or very light floors. And those are very difficult to see. Even if you’re looking down and expecting to have to look for a clear path, those are very hard to see, because they’re quite low. A lot of those benches are knee height or below. And that to me is the same as having something stick up from the floor. But quite often they’re open underneath, so you can fix that easily, though, by putting contrasting colors.

This is inside our museum gallery (slide 10). [When] they want to show off the art work, they often make all the finishes the same. So the walls and the floor and the ceilings and even the stands the things are on are all similar. But some of them do have a good shadow where that little darker wood base is. Some of them don’t.

But what you often see when you go into galleries or even office buildings is, if they have a hazard there, they’ll put four [posts] and then they’ll put a rope. Well, it’s not only hard to see it, but a cane goes right underneath the rope, and so people get embarrassed more than hurt, because they usually stop by the time they walk into the rope, and then all these metal posts are falling over. And that’s really common today.

Even though you want the art to show up, this space should have been a different value, a darker value in the floor and then the bases [a lighter value]. But you need a change there.

Signage (slide 11)

Location, location, location, especially in relationship to the light sources. And then reverse contrast is better because you don’t have the glare from the background. They really should be solid at floor level, and, not shadowed, as you [lean in to read]. Auditory signs can be an option.
Orientation (slide 12)

This was already brought up. Floor-plan organization, if it’s consistent from floor to floor, it’s much easier for people to navigate. If circulation areas do not have curves and non-right angles, it’s much easier for people to navigate, and if waiting areas are kept separate from the circulation areas.

You know, any time you go through [circulation areas], not when you get to the end. But as you go down the line, the waiting areas are separate. We don’t always do that in public spaces, and we don’t always do that even in office buildings. But there are a lot of buildings where [separation is provided by] an area rug or a change of floor color: “that’s the furnished area that’s [the waiting area] right adjacent or to one side.

Comment by [Participant]: New office space also. There’s plans where they want people to eat outside of the work area, so they’ll put them in the corridor space. And it’s undefined, separate [area].

Response by Jeanne Halloin: It can be a real problem.

Visual Busyness (slide 13)

And I want to also say avoid visual busyness because we’ve been saying contrast is really [overused]; I think you have to use contrast sparingly. All of a sudden the place is so busy that you’re trying to take in too much information. And if it’s hard to see, it takes you a long time to take in all that information.

So I think what you have to do is use the contrast on the edges of things to tell you where the edge of the counter is, to tell you where the floor meets the wall, to tell you when something sits out [and protrudes into the space], to tell you when there’s a freestanding object. But you don’t want to then start balancing it by just putting it all over.

And you see that. Sometimes you see it in the ceiling pattern, but the ceiling isn’t all that high and you have all these beams running across. You look at it. The first thing you see is there’s a lot going on here, and so you feel like you have to really [concentrate]. And we can avoid that by making spaces simpler, avoid alternating light and dark areas.

Lighting Applications

Wayfinding

And again, I agree that we do use light to direct people. It’s a fabulous way to direct people. You can have a little meeting area, a little cafe across from the university campus, and because there’s windows in the front, if anybody walks by and looks in, and if the people are all sitting there, you think it’s full, so you don’t go in. But you can use light to make them all go to the back, and then it’s more empty in the front, and then they keep getting people in.

Behavior Modification

I mean, there’s tons of ways. We use lighting to tell you how to behave. We use lighting to tell you the sheets in the store are really expensive. We use lighting to tell you this is a discount store; things are probably going to be cheap. It’s not that we use less expensive lighting or lighting, but we use really good color [rendition].

But we know, for example, if an elevator door opens and this area is lit much better than that, 90-some percent of the people will go there. So we use light to tell you how to behave, to direct you, tell you where to go, to make you follow a path we want you to follow.
Lighting Performance

So I think we can do that and still not have our lighting levels be dramatically different or not have them use spotlights to make things bleary and confusing. And also, as someone talked about earlier, you just have perimeter lighting sort of like this (slide 14), where you have all these [sconce lighting fixtures].

There were a number of slides we saw today where the tops of the walls were really dark (slide 15). It made the hall space look smaller and lower. And there’s a lot of recess perimeter lighting that just gives you a wash down that wall. It’s inexpensive lighting to run, but we [have alternatives that are] a lot less expensive than they are.

But you can just come in early in a job. You can design it into the architecture and not have to buy all those fixtures. So you can get a lot of good perimeter lighting without having to start adding things later (slides 16 and 17). And that’s a huge advantage to coming in early.

Another thing I wanted to point out is lighting has a lot to do with our sense of security. I have gone back to projects, even recently a project I did where I was above the IES standard for lighting for the public restrooms, but it was a facility where people didn’t know each other and there wasn’t a community where the same people were always there, and they didn’t feel comfortable in the restrooms because of the lighting level. It was easy to add some more lighting, so we did.

There was a study done where there was one person at a table, and someone would come in, like, over in another part of the room, and they would fill out a questionnaire. They thought the questionnaire was what the study was on. The study was actually on lighting. But then they were asked to turn their questionnaire in to the person at the table, and there were only that subject and the person at the table.

If the lighting level was low, they would kind of reach and put it on the table, and they would not come close to the person at the table. They wanted to keep their distance. If the lighting level was higher, they would come right up there and they would talk to the person at the table and feel more comfortable.

So I think if we keep lowering our lighting levels, we don’t feel as safe. We don’t feel as secure. We’re a little more frightened of using public spaces in places we don’t know people. There’s psychological affects as well as the safety affects.

Roberta Null, Ph.D., ASID. Training for Blind and Low Vision Persons: Color Contrast

Center for the Blind

I did a lot of work years ago teaching kitchen design, and found out about the Center for the Blind in San Diego (slide 1), which was right off of our campus at San Diego State University.

It started out as a student project. I think that that’s one of the things that we don’t do enough of, and that is involving students.

This was an example of involving students in learning about the low-vision elderly group that really use the Center for the Blind. And, in fact, it changed their lives.

Activity Room (slide 2)

The color contrast wasn’t quite that bright when we first did this, but they put it and they seemed to like it. And it works for them.
This was a project that was done with very little money. The Bola chairs were donated by Norm Polsky from Pictures Furniture. They still look as good now as they did. This was 1984 that we did this. And we got 50 Bola chairs. And they still look great.

**Hallway (slides 3 and 4)**

And the highway – or the hallway – it sort of looks like a highway, doesn’t it? They added [wayfinding arrows] at each room (slide 4). The only complaint that they’ve had about it is that the dog hair from the seeing-eye dogs shows up on the blue contrast.

One of the things I learned when I one time went through the Lighthouse in New York City, that they paint the doors that they don’t want people to use, like the janitor’s closet, a solid color that contrasts with the other.

**Training Kitchens (slides 5 – 9)**

**Main Teaching Kitchen (slides 5 – 7)**

This is the [main teaching] kitchen. We got an ASID national award for the training kitchens, because one of the things that I discovered in working with this is that most blind rehab centers are really geared up to rehab young totally blind people. And so their kitchen is usually a little one-wall kitchen that maybe would accommodate two people.

And this is probably one of the biggest [features of the kitchen] facilities and blind center; and the reason being that with older low-vision people, activities of daily living is their main [interest], I mean, they’re not going to go work in an office when they’re 85. But they might learn to live independently.

Another thing that I learned in doing this project is that kitchen-design firms are always changing their displays. And so they were replacing their Formica kitchen and putting in mauve countertops and white oak. This was in the ’80s. So I asked them if they’d like to donate the old kitchenette, and they did (slide 8). And actually, it was sort of like dark Formica. They have replaced the cabinet doors since then.

And so that’s one of the reasons for the bright colors. I mean, it really shows a lot of contrast. The Bola stools [are] very satisfactory and really wonderful for their elderly population.

Notice the contrast with the light switches (slides 5, 6, 8and 9). That was one of the students that volunteered that information. It doesn’t cost anything. I mean, you just buy brown ones and then you buy some cream-colored ones, and you just alternate them.

**Corner Teaching Kitchen (slide 8)**

[The] corner kitchen (slide 8) has the 30-inch-high countertops, and [has been] re-designed for wheelchair users. They can also sit at a regular chair and work here.

This was Corian that we had donated, and they put this little strip of blue as a contrast. And it has a gas range. So we said, “Well, wouldn’t that be dangerous to put a gas range?” These people are going back to houses where they have gas, so they need to learn to use it safely. And, of course, that’s one of the big projects.

And this [is] a single-handled faucet and the light for the hot-water tap next to it (slide 9). This one is very easy to use. A lot of the hot-water taps you have to turn and twist, which are not good for elderly people. A lot of these things are 15 years old. The sink is. The faucet is. It was given to us by KWC.
Model Apartment (slides 10 and 11)

We put in a model apartment. The window goes out into the hallway (slide 10). There’s [also] a window from the kitchen area out into the hallway so you could see in to see what’s going on. This is a grooming area that they put in (slide 10).

Behind the tall cabinet to the right, is the Murphy bed (slide 11). It folds down, and they can use it to teach bed making. Or if someone gets sick, you know, during the day, you know, there’s a place where they can lie down.

These were the orange plastic chairs that we started out with (slides 10 and 11). But these were some that were older and are used in the center.

We were given a washer and dryer by Whirlpool. The only problem was there wasn’t any place to connect it. So when they remodeled about five years, six years ago, they were able to get the washer and dryer in the apartment.

Post ADA Signage (slide 12)

And then the signage, of course, it was on the door, and that was before ADA passed even. This was ‘80s. So now they’ve got really redundant signage on the bathroom doors.

Open Discussion

Issue 18: What design guidance on accessibility through contrast and signage attributes can be provided in the short term for persons with low vision?

Comment by Greg Knoop (Moderator): Thank you Roberta. And from the clinical corner here – I hear a lot of positive “Hmms” – because this is the appropriate use of an aesthetic. Do you remember “The Joy Luck Club” and that stainless-steel-on-stainless-steel kitchen that the mother walks in and is, like, you know, shocked? I mean, that’s what we’re seeing as a common aesthetic. So here’s a more appropriate aesthetic for our population.

Lighting Contrast and Conceptual Design

Comment by Vijay Gupta: I wanted to [continue] discussing [the] earliest availability of standards or [guidelines] which are already on hand. So your panel has done a good job. There are a lot of issues on contrast.

I want to give you a real example. I work in a building that three of us here – Kate and Tom – : [The GSA Headquarters] Building. It’s a historical building, 1917. It’s a very bad building. I’m in the office of the chief architect. So I had an old ] space. It was old design.

In February of 2002, we moved into the new office of the chief architect. It’s [on a corridor of a wing] and was 50-foot-wide [with the core running] east and west. And the whole [interior is] all white, clear white, everything white – the ceiling, the floor, the floor tiles, the wall, the columns, the furniture. Even the signs are so little – all white, all white.

Comment by Greg Knoop: We can show you that. It’s in that synopsis presentation [slide 8].

And the chairs – somebody brought in the chairs with the leather. The chairs were leather. And the only thing which was shining was the [frame, which was] chrome. The good news was they had plants at every column. So [I did not] bump into the columns.

The conference room [had glare as furnishings were all] white – chairs white. And especially if the sun is shining, you got a lot of sun.

Okay, to conclude. My eyesight was a little bit better than now. So I could navigate with the green plants and with some other [visual cues]. I [relied on] them that way for several years. But I had to go into this [new space]. But they got rid of the plants.
Comment by [Participant]: The design of this space was influenced by Richard Meier. I think Ed Feiner had gone to Meier’s office and, you know, he liked that and so they hired some designers to do this all-white scene where everything’s white.

Comment by [Participant]: But it was good because it got Vijay so angry that he convened us.

Comment by [Participant]: We certainly don’t want that to be the representative of what makes American architecture great. That really is a horrible statement.

Signage

Comment and Question by Tom Williams: Along with the discussion about wayfinding and signage, it brings out the issue of contrast and tactile signs and so on. One of the things that we don’t do much here in the States is use pictograms. Wouldn’t it seem logical to use that on a more regular basis? And I understand that there are people out there that, these things just don’t register.

And I happen to be married to one of them who can’t translate a pictogram, but I think some of it is a learned skill and that, in addition to the fact that it’s easier to make the contrast, it’s also a more universal signage that doesn’t rely on knowing the English language. Is that something that we could build into these guidelines?

Response by Erin Schambureck: The only pictogram requirements that I recall being in ADA – and Marsha, maybe you could verify that – is really just that handicap image – the person in the wheelchair. The international symbol of accessibility.

Response by Marsha Mazz: Actually, there’s four, in terms of the ADA and ABA standards – one for assisted lifting, one for volume control – off the top of my head, I’m forgetting the fourth one. But anyway, we don’t require pictograms except for the international symbol of accessibility. The others we require only if you provide those features.

Question by Tom Williams: Well, the question really is, would that be an easier way to provide guidance?

Response by Marsha Mazz: Probably not for people with vision impairments because oftentimes, if you’re looking for the restroom, you know what the word “restroom” looks like as a whole. It’s a Gestalt – or “ladies” or “women’s” – you know all those. And so you have a sense of that form and how much real estate it takes up.

But pictograms – they get expanded and shrunk and they get, you know, decorated and all kinds of other things, which may – if you only use a pictogram – may be a problem. But I think you’re onto something in terms of, you know, trying to get at people using multiple methods. Some people are going to find a pictogram easier to spot and easier to understand, and particularly people with cognitive disabilities who may not read at all.

Comment by [Participant]: Perhaps incorporating those pictograms into the wayfinding to get you to those place, not just the sign identifying to the stair or the restroom.

Response by Marsha Mazz: My argument would be for redundancy with the use of the pictogram, not to have the pictogram totally supplant the word. In fact, when you use a pictogram to identify a restroom, for example, you are required – it’s in the ADA and ABA standards – to provide the equivalent verbal descriptor in raised letters or Braille.

Comment by [Participant]: And I think, also, those pictograms should be informed by human factors or something because I found out I’m not the only person in the elevator who cannot identify which of those triangles is – and I never want to push it because I’m sure I’m going to be pushing “close door” on somebody who’s trying to come in.
Response by Marsha Mazz: That’s a very good point. Most of the pictograms we use are not ISO standards and so they haven’t been tested through any kind of [a consensus process]. Just because we invent a pictogram doesn’t make it a good one.

Question by [Participant]: Is there a requirement for size in our standard – the size of the sign?

Response by Marsha Mazz: We’ve declined to try to describe the minimum size of a pictogram itself because, where do measure on a glyph? So what we did was, we prescribed that the field in which that pictogram sits has to be a minimum of six inches tall. So we’ve trusted the graphic designers to not put a postage stamp in a six-inch field. But legally, they could.

Question by [Participant]: But what is that six inches based on?

Response by Marsha Mazz: The six inches is just a typical plaque size that you will find for most signage. And we know that six inches is going to be installed anywhere between 48 and 60 inches on the latch side of the door because that’s required. So it’s going to be at eye level and it’s going to be at least six inches tall.

Comment by Fred Kringgold: One thing that I’ve noticed that is kind of interesting is, just taking airports and gate numbers around the world, they vary tremendously.

Response by Marsha Mazz: It's a huge problem, and we haven't regulated them as clearly –

Other Contrast Attributes

Comment and Question by Jim Woods: [This] picks up on what Fred was saying, but I heard something that is just blowing my mind. It’s confusing me and I want to get some understanding. Several of you used “contrast” in ways that I’m not used to considering contrast – contrast of texture, contrast of some of the other attributes. But do you see contrast in a different way than “light and dim”?

And that’s a big issue, I think, as far as us trying to get into a common vocabulary. I’d just like to hear you express, for example, when you talk about texture contrast, how do you measure and perceive that differently than you do color contrast?

Responses by [three Participants]: Change. It's a change in light. It's an obvious change.

Response by [fourth Participant]: For example, in our doorways in our center, we use wood-carpet-wood, and it's a whiter color. And we have carpet and it's all butted-up so there's no step down or anything. But it's a change in texture so a person who's visually impaired or blind, they would know – they've got the texture – but they've got both [cues].

Response by [fifth Participant]: There's a change in resiliency between carpet and wood, and that change in resiliency is a good cue because it's also, often, an auditory cue if you're using a cane or it's an underfoot cue if you're not using a cane.

Question by Jim Woods: Okay, but if we were to go color-neutral, [what are some of the other aspect of contrast?]

Response by [Participant]: You’re going to feel the difference between the smooth surface and a soft surface or a textured surface. You feel that because it’s a difference in the friction, basically.

Response by [Participant]: When we did our [consensus review], we had huge discussions going on for hours because the lighting designer would use ["contrast"] one way and the interior designer would use it another way. And I mean, I had a lot of terms, and we could pull out some of those terms.
Question by [Participant]: So, how would you measure contrast in a non-visual way?

Response by [Participant]: We say obvious change.

Comment by Vijay Gupta: [This] is that experience from that obvious place I had. So I complained to the director of the office that very problem and a few days later, in that lobby, I saw some black leather chairs I say, they listened to me. Later, I came back – the chairs were gone. So I asked – I went back to the director and I said, what happened? Oh, Jesus, somebody made a mistake and delivered the wrong chairs.

Question by [Participant]: [What about surface changes?] – the old bumps, you know, in the road that they have. That seems to be the thing that you do, too, for low-vision people or blind people, because they stand up. But they’re really hard for older people with low vision because they’re hard to walk on. Your walkers get stuck in them and things like that.

Response by Marsha Mazz: Actually, we’ve researched that, and I know people say that, but the research doesn’t support that claim. So I will tell you that there is a constituency of people who have fought that requirement forever and they are the successors to the constituency of people who fought installing curb ramps on the basis that their belief that curb ramps would be dangerous to blind people.

And now they’re saying that you can’t put warnings on curb ramps or you’re dangerous to walking people. If you walk, you don’t have to use the curb ramp. In fact, most older people, including older people who use walkers, prefer not to use a sloped surface, not because of a detectable warning, but because it’s easier to step down off a six-inch curb than it is to lift your feet and walk down a slope. And this is why we had such competition over the issue.

Comment by [Participant]: [Maintaining] balance --

Response by Marsha Mazz: Right – exactly right because your walker is not on a slope. We have a constituency of people who like stairs and don’t like ramps for disability-related reasons. But [others have] been using these detectable warnings on interior locations and to aid in wayfinding. We’ve participated in international forums on this subject. In some foreign countries, they do use a variety of detectable warnings – or [as] they call them in Japan: “taki blocks” – to aid in wayfinding.

And some of them are herringbone patterns and all kinds of other patterns, most of which people who have vision impairments can’t really distinguish one pattern from the other. They just know that they’re on a pattern. And so we find that the research, again, doesn’t support their use for wayfinding, most importantly because detectable warnings have a single purpose.

Like a stop sign, the detectable warning signifies to an individual who is blind or has low vision, stop here; don’t proceed further because you’re about to enter a vehicular area. So if we start proliferating these things all over the environment and putting them at drinking fountains and putting them here and putting them there, they lose their utility as a warning. They will no longer serve as a warning. We selected that pattern and that particular design because it was not readily available in the environment. Corduroy actually tested better for detectability but didn’t serve as a warning.

Issue 19: What Principles of Universal Design can be applied in the short term for persons with low vision?

Comment and Question by [Participant]: I have a question for Roberta. You really did a neat job on those kitchens – and in looking at the colors, I mean, it looks like it’s the 1980s. But now, are you just – is there a set of guidelines written down somewhere that, you know, when someone comes in and they say, yeah, I have trouble in the kitchen, they say, well, you know, if you really want to stay in your house, you might have to spend a few bucks.
But here’s a set of guidelines that you can take to your builder, remodel your kitchen so that it’s safer, accessible, blah, blah, blah, you know? You could figure out, well, that will cost me $10,000. Well, if you have to go to assisted living, it could cost you a hell of a lot more than that.

Response by Roberta Null: The National Kitchen & Bath Association does have guidelines and they’re good. And they change them and you know, they keep updating them and things like that. But it just should be universally done because no one should have to stand on their head to find what’s in the bottom of the base cabinets.

You know, that’s for everybody. And I don’t know if you’ve seen that refrigerator ad – it’s just wonderful – the little guy that can’t reach? And so they add this drawer, you know, to his Samsung, or whatever refrigerator it is. And he says, wouldn’t it be nice if everyone designed for everybody?

Comment by [Participant]: I would have said it on our website, on senior’s site, we have some tips for kitchens and bathrooms and all that – what people can do to just, you know –

Comment by [Participant]: There are universal designs for kitchens where the cabinetwork is actually – it can be raised and lowered, depending on –

Response by [Participant]: Oh, absolutely. That’s for the guy that was in a car accident and made a million dollars and, you know, had his kitchen completely redone. And in fact, they have a couple of these kitchens that are CGI. Yeah, and somebody that was at grad school there said that the one thing they always had problems with was the range that went up and down.

Response by [second Participant]: Yeah, that’s right.

Response by Marsha Mazz: There are drinking fountains that go up and down and nobody likes them and they’re no longer manufactured.

Response by Roberta Null: I really think a lot of this is education, you know, that you have to – with universal design, you have to show good examples and then you have to tell why they are good examples.

When I was in San Diego, we went to the Mariposa low-vision center. I don’t know if you’re familiar with that, but they’d just redone it. And everything was mauve. I mean, the chairs were the same color as the carpet; the walls were the same color. I mean, it was just like going into a monochromatic cave. I thought, this is the low-vision center? It was really alerting to me.

Panel 7: Next Steps - Guidelines (Earle Kennett, Moderator)

Earle Kennett. Introductory Comments

We have our last panel. And this kind of meshes into concluding thoughts. So we’re going to do this having a brief presentation by Kurt, and that will sort of lead into our final thoughts.

When we go into the talk, we’re going to put up a Microsoft Word blank sheet, basically, and keep a flow-point of concluding-the-way-forward thoughts – just to give us a virtual notepad to share and go with here.

Our panel, in no particular order, is Cheri Wiggs, Debra Babcock, Kurt Knight, Priscilla Rogers, Marsha Mazz and Patrick Fee. And we will begin with Kurt’s presentation. Kurt?
Kurt Knight: Development of VA Standards

I'm just going to give a little overview of VA's standards website, a little discussion about how we go about developing the standards and implementing them, and a little about the issues involved relative to this particular subject.

Website

First of all, this is the website we have all of our standards at (slide 2). It is called the technical information library (slide 3) and it is accessed through all the VA – the field VA, as well as our consultants – for standards that they design to and incorporate in all of our projects, major and minor. You can get at it, too, by just googling the words “VA technical information library.” It will be the first thing that pops up there.

Design Guides

It's a series of different type of standards, design guides, design manuals, master specifications, design works and finish schedules (slide 4). Design guides are what we focus on mainly because that's the document that provides guidance, but not requirements. We have design manuals that have a lot of requirements in it. Design guides try to give a graphic organization of all of those standards in one document.

I think it's appropriate and may be a method of, in this group, trying to identify guidance separate and apart from requirement, in a graphical context. This is just some coverage of some of our recent design guides (slide 5). And they're constantly evolving, constantly changing.

We try to update them every five years, and in some cases, more often than that because the [attribute] changes (slide 6) and medical care changes. I mean, VA is rapidly changing – and I mean medical care in general is rapidly changing and it's hard to keep up with it from a space and function standpoint.

The space criteria that we have is kind of the requirements – in other words, how much space we allocate for each particular function. We have 60-some functions in the VA. We identified specific amounts of space for each of those types of rooms within those functions. The space criteria is a written document, also available as an electronic tool.

Attributes

The design guide is, again, the graphical representation of that space criteria plus key mechanical, electrical, structural issues associated with each group. And the design guide deals with the narrative with a lot of different kinds of design issues that are associated with that particular function that we think are important – adjacency that flows with patients and staff and visitors, et cetera, in those areas. And it's a basic functional document for the VA.

Then we get into other attributes because this is kind of the basis of our standards and what are we trying to strive to achieve in all of our mechanical, electrical, structural, architectural, et cetera, standards (slide 6). Modularity and flexibility are very important because as health care is constantly evolving and changing – five years from now, I mean, we have to change what we get, especially in certain key areas – outpatient clinics and polytrauma is a new one.

There's always a new function, a new program, a new medical issue that has to be resolved. And that requires, in many cases, functional cases in the building. So we try to make our system flexible and modular so we can better accommodate that change. Reuse is just another – in older buildings, we often reuse them for some other facility. The average of VA facilities is about 55 years old. They're going to be around for a long time. They're going to be used for different things.
Re-use is an important issue. Security: obviously a major issue in government facilities. We have series of rules and manuals associated with that. Sustainability: very important nowadays. Energy reduction – I think we talked about that quite a bit, and the things that go into that issue.

And finding resources, where the money comes from. Governments – there’s always the major-project funding; there’s minor-project funding; there’s maintenance funding and never the twain shall meet. You can’t use one funding for another funding. And that causes significant problems trying to address a lot of these types of issues. It’s very difficult, but nevertheless, that’s an absolute barrier that we run across all the time.

VA Hospital Building System

The VA Hospital Building System (VAHBS) is a method of getting a flexible system that is easily changed and less costly changed over time, again reflecting that need for flexibility and modularity (slide 7). It’s basically got an interstitial deck, a functional zone for pumps and all the mechanical and electrical piping and all that is on the service zone that can go there (slides 8 and 9).

[The VAHBS] allows us to change [systems, such as lighting systems] much more easily and much cheaper because of this particular flexible design approach. We have this [system] in probably three dozen facilities, been using it for some over 20 years.

And all our new facilities, with one exception, have adopted it. We don’t use it in all buildings. We don’t use it in long-term care. We don’t use it in other types of functions that don’t change as rapidly as a clinic building or a bed building.

Security Design Manuals

These are some physical security manuals that have been developed with NIBS over the last few years (slide 10). We’ve had a great deal of assistance and coordination and collaboration with NIBS over a number of areas, and this is one of most successful ones that’s been adopted for all VA medical centers, approved by the secretary. And again, there’s some integrations here with security.

And somebody mentioned it before – lighting for cameras, lighting in the parking lot and to low-vision. I mean, some of these are collaborative. [We] could provide more lighting in our parking lots. There are a number of reasons, security being one of those. And cameras – that also helps in low vision and there needs to be better, say, collaboration and integration between the needs of the two so that we make sure that, if you’re going to provide this lighting anyway, that it serves both needs. So I mean, that’s one area in a number of areas that we could do this collaborative effort.

Energy and Sustainability Requirements

Energy

We’ve talked about a lot of federal laws. This is just a summary of the laws that we have to comply with (slide 11). ESA 2007’s been mentioned, the executive order 13-423, EPAC 2005 and a federal leadership on high-performance sustainable buildings. All those are statutory or executive orders. They’re not optional. Every agency has to comply with them. So 30 percent energy reduction is a requirement.

And it’s a publicized, well-established criteria. Agencies are given scorecards, whether you’re green, red, blue or green, red, yellow or whether you’re fine. So there’s a great deal of emphasis to comply, to be green so that to OMB, you’re saying, we’re meeting all these goals and guidelines.
Sometimes your funding depends on ensuring that you meet some of these goals and guidelines. But this is just a brief summary of the actual statutes themselves. And this is many of the attributes that are designed into all of our new buildings since 2009 (slide 12).

**Daylighting**

Day lighting – that’s been discussed. How do you do that? Well, that sustainable design means solar is a certified requirement now.

**LEED™ or Green Globe Certification**

It used to be [LEED ™ Silver certification]. Green Globe is [also] a leading-type organization that VA has used, and sometimes, tends to be a lot cheaper and more flexible. And we’ve talked a lot about the problems code provides, but quite often, from a mechanical engineering standpoint, it’s really been a bonanza, in my opinion – these energy reductions and this memorandum sending.

**Building Commissioning**

Other agencies have used [building commissioning]. The VA has never done it because it costs. Well, that’s no longer an option. You have to do the commissioning. You have to do retro-commissioning of your buildings. That is a requirement in the law.

I mean, every four years, you’ve got to go back and retro-commission the systems to make sure they’re operating as they were originally intended. Metering of the systems – I mean, that again – these are important measurements that help demonstrate that the buildings you’re building now – and we talk about a post-occupancy evaluation, at least on the energy-use side, the mechanical-system, electrical-system side, especially when the skin (ph) of the buildings is commissioned and other things.

We can track how well we did in the original designs, that yeah, did he really performed this 30 percent reduction? Did he achieve it? Is it maintainable? Can it continue to be identified as a 30 percent reduction? And these laws have – at least, again, from a mechanical engineering standpoint at the VA – been kind of a real bonanza. No longer can they say, oh, we can’t afford that additional sustainability, that additional energy reduction. That’s the end. The conversation is over. It’s a requirement – a statutory requirement.

**VA Initiatives**

While we talk a lot about these technical aspects of functions of our buildings, the VA did – and again, with the assistance of [NIBS, publish a document on “Innovative 21st Century] Building Environments (slide 13). Basically, [about] health care and how the new building environments can integrate with each other and function together and work better. And it’s been reported to our management and there’s some interest in doing some things.

We had a new reorganization to address some of these issues. It was done with advice from a number of well-known experts in health care, [with a focus on] how the VA is going to provide health care (slide 14). The VA is moving into areas like home care – a great deal of effort – and treating patients by phone and, with the electronic systems, take readings.

**Standards Implementation Issues (slide 15)**

Electronic medical records has been a part of VA’s requirements for a number of years. It’s been a tremendous asset in using our VA system. And patients can go to any of our 155 medical centers and instantly, the doctors know what he’s been treated for, the medications he’s had and his whole medical history in the blink of an eye. These [records may include] some of the implementation issues strictly related to standards and, kind of, the crux of what we’ve been talking about here.
First of all, as we develop standards, it has to be supported by the VA management and medical staff. Any of the standards we [develop] is a collaborative effort between our medical staff and our technical staff. We often hire consultants to assist us in this effort. We have an advisory team on the medical side to provide what they want.

They are [the] customers, per se, and they have a great deal of input in the kind of systems, and especially in the space area and the functional areas – our space criteria design guide. They're very instrumental on that, but not as much on the technical issues.

Compliance with national codes is a given. We comply with national codes. We have a set of VA criteria standards that are in excess of the codes. But in no cases, to our knowledge, would we not be in compliance with national codes, and also, compliance with national institute standards, in excess of [those], in many cases.

ANSI was mentioned as a guide here. If an ANSI document is out there, unless there's some reason that we don't feel it's appropriate, we would generally adopt those types of national standards. And again, I mentioned earlier, that's a law that says that the goal of government standards is to use national standards and industry standards where appropriate.

I think we have been a leader in accessibility standards, and often in excess of what the codes say – ADA and accessibility, et cetera, et cetera. I think we’re ahead in all that.

Our standards have to be practical, enforceable, cost-efficient, flexible and long lasting. I mean, our buildings are going to be in place 50-plus years. That’s a given. That’s the history. And again, flexibility is important. We’ve got to make them understandable. We can’t put a bunch of standards out there that are field-engineered if we don’t understand the reasons why we did things.

Low Vision Issue

If we’re going to make changes in our standards regarding low vision, we have to have some description of why we did it, so that you have an advisory team that, when you’re planning a project, you work quite closely with a medical center. And some of these issues, especially in architecture, you know, everybody’s an architect. Everybody knows what they’re doing. And that may be good and bad. I mean certainly, some of their needs are absolutely essential. In other cases, they just don’t understand so you have to have some description or reason or justification of, hey, we’re using all these different colors and contrast issues for a reason, not just because we think they’re pretty. That’s an important part of it.

Again, our standards are nationally applied across a wide range. It has to be somewhat flexible for areas of the country and whatnot. We don’t have to comply with state building codes, however we, in all cases, try to do that although it’s not a requirement if it’s a facility built on federal property.

Multiple Levels of Oversight and Review

There’s a lot of people with oversight of the VA, from Congress right on down to the local veterans organizations of all types. And they’re often involved – in the vast majority of cases, they’re often involved in the development of our projects at the early levels. There’s a lot of scrutiny so if we want to do standards, we have to make sure that they’re appropriate – that they pass the test of feasible and appropriateness because we know they’re going to be criticized at some level. So we have to have a firm basis and background on what we do and how we do it, and again, the project teams are very important with individual projects. Every routine, every hospital has a project team when we develop a project.
VA Signage Manual

We have a signage manual I think that’s worth looking at for this group. It has a lot of detail in it, types of signs, wayfinding, where the signs are located, the lighting on the signs, how far they are away, entrance signs, exit signs, biosafety signs.

It’s a very voluminous book that has a great deal of development and detail in it. It doesn’t specifically say that it addresses this low vision issue but in the development of it, that was one of the attributes that we built into it. But it probably doesn’t stipulate it as strongly and probably should be looked at again. It’s about 3 years old or 4 years old. Actually we have a taskforce underway to upgrade it, to redo it.

Summary and Commitment

So we’re certainly going to try to incorporate some of the ideas that come out of this committee into that update.

We have a new design guide for community living centers, which are nursing homes now. VA has had a tremendous change in their approach medically to our nursing homes; it’s a much more homelike environment, and it has a more national emphasis because VA funds, to the tune of about $300 million a year, are to state nursing homes.

And this design guide we’ve developed generally would apply to those state nursing homes. Now, they have to comply with some local codes but in a general way they have to at least comply with our VA standard of care, which in this case has changed dramatically from what it was five years ago, and it’s really quite a change in the way that we provide that sort of care.

I always end my presentations with what we do: we provide care (slide 16). That’s what we do and we can never forget that. And we have all these technical issues and energy conservations but the bottom line, we provide medical care, and you always have to keep that in the forefront of everything you do. And just my contact information (slide 17). Thank you very much.

Open Discussion (Earle Kennett, Moderator)

Comment and Question by Earle Kennett: Unless I’m mistaken, we didn’t have any other prepared remarks for this panel, but we will now open [the panel for discussion].

Issue 20: Why should we embark on a new guideline?

Kurt, you touched on one thing, and even though we’ve sat here and talked about this subject for two days now, and many have thought about it for years and very concentrated over the past couple weeks in preparation, we have to define the problem again maybe in our own group. Why do it? Why are we embarking on a new guideline? How can we define that as a need? When you go to your various leaderships, we have to take a step back from what we’ve actually talked about today and begin to add some definers of why we’re doing this.

Response by Kurt Knight: And VA is an easier sell because our average patient is older, has many more chronic conditions of mental health and alcohol and other psychological issues. Our typical patient is quite different than the private sector hospital. So from a safety perspective, and trust me, VA, safety, it drives you. It goes over the top. We’ve had a few suicides, and there’s been a series of mandated looks at all of our hospitals, everything imaginable that somebody could commit suicide doing, and there’s been changes in what you use in bathrooms and anything you can hang something on and a lot of direction and emphasis on that.

So I think it needs to be tied to safety. I think it needs to be tied to security and the energy issue, whether pro or con, whether it uses more or less, I mean, that can be
debated and I am doing that but certainly those are issues that we could tie into, separate and apart from low vision. I mean, again, [in] this integrated approach, safety is a very strong issue. Security is a very strong issue. And, again, I think we can achieve [safety, and security while meeting] both energy and the range of issues.

Comment by [Participant]: You can anchor it, then, on your patient population because you’re VA.

Response by Kurt Knight: Yes. Because you can actually say our patient population is older, they’re injured, they’re here for care, and so low vision is an actual tangible percent population that we have to address. And I would say -- just to jump in, and then I’ll turn it over to you -- Social Security, the SSA has a mandate to bring people with disabilities into their workplace.

Response by Marsha Mazz: Every federal agency does. Every federal agency is mandated by an executive order to bring in people with disabilities, every single one.

Comment by Debra Babcock: It’s basically what I was going to say. There’s an executive order that mandates that federal agencies hire people with disabilities and veterans, and most federal agencies have disability initiatives, like you heard me discuss the IRS does, and I know this is going to sound cheesy but I feel very passionate about this subject, and one of the main reasons we should do this is because it’s the right thing to do.

As we hire these people and bring them into our agencies -- and we do a great job at the IRS recruiting them. We go to Alliance World. We have all these recruiting programs, and we bring them in, and then we do a horrible job of taking care of them once we bring them in. I mean, sometimes they sit there for six months waiting for assistive technology applications in order to do their jobs and they quit.

As I go around and interview these people, they’ve waited three, four, six months for an application for them to do their job and what have they been doing? They’ve been sitting there waiting and it’s horrible. It’s actually a crime, in my mind, and that’s why I feel so passionate about it. Because it’s great to say you have these hiring initiatives but if we don’t take care of these people with disabilities once we bring them in, or even our employees that develop disabilities, as Marsha has a wonderful little saying, that we all could develop a disability. Who’s going to take good care of us? Are we going to be sitting there for six months waiting for an application that will help us do our jobs? So, sorry y’all, I know I’m preaching to the choir, but –

Response by Marsha Mazz: I just wanted to say that there is a law and that law is the Rehabilitation Act of 1973, okay? And so for over 30 years the federal government has been required under section 501 to provide its employees with disabilities reasonable accommodations in order to do their work. I’m appalled to hear that people at IRS wait for months. I have several acquaintances who work for IRS at perhaps higher levels, and people and acquaintances with disabilities who haven’t [had] that experience, but I think that there is an issue with bringing in people at lower levels and then perhaps not seeing to their needs or maybe they’re not well-informed of their own rights.

But just because we talked about this the other day, the federal government has a nondiscrimination in employment policy. It isn’t a recommendation. It’s a law. And employees with disabilities have avenues to complain about these issues, and in fact there’s all kinds of recourse they have. So like the ADA, in the workplace, people have a right to accommodations. As we talk about improving the building, I think it would be a good idea to talk about improving the building perhaps in areas where you may have a less clear way to an accommodation.

You have a right to an accommodation to enable you to sit at your desk and do your job. If that means you need additional lighting, if that means you need assistive technology, then you should get it. I get mine within days. So I don’t know what the problem is at IRS. But you have a less clear right to be able to navigate the building, to be able to get
lunch, to be able to socialize with staff or get to a meeting room. So maybe we should be looking at perhaps first providing guidance in the spaces where there is less support for the employee with a disability.

Comment by Debra Babcock: One thing I do want to add on to that is in headquarters, we have employees that get their applications right away. The locations I’m talking about are at the campuses, [where] they work at night and they receive even less support.

So some of the more obscure locations I think is really where my focus has been, and that’s why we developed the website in the first place so, even though they may not even have a computer, they may have a kiosk that they can go to and look up and try to find out facts. We have the JAWS applications on those computers and the zoom text. If you went into a lot of these federal headquarter buildings, I don’t think you’d see as much occurrence as you do in these more obscure locations out in the campuses and I think that would go for a lot of the service, federal agencies.

Comment and Question by [Participant]: So Marsha, from what you’re saying and what I’ve heard here at the table is that there is the germ of language in the current law that doesn’t exclude the issue of persons with limited sight. In fact, that could be the beginning of a foothold to say, well, those people are disabled and they should be accommodated for. Are we saying that there’s already the germ of some law –

Response by Marsha Mazz: No. I mean, it’s more than a germ. I mean, you know, it’s a full-blown infection. The law, the Rehabilitation Act of 1973 and the Architectural Barriers Act of 1968, ensured people certain rights. The ABA, the barriers act, is essentially, you know – operates like a building code. You build it, you mess with the building, you comply with the barriers act. And we write the standards, and we are to write the standards to benefit people with disabilities at reasonable cost and we always have to balance cost and benefit. And people with low vision are not excluded from the group of people that we are obliged to address in our guidelines and the resulting standards.

That said, that’s a generic accommodation that we would offer to a class of individuals. So for example, and I think I used this example and I apologize, yesterday, we say that for people who use wheelchairs, you design a ramp. You never exceed a 1 in 12 slope and if your ramp doesn’t exceed a 1 in 12 slope, then the ramp is compliant. But it may not meet certain people’s needs and we know that. We know that when we pick 1 in 12 that there are going to be outliers, people who will not be served. But on the whole, it serves a very broad range of individuals with mobility disabilities.

When that individual has his own unique needs which are not met, he has to then – he cannot file under the Architectural Barriers Act completely because the building is compliant. He has to go to his HR office and he has to say to the people in HR, I’ve got a problem, I can’t use this building that meets the standards and so I need you to develop an individual accommodation for me that meets my own unique specific disability-related needs.

So it’s the difference between building standards which address John Q. Public with a disability and an individual employee accommodation which addresses the unique special needs of John Jones, who is a real person, and so those two work together because the building standards give you a minimum level of accessibility that addresses a lot of people’s needs. But when they’re not met, you go to HR, you say, I need a reasonable accommodation. The reasonable accommodation might be for that guy who can’t get up that 1 in 12 ramp that we’re going to move your office so you don’t have to traverse the slope.
Issue 21: What additional education and training are needed for supervisors of employees with low vision?

**Question by Vijay Gupta:** So, Marsha, I’ve got a question. Are you saying that the chief architect's space where I work, which I consider not accessible at all because there is no contrast, is that not in compliance? Is the office of the chief architect, which is a non-contrast environment, the old white on white on white environment not accessible?

**Response by Marsha Mazz:** Let’s take that specific case and figure out what possible things might happen. If you were to file a complaint with the U.S. Access Board, which enforces – that’s my agency – which enforces the Architectural Barriers Act, we would not – we would not make a finding in your favor because there is no violation of the Architectural Barriers Act accessibility standards. We would then refer you to your own section 502 HR folks, your own folks in GSA, and we would say to you, you may have a right to a reasonable accommodation under the section 502 of that act and this is the person you should contact in GSA.

You would go to that person in GSA and you would negotiate a solution that works for you. If you were assigned to the chief architect’s office and you said, I can’t navigate this office because of a lack of contrast, under reasonable accommodations and under employment law, they would have a variety of options. And one option might be to relocate your office to a place that you could function in, presuming you could still do your job with its relocation.

And most people with disabilities would object to being segregated from their – from the workforce. But I’m just telling you that I can reasonably anticipate that outcome. The other outcome, which is less likely, is that the chief architect will be instructed to paint contrast and build contrast into the space. You might also be asked for documentation of your medical condition and to document the need. We don’t have anything to document that there’s been a violation of a building standard. It’s a yes/no thing. The standard exists and it’s clear and it’s interpretable. So, is that 1 in 12 or is it not 1 in 12? If it’s not 1 in 12, we don’t care who brought the complaint because whether or not it interferes with their ability to negotiate the building is irrelevant. It’s a fact-based claim.

**Comment by Dennis Siemsen:** Okay, so let me see if I can summarize this. Let’s use Deb’s example here. So I’ve been hired by a federal agency. I go to work and for some reason I can’t do my work, whether I don’t have an accessible workstation because I have a vision impairment, materials aren’t printed in big print, I mean, whatever it is. And I could use Mayo Clinic as an example too, and again –

**Response by Marsha Mazz:** But they’re not federal, so let’s stick with federal.

But let’s say they were. They’re a big outfit and you’d think some place like Mayo Clinic would be – boy they’d be great. They’re really into employee – it’s one of the 10 best places in the nation to work, blah, blah, blah. But I come in and first of all I’m just tickled pink to have this job, because I’m disabled, and to get a job in the federal government with easy benefits and it’s stable, man, I am on cloud nine. For a veteran, there are no other jobs back [home] and I got a job with the VA? Man, what could be better. You think I’m going to go and start making waves here and say, gee, you know, I think I’ll file a complaint?

**Response by Marsha Mazz:** Many people do.

Okay, so that’s one thing. And then, let’s say [the employee goes] to the [Mayo] HR office but HR doesn’t really know anything about vision, because our employee health people don’t know anything about vision. Fortunately they had me around but they don’t always call me first. But let’s say the employee goes to the supervisor and the supervisor for whatever reason decides, I’m not going to do this. I’m going to just drag this out.

**Comment by Debra Babcock:** Maybe they’re new management.
Response by Dennis Siemsen: Who knows?

Comment by Debra Babcock: Right.

But it just doesn’t happen. I mean, shouldn’t there be like either an ombudsman or some –

Comment by Marsha Maz: Yes, it’s called the U.S. Equal Opportunity Employment Commission.

Comment by Kurt Knight: But we have required training every six months, that if you as a new manager don’t know that it’s your responsibility to do these things, ultimately it’s going to come back on you that you’re not doing your job.

You could be held accountable. If you don’t help this employee and somebody finds out that it took weeks or months for this employee to get the accommodations, you know, then it could reflect badly on the supervisor.

Comment by Marsha Maz: I didn’t mean to initiate a discussion of equal employment opportunity law and I don’t know how useful that is. All I meant to do was to say if we’re going to start out, a good starting place is in the areas of the building where an employee with a disability has less defined rights to influence changes in the building.

Like wayfinding within the building. The number one complaint we get from people with vision impairments is not that their workstation doesn’t work for them. It’s that they cannot find their way. They can’t get from the bus stop to the building entrance. They can’t get from the building entrance to their office. They can’t get from their office to the library to the cafeteria to whatever else needs to happen within any given daily routine, and so that’s the number one complaint we get from folks. It isn’t that when I’m sitting at my desk I can’t do my job.

Now, that may be just because of who we are. But I just am only suggesting that that the areas where you might have not only a greater impact but also areas where, as Kurt has suggested, you may be able to marry the low vision issue to the safety issue, because when you’re in an environment that is not your work space and you have to evacuate that building or you have to get out of that building, you know, quickly, then the factors that we’re talking about, you know, the ability to see the way, to identify that means of egress, to use this fixture as part of an easy egress becomes even more critical.

So if you’re going to marry the needs of individuals with low vision to the safety factors, I would think that in the general circulation within the building and within the public and common spaces within the building is the best starting point.

Let me just summarize. So what I’m getting at is, who acts as the advocate for the employee?

Comment by Debra Babcock: The manager. And that’s why I was asked to create the website. You summarized it perfectly. The commissioner said, you know what, this is an issue. We need to get a handle on it. We need to consolidate this information so the manager can say, I need this application, what are the steps, one, two, three.

So if the employee or somebody else identifies that there’s a problem – where are we going with this?

Question by [Participant]: Well, just to elaborate on what you were saying, in Vijay’s case, could the board help him in the negotiation to get the plant put back?

Response by Marsha Maz: I won’t make that kind of commitment because we try not to interfere in an agency’s, you know, employment decisions and this is essentially the agency’s negotiation with Vijay. We might be able to provide Vijay information that will enable him to represent his needs better to his employer. But we would not intervene between an employer and his or her employee.
**Issue 22: How is accessibility for persons with low vision assessed during the design review process?**

Questions by Earle Kennett: I had a couple of questions for Tom. In the design process, [are you] the advocate for GSA for accessibility.

Response by Tom Williams: That’s right.

Are you part of every design review of every new facility?

Response by Tom Williams: There’s no way I could be.

So there’s only one of you, right?

Response by Tom Williams: No, there are 12 of us. We have a person in each region who has the responsibility to manage the [accessibility] program in his or her region.

And is one of them part of every design review process?

Response by Tom Williams: In a lot of regions, that depends on the managers they have.

Okay let me just ask one last question, then you can elaborate. And if you are lucky enough to be part of that process, do they listen to you?

Response by Tom Williams: Yes, because you can’t argue with what’s legally mandated. So if you show the [regional and project] managers that there is a federal law, which has governed our facilities since the first initial standards to implement that law were used by our agency, and you tell the manager that if they don’t understand that it’s the ADA instead of the barriers act, you tell them, no, it’s the wrong law. [If they] don’t know the difference, you tell them you have a standard. The standard is implementing this law and the law was passed by Congress. You have to do this, whether you like it or not. You can’t cherry-pick what you will or will not comply with because you [will] violate the law, you’re opening our agency up to lawsuits. Don’t want to go there.

Or the enforcing agency of the barriers act, the barrier board, can then stop funding on a project until we fix it. They have, by law, the right to do that. That’s a big stick. That makes people very nice and conforming if they know; and a lot of these managers don’t know that.

Getting back to a point, I was starting to say, I got an e-mail from someone in the central office who had the responsibility for coordinating projects on a grievance. [That person mistakenly] told me that it was the manager, not the regional accessibility officer, who decided whether they wanted to review projects for accessibility or not.

I e-mailed back and said, no, it’s not the manager’s decision. I said, this is a federal requirement under the law Congress passed. A manager can’t selectively make a decision whether a regional officer reviews a project or not. He didn’t like that answer.

So they do have the responsibility but a lot of our regional management doesn’t get it, after all of these years, and they think they can cherry-pick what they do or don’t comply with.

Comment by Earle Kennett: I’ve seen a number of courthouses out there, GSA courthouses, and I’ve seen new courthouses who don’t meet certain accessibility standards; I wondered how that happened.

Response by Tom Williams: Well, the way it happened is because you have someone working in this position in a region that has to report to somebody else. [If] that person doesn’t give [the regional officer] the project to review, or [doesn’t] tell [the regional officers] this project needs review, then [the regional officer doesn’t] review it. [The regional officers] don’t even know necessarily that [the project] exists.
**Question by Earle Kennett:** Kurt, how does the VA handle it? I know you have your accessibility headquarters. Are there regional or are there vision advocates?

**Response by Kurt Knight:** No, the accessibility at headquarters is about it. We don’t have a specific person identified or we don’t have regions per se. The VA designs to those standards but we don’t have an individual person identified to ensure that’s adequate.

**Comment and Question by [Participant]:** Let me build off of that. You represent a part of the authority having jurisdiction. How well-versed are the project managers who bring these projects to you on the issues of accessibility and this particular accessibility issue which is for low vision?

**Response by Tom Williams:** Well, first of all, this is not right now an accessibility issue. As Marsha has already explained, the chief architect’s office basically conforms, as far as I know, to the [ABA]. We have an accessible program in the chief architect’s office, and for that reason, even though they have messed with [the issue], they haven’t complied with any current standard. You can’t go to almost any [standard], it’s just not there.

**Response by Kurt Knight:** In the VA’s case, our standards stipulate that they have to be accessible and because we have so many handicapped patients that have wheelchairs and other methods, then it is a common issue at VA hospitals. Our engineering people address it all the time. So when they renovate something, it’s always meeting the criteria, partly because it’s just we have too many people that are in that status that need it.

**Question and Comment by [Participant]:** To create an understanding of these men, do we need to educate project management people at the design and construction end of the various federal agencies to make them aware, and sensitive to, this issue in order to lay the groundwork for what we’re talking about as adaptation to the standards? People aren’t going to be able to evaluate what they can’t see or what they don’t understand.

**Response by Tom Williams:** Correct. We already have a program. Basically we have done it nationally. I’ve gone to Chicago and had training classes there on accessibility with project managers. The regions individually ask us for training and we do that, but the problem is we can train the project managers, but the project manager is under pressure, he’s got to meet all of these different [requirements] and whatever it is; green building is the big buzzword right now, sustainability, all of these things.

They’ve got so many balls they have to juggle in the air to get a project done that some things get dropped, that just don’t get done because of time and budget. So accessibility is probably one of the things that gets dropped more often the most. Our AEs should know this. They should know that. We have mandates. The facility standard basically is incorporated into the contracts with the AEs and it says you have to follow this standard. But nevertheless, I can give you a case in point where I’ve been asked to review projects that should have been reviewed in the region but for whatever reason they weren’t. That can be a management issue.

**Issue 23: Should design guidance for persons with low vision be prescriptive or performance based?**

**Comment by Marsha Mazz:** I don’t know where we’re going with this because as we’ve said, time and time again, the issues of concern to this group here are not addressed by the standards. So educating people on the standards won’t be helpful.

**Response by Earle Kennett:** It’s probably the most helpful thing we’ll do.

**Comment by Marsha Mazz:** The only things that the standards require are certain accessible signs, okay, I’m trying to think, accessible ATMs. What else do we have? Well, first of all there’s no lighting standard at all, I mean, there’s none at all in the barriers act standards or in the IBC accessibility in chapter 11.
Response by Earle Kennett: You missed the whole point, Marsha. And here’s the point. You’ve got design teams, and it’s a matter of educating the project design teams in areas that they can bring their design expertise in. And it’s not a standard. In fact, the vast majority of design guys, the criteria are not cut and dry, black and white, yes and no. I think that’s where a big problem is: that the design teams don’t really look at accessibility across the board in the same sort of way as we’re looking at energy and green and areas like that. So there is a need I think to –

Comment by Marsha Mazz: If they’re interested in accessibility, they’d be looking at the standards.

Response by Earle Kennett: They’d be looking well-beyond the standards, well-beyond the standards. That’s the point that you’re missing.

Response by Kurt Knight: It’s not just missing the standards. It’s all of our standards, which in some cases are inadequate. There is no standard there [that A/E’s] had to deal with; we have to be careful. The word standards tends to be [misunderstood].

Comment by Marsha Mazz: You’re right. It is a significant problem, how do you get you’re A/Es and how do you follow up and do the review to make sure what they’re doing meets all of our requirements. And that is a major issue.

Comment by Jim Woods: I want to pose something here. I’ll probably get shot but I think we’re trying to put the square peg in a round hole. Part of what we’re talking about may be accessibility. But I don’t think the major issue of what we’re talking about, [which is] design to improve or recommendations to improve design for low vision persons, is necessarily something that we’re going to standardize.

Response by Earle Kennett: I agree, absolutely. But we can have performance requirements, okay, and performance requirements can be put into standards.

Responses by [two Participants]: Or guidance. Yeah, like the VA documents, et cetera.

Response by Kurt Knight: Let’s call those guides. We’ve got to be careful in language here because standards mean something. We ought to talk in terms of guidance at this particular point.

Let’s talk about guidance. But the issue for me, fundamentally, is a lot of this discussion has gone along with ideas that “if you do this, it’s going to be permanent.” That thing is going to be there – if I put the sign on, it’s going to stay. Now, if I’m dealing with a lighting issue or a thermal or an acoustic issue, first of all, [it’s performance] doesn’t even start until the building’s occupied, because it depends on use patterns. So the use patterns have got to be put into the consideration.

The time of use is another situation. Is it going to be instantaneous? Is it steady-state? What are the dynamic implications? We’re dealing with a whole different realm of issues. I was trying to [describe] that this afternoon. So as we move forward, it seems to me that we’ve got to look at some kind of a dynamic approach that addresses the longevity of the occupant in the building and what’s going to happen with aging, what’s going to happen with the durability of the maintenance systems of the building itself. It’s going to change and we’ve got to accommodate people over time in a dynamic environment; we have not addressed that.

Comment by Fred Krimgold: I think that in picking up on that point that we’re not only looking at static physical solutions. But there’s an interaction of operational and management practices which make the system work and that’s where the flexibility enters in and where the judgment has to continue to be operative and that’s more complicated than prescriptive physical standards and it has to be taught and administered in a more subtle way. I understand the difficulty of the standard having to be something objective, incontrovertible
and, objectively measured, and so on. But we’re really trying to improve the circumstances of people’s lives and that is a more comprehensive and complex activity than simply dimensioning or –

Response by Earle Kennett: And there can be many solutions to that.

Comments by Robert Lynch: Ladies and gentlemen, I don’t want to interrupt the flow of this conversation, but there’s a few points I’d like to make before we disperse today.

First of all, I’m reminded – and I don’t want to diminish the importance of a great old hymn called “Amazing Grace”, but I was lost and I was found eventually by people like Stephanie and a good friend of mine in the AIA, Syl Damianos. I wouldn’t be here today if they weren’t diligent in looking me up because I had moved to the sticks of Northern Virginia. But my three points I’d like to make, I am so grateful to be here. Vijay, who I didn’t know before today and all the others and you my colleagues who I’ve had a chance to maybe talk a little bit with, I am grateful for that and I look forward to a longstanding relationship as we work on this effort together.

But there are three points I’d like to make before we leave and if you forgive me, I’m going to read them so that I get it right.

1) Someone this morning mentioned that the ANSI A117 committee, should work on these standards and I agree. But we’re not qualified at the moment to do so. As an example to the contrary, the ANSI committee achieved good elevator standards and criteria over the years because we had strong participation by the elevator industry on the committee. They were always forthcoming.

They were technically grounded and very persuasive in helping us to achieve good elevator standards. We need that sort of thing, that sort of participation on the ANSI committee. The International Association of Lighting Designers and the Illumination Engineering ought to be represented as professionals on that committee. We do have representation. As being a consensus committee, we do have representation from the disability community. But we need some good, strong technical people on that committee to get the job done. So I might say we might even have a volunteer here on this committee here today who might be willing to serve that way.

2) There’s another thing, a different tact that I think we may ultimately have to take. There’s a limit on what energy conservation can achieve. I mean, we are struggling. I mean, we hear things – like someone on high who probably doesn’t know enough about what they’re talking about says we’re going to have to achieve a 30 percent reduction in energy conservation standards over the next few years.

It’s good to strive for ever greater efficiency and achieving better design and to attempt to meet an ever greater number of design goals while consuming an ever decreasing amount of energy. There will be a limit to this approach, however, and we may no longer be able to deliver ever better functioning buildings with ever diminishing amounts of energy. We may need to consider an alternate approach. That is we, our country, will probably eventually have to find a way to obtain more energy after all conservation efforts have been exhausted to meet more extensive, more sophisticated design goals.

3) My last point is very short and it has to do with energy conservation as an ultimate problem. The Department of Energy was instituted to solve energy conservation problems but I have a feeling that in the end-result or as we sit today, it might be the problem. So that’s all I have to say and I thank you for having me be with you today and yesterday.

Response by Marsha Mazz: Bob, as former chair of the ANSI A117 membership committee, and as a current member also of A117, I will say that anyone who applies for membership and has not ever attended a meeting is likely not to be accepted on the
committee. So I would very strongly urge whoever is considering joining the committee to begin attending meetings.

We’re starting up a new cycle and to put in public proposals and come and defend those proposals and then ask to be on the committee because anybody can submit a proposal to A117 just like anybody can submit a proposal to the building codes. So although I strongly encourage professionals to step forward, I know that committee pretty darn well and the membership committee on which you also serve, always ask yourself whether this particular interest has ever participated or whether we can count on them to continue to participate once they’ve got their one issue solved.

**Issue 24: What are the long-term and short-term targets for guidance?**

Comment by Earle Kennett: Let’s go back to some of the things that are targets, long-term targets, short-term targets. We’ve talked a lot about the struggles of employee issues. We can spend days talking about that and we’d need to have a lawyer here to actually help us through that subject. But, where are we going? Fred talked about research. Kurt, you talked about, hey, we can put some of this stuff into action ASAP.

We need to create a tangible list of ways forward, long-term, short-term, middle term so that we know our mission going forward. I think as we near the end of our discussion, I would like to hear things rapidly go on a list.

**Stairs, short-term list**

I’ll put one up there, short-term, stairs. Stairs is a tangible safety issue and in fact the code has elements of some of the things that we’ve just described as better practices here for codes and guidelines that it’s easy to put our foot on and say that just needs to be enforced.

Response by Marsha Mazz: I think one of the things we can look at is the stair geometry and talking about is stair identification. Well, the tread and monitor Identification and identification of the stairs.

Response by [Participant]: But then again, stair safety would be legitimate for all of these.

Response by Kurt Knight: I think there’s been a number of presentations that have identified a number of issues and as we go through the presentations there’s a lot of consistency, to be quite honest with you, in some of the ideas presented of these short-term safety type, easy to do solutions.

**Contrast and wayfinding, short-term and long-term**

Comment by Earle Kennett: You know, the whole contrast, wayfinding –

Response by Kurt Knight: Wayfinding.

But you know what’s really great about that and you know it was interesting. We went in to talk with Susan and you know she’d never even thought about that and we ended up talking an hour and it was very fun to sort of understand where her light bulb sort of started going off: it wasn’t a matter of new technologies or increased cost really. It was a matter of the design team relooking at a problem and coming up with design solutions; [to assure] that many of the decisions that they were making were not made to be barriers to people with low vision.

It just happened that way because they hadn’t thought about it; that if GSA can incorporate that into their criteria, it would be helpful not costly; you know, it clicked. The second thing that I think clicked on her, was this whole idea of changing demographics, because the low vision part, even though we understand it can be from birth, it can happen, as in Fred’s case, at a young age, but much of it happens as in an aging population. Quite frankly, the GSA staff demographics probably will be increasing over the years. All of us, or many of us here,
that have not been completely successful in our 401s and pension programs may end up working a few more years.

Comment by Roberta Null: I was just thinking about with the aging there’s been a lot of work done and they’ve had a lot of money for doing this, fall prevention and it was USC and some of these others. I go to their presentations and they really do a good job of thinking about the demographics, aging and the two or three causes of fall. One is medication and that’s the medical and we can do all that and then another one is balance and they do a pretty good job of that with classes and different things like that.

Then they talk about architectural barriers. Well, of course stairs and things like that and they don’t think about it. I mean, they mention it but it’s just like, oh yeah, and then there are architectural barriers. I think that’s where we have a chance through the lighting people and the design people, the architects, you know, to really tap into something that’s already started. They have all kinds of funding and have done some really brilliant research in that area but architectural barriers, well, ‘we’ve got to get rid of the clutter and things like that.’ But I think it’s something that we can really contribute to.

Response by Marsha Mazz: I think if we decided, tomorrow, to start incorporating photo luminescent tread marking on all exit stairs, we would improve the ability of people with low vision and everyone else in the building.

Responses by [three Participant]: The majority of stairs in building are back of house. They’re really egress stairs. So they’re unfinished. They’re not painted, raw steel, the walls are not painted or anything, like the black stairs that Eunice showed in her presentation. So along with stair safety goes finishes, just paint the stupid things. Fifty cents a square foot. Leave the walls white because we can’t increase the lighting because the energy code doesn’t allow us. Give us some light-value finishes, voila we’ve lit the stairs.

Energy utilization, short-term and long-term

Comment and Questions by Cheri Wiggs: Just so I’m going along that point of forward thinking, because I have been thinking about this all along. This kind of guidance is going to help the general population, right. It’s not just a select group but it’s going to be all of us. So it’s wise to take this into account. All of us should be interested in this going forward.

I think I’m going to piggyback on a point that Marsha made earlier that really did resonate with me. I might sound a little contrarian, but this whole notion of the energy regulation, I’ve been hearing how difficult it’s going to make everything. But it is important.

I mean, it really is important for us to get a handle on how much energy we’re using. We’ve got a lot of intelligence in the room where we could say ‘look, this is going to happen and how much light we’re using is going to decrease and if that’s the case, it’s going to be difficult for all of us.’

Can we use this kind of intelligence to use smarter lighting? If they’re saying we can’t use as much, can we get some guidance here in terms of [how] this is going to be difficult? [Are there] ways you could do this in terms of paint colors? Where again, it’s going to be [for] all of us because we’re all going to be in a situation where the lighting is lower.

So it’s really thinking forward and it’s really attaching to what’s happening now. I’m not speaking as NIH here. I’m speaking as somebody who’s sort of been listening to the discussion here and I don’t know if that makes sense. But I also think it’s a lot more palatable if people [understand that] we’re not trying to fight against this. We know this is going to happen. But we could have some smart ways of dealing with this.

Response by [Participant]: We have taken action in that with the photoluminescence and setbacks on the lighting through service lighting systems for stairwells that glow 50
percent and, as soon as there’s motion, they’ll go up to 100 percent. So we’ve already done those types of things.

Research and its applications, medium-term and long term

Comment by Bob Massof: Well, just in two days of discussion I’ve been motivated of thinking how we would approach this from a research perspective. I think there’s a tremendous opportunity here to develop the support of this project with bringing together the expertise. I marvel at just the kind of expertise that’s out there and with bringing parties together, I think we can really build a project. So I just want to throw out some of the ideas that I’ve heard. I think first of all that there is a funding mechanism which is through the NIH for supporting these types of collaborations.

So I think it’s not pie-in-the-sky to talk about it. And there’s been some pretty spectacular collaborations, especially the one I’m developing, what’s called adaptive optic supply to the eye. That’s getting right down and seeing individual photoreceptors live through imaging and using technology that – the same type that’s used to look at galaxies thousands of light-years away by correcting for the averages in atmosphere. This corrects for the averages in the eye.

So that was literally pie-in-the-sky until this project started. So while that may sound like it’s too hard but I think the first step in just hearing a lot of the discussion about the regulations, like where do these things come from and what’s behind the recommendations and what’s behind the guidelines. It doesn’t sound like there’s an awful lot of data, and that some of it just is summary type of information. It’s not really getting down to a level of computational type of approach.

Comprehensive modeling of vision

So I think the first step would be to create a physics-based model of the environmental conditions so that you really can computationalize it in a database from any viewpoint of what the illumination of the environment is going to be. So, if I put my eye over here, this is what it’s going to look like. This is before you build anything, before you spend any money on actual hardware that this all can be part of the design phase to create a model that is a physics-based model.

On our side of the world, we’re already building physics–based models of retinal imaging and if you marry these two models together, the physics-based model of the environment becomes integral to the physics-based model of producing the image on the retina. What would have to be included in the model of the retina, which is very active research and we know people who are doing this type of research and we probably will be able to talk them into collaborating on this type of project, is some of the more subtle things that is very important to plan.

I think I mentioned yesterday the Stiles-Crawford Effect, which is the directional sensitivity of the photoreceptors. But there are physics-based models for that effect and that could be built into a computational model to handle scatter of light. So you can end up making measurements of fundus reflectance and things of that sort, build those parameters into the model. And so take the environmental, you put a glare source or a point source in the environment and we can look exactly at what would happen to the retinal imaging through those types of models.

The next step is to really fully characterize the population we’ve been talking about with respect to the parameters that we build consensus and support. People talk about contrast, play with color and illumination. So we really want to describe what the characteristics of not only the low vision population but the older population in general. Some of this John Brabyn showed to suggest that low vision is kind of in the eye of the beholder literally.
We can then have a description of the important vision parameters and there are unemployed psychophysicists I think we can put to work on that project and we have collaborative networks set up already to collect these data and we don’t need – well, John will know what I’m talking about – white bars and review systems to do this, that we can do it with equipment that readily can be put into a clinic out in the field and so we can gather rather large quantities of data in a reasonable period of time.

That then also gets added to on most of the people on this side really developing kind of a conceptual model of what are these constraints on the design. You’re bringing in legal requirements, you’re bringing in things that pose constraints on what you can do and so those should factor into whatever model we’re developing so that gets taken into consideration and limits your options.

Every modeling effort has to have constraints. They might as well come from the outside as well as those from the inside. And then, finally, there needs to be some qualitative research that’s done on the side dealing with the aesthetics and dealing with the functional usability both from the standpoint of the owners and from the standpoint of the people who are expected to use it so that if you have this tension between the artistic and the practical, you know, how do you place value on those two things, on those people who have a stake in it, and there are tools out there for doing that.

We’re always doing quality of life research in health care and so many of the concepts and many of the tools that are used for quality of life research could really get transferred over to these various kinds of questions more subjective types of measurements of subjective phenomena, the so-called latent barriers and that ought to be built in.

So by putting a collaboration together with all the appropriate expertise, working in parallel to create these pieces, you can kind of put a whole system together that would allow you to rather than having to build consensus among all parties really allow you to do something in a very quantitative and very objective way and then you’re not – we’re always saying in campaigns, you can have your own opinions but not your own facts. This puts all the facts under the control of something that we all agree to, something that’s all objective, and then now you can get down to making decisions without arguing over how we’re making decisions.

Comment by Fred Krimgold: Well, I just wanted to very strongly endorse what Bob has suggested because I think, you know, that given the expertise that’s been revealed in this room, the idea of developing parallel models of individual visual capability and the salient factors in the environment that influence the functioning of that individual visual system allows us to structure our understandings, our experience, the existing models, [and] the resources available in a way that allows them to interact in such a way that we can evaluate existing environments, we can evaluate hypothetical environments, we can evaluate potential policies.

It gives us a really powerful new tool for looking at this whole set of issues and it certainly qualifies as a serious area of applied research for both physical environment engineering architecture and on the medical ophthalmological side and it can then provide a basis which I think will be tremendously valuable to whatever application comes after it, be it a regulatory application. We have – we will then have an organized foundation for presenting those arguments and for again looking at costs and benefits, if that’s relevant, if that has to be dealt with. And it’s a very exciting possibility.

I think it’s the sort of thing if there is a funding source that would be appropriate for pulling together that kind of cross-disciplinary group -- and by cross-disciplinary I mean not just academic disciplines but practitioners, and -- that is, both medical practitioners and [design and operations] practitioners, we could do something that would be tremendously stimulating and valuable and it might well be done under the auspices of NIBS, which has the kind of relationship with federal agencies that could facilitate this kind of a collaborative effort.
Comment by Cheri Wiggs: What Bob was mentioning is actually a program announcement that is written specifically to encourage the type of collaboration that he described in bioengineering, and bioengineering is defined pretty broadly. So there's actually a program announcement at NIH that specifically is meant to encourage that kind of research effort. So it exists.

Guidance Documents, short-term

Comment by [Participant]: I think Bob's absolutely on the right track, and I think that's one of the sort of things we should start on immediately that will have medium to long-term effect.

And it seems like another medium-term effort should be the things that have come up yesterday and today about the ANSI committees and Illumination Engineering Society committees. [They] are really closely related to this field and we could start developing input for those, which would eventually result in standards that were backed by facts and research and that kind of thing.

It seems like we should also think about maybe some short-term efforts in that some of the things that we've all discussed over the past couple of days are kind of so well-agreed upon and obvious that it might be a good idea to try to compile something almost immediately that everyone agrees on. And whether it's a brochure put out by NIBS or whatever it is, it could be something that could be just used as examples or suggestions for good practices.

Comment by Roberta Null: I wanted to offer sort of a framework that we could start with and I just have – I wrote this book *Universal Design*. It was called *Creative Solutions for ADA Compliance* and it came out in '96, and it's out of print. But I've been working on a revision of that – and with best practices and things that are going on in a whole variety of areas related to universal design.

I just lost my publisher because it was somebody in interior design and very interested in the fluff, and not understanding universal design. I thought, well, I've got a lot of it done, so I could bring in the collaborative thing and it started out that way anyhow.

I certainly would be willing to work with anybody who's interested in really having some examples of things right now. That would be something that I will offer as something that I think could be a solution because I think that I've done a good job so far and the book has received a lot of recognition.

I've never made a lot of money on it, but the people in Japan think it's wonderful, because they've got this aging population, and of course in working with the elderly. I'm an advocate, and so it's been written but it's got a lot --. I've found it on Amazon and I can buy the used book. This was in a library someplace and nobody checked it out. So I could get it for $15.

But the other thing, when we were talking about stairs, I worked with a fellow called Jake Paul. He's working on the international codes and things like that. But we could really bring in, you know, people who, I think the people in this group really recognize, lots of experts in different areas, and I think that that would be a good example because he's really –

Response by Marsha Mazz: And Jake is on the ANSI A117 committee.

Comment by Jim Woods: I'm going to take a chance on something here and look at it short-term, mid-term, long-term, and go back to some of the stuff that I used to deal with when I was teaching in the classroom, undergraduate and graduate levels. I'm going to propose three principles and see how far they fly:

- One is to design for health and well-being, not just to prevent disease or infirmity.
- The second is to design for the last day of occupancy, not the first day.
- The third is to minimize energy consumption, don't build it; otherwise, optimize energy efficiency to achieve the design objectives.
I don’t know if that captures what we were talking about here or not but it gets across both the current situation, the energy issues, but it also, I think, attacks some of the health issues, and we can then start putting the low vision lighting and stuff like that within it. But it would lead us I think in the area of being able to support that with research.

Response by [Participant]: I like your first point, because I think that what Bob has suggested is a starting point on that, which can be supplemented with similar approaches to modeling this individual environment to fit at the same level of sophistication for other types of sensory and physical conditions. And then we have something to work with. I mean, we then have a basis for making rational recommendations and having reasonable answers to the skeptics.

Comment by Erin Schambureck: In the interest of giving ourselves some short-term goals to work on immediately and [to] have something to review, possibly when we consider getting together in three or four months here, would it be a positive thing to – and I’m willing to volunteer for this task – but to take all of the presentations and the notes and things that have been taken from this workshop and compile two lists?

One is a list that would go out on the site that would be the list of the identified problems – not the solutions yet, but the list of the identified problems that we’ve all talked about, and try and define them as we can. Maybe that’s a Google doc that people can access and modify or revise or update, still trying to keep that succinct.

We want it to be obvious what we’re talking about and not go into the hours of discussion that we’ve had here, but to create that list of identified problems, and then the second list to create a list of the proposed solutions to those problems.

So the second list might have that point that says we have a high-contrast strip at the top stair and the bottom stair of each stair section, you know, at each landing – simple solution, two sentence, something that then that second list is again user-friendly where it’s succinct but we’re solving problems or at least attempting to solve problems and creating something almost immediately that can be used at the VA, that can be used at the IRS, that can be used throughout GSA quickly.

[Editor’s Note: Erin has drafted the list: it is included as Appendix G.]

And then as part of the mid-term and long-term solutions, we’re backing that up with research and developing ways to turn that into more long-term implementable solutions, and I’m willing to do that, to cull through the information in my free time.

Responses from [five Participants]: Wow. And create those two lists so that we have a summary of what’s happened. Sold. This can become a living document in the short term. With data of items to move forward.

Comment by Bob Massof: Our deadline is November 16. That’s the deadline for an R-21 proposal to do an exploratory – kind of the equivalent of like a planning grant to put together this type of a collaborative project, and so the next window to do that is – the deadline is November 16, which if we could meet that – it’s a six-page proposal. It’s going to be denser than a New York bagel, but the earliest start date would be July 1.

Comment by Earle Kennett: So to some people who are interested in pursuing that type of thing, you know, raise your hand. We could really get started on this immediately and we’ll set up some conference calls and –

These can be completely parallel.

This is really kind of a framework for things that Kurt –

Response by Kurt Knight: Both are useful, I mean, absolutely.

Well, we can quote your problems in the beginning of the research project.
Comment from Marsha Mazz: Well, it’s kind of hard to hear over here what you’re exactly talking about and I can’t read your lips. So, if you could talk about what the research is again that you’re trying to do?

Response by Bob Massof: Well, the larger project, which is what would be two years preparatory window in terms of before you would actually engage in, there’d be a lot of preliminary groundwork to do: planning and pilot work to see what’s feasible and what direction you go and things of that sort.

So there’s two phases to it, and the first phase is this planning and feasibility phase, and there’s a program announcement within the NIH to support just that for these collaborations, and there are grant types that are called an R-21. It’s an exploratory grant. You don’t need preliminary data to show what you’re going to do. There’s no risk. So it gives you an opportunity to do some things a little wild and crazy.

So it’s providing funding to help people get together, provide funding to get some pilot data, provide funding to try some things out, see what’s going to work, what’s not going to work. And so if we wanted to get on that train, it leaves the station November 16, and we would be able to get started doing work. The earliest start date would be July 1.

And so there, what we would need is for people to basically identify themselves as being interested, wanting to participate and to help shape the larger project. It would involve, you know, conference calls – maybe if NIBS would be interested in hosting these kinds of meetings to help shape that out, then that might all get together on occasion to further refine and put this together, and probably bringing in other people as well who represent certain technical expertise that we may not have represented here. Like, if we’re going to do physics-based modeling, we want people who know how to do physics-based modeling. We want some optical people who do these rate tracing models, and these are kinds of people who design lenses and do things like that. You do that with helicopters, I know.

Comment by David Munson: I do that with architecture. I was one of the guys who invented it. And here’s the problem. Unless you’re doing 100 courtrooms and you’ve got a federal judge who wants to see 100 federal courtrooms, you can’t afford to do it because the cost to build the model is almost as much time as designing a real courtroom and getting the thing finalized. I’ve got a courtroom program right here. You can dial up how many people are on the jury, how many tables the defendants are going to have, what colors, is there skylights; and it will generate a three-dimensional model and you can walk around and you can grab a chair and you can put it over here and you can say, does all of the chairs see everybody’s chair because they’ve got eye heights, and can the judge see all the ones in the jury? And you can go through all the stuff and in the end it’s not very damned practical.

Response by Bob Massof: Well, you’re about 50 years ahead of my thinking.

Comment by David Munson: I was flying three-dimensional computers in 1983. We did ray-tracing, we did full radiocity calculations.

Response by Bob Massof: So this may never be useful. This is really designed to understand the problem. It’s still a research project. The idea is to create a research tool.

Comment by David Munson: Find five buildings that you find acceptable. Find five buildings that you find acceptable and say these guys work. Find five that don’t work. Publish just the pictures.

Interdisciplinary Communication and Vocabulary

Comment by Jim Woods: The thing that I think is so exciting about where he’s going with this is addressing a little bit of the gap analysis that we talked about yesterday, that the physics in terms of parameters that we can design with are not there, and you know, we’ve got some
information on the perception which may or may not be valid. And so you’re starting to address those things at a research level that we can put some certainty to or look at least at the uncertainties to it and have a foundation to work from.

Response by Bob Massof: Research versus common design.

Comment by [Participant]: I don’t think in the end you’re going to get a specification that says this is what it looks like. And unless you’re ready to give an order to say this is what it looks like, you aren’t going to be able to [complete in] a two-year research-worthy project, and I’m exaggerating of course, but to solve these problems on every single project. What I think this is getting to do is to try to really focus [and] maybe to assist us common practitioners, small businesses, who have to solve problems every day with an eight-hour day, 40-hour week draftsman who gets paid a certain amount of money.

Comment by Jim Woods: A basic problem that has come up in the discussions in the last day-and-a-half is that a lot of you talked about the necessity of measurement in order to give instructions, in order to set standards, in order to define objectives, in order to support regulatory activity.

And what we’ve heard from both sides is that the measurements aren’t compatible now, that we don’t have a way of expressing in the physical description of the environment the factors that are relevant for the performance of the individual, and that’s what we have to find in this mutual modeling exercise. It’s not a trivial thing, because what we are trying to do is look at the interaction of two existing bodies of knowledge and two sets of phenomena, and if we arrive at that, then we have the basis for a lot of thinking and a lot of activities beyond specific design.

I think what you’re suggesting about the 10 pictures, five good and five bad, is immediately tangible, practical and something that you could use in terms of getting the job done quickly make sense. But what we’re trying to do with this in parallel to that -- and I think maybe that should be another short-term activity, but what we’re trying to do here is lay the foundation for coherent communication between two bodies of knowledge and to allow for the construction of interaction of an understanding of individual human capacity as it may change and is changing, and of dynamic environments which can be modified and can be supportive or less supportive depending on how they’re designed.

And by taking pictures of what’s out there and what’s worked, it’s a rough-and-ready summary of what combination of things happened to have worked but it’s kind of an artistic approach rather than one of trying to identify what those specific relationships are and what the mechanisms of relationship are which we were trying to approach in the modeling.

Response by Bob Massof: Where the differences are derived, the physics of the picture are very different from the physics of the environment. So to get this picture and use it, looking at the simulation [is only a start].

Comment by Vijay Gupta: I’ve been thinking that it’s [encouraging] that the medical community and the engineering and design community [are here] and I think that’s a good solution right there. We need the support of the medical community to meet Marsha’s needs, and not only Marsha’s needs but to meet other needs. So the medical community and architectural and engineering community needs to get to get together.

Response by [Participant]: And we need to begin that vocabulary list.

Comment by Jim Woods: I think we said that yesterday and I think that’s got to be on one of our big list items here. We don’t have a common vocabulary list, just the way of speaking a language together besides the research, so we can understand some of what you’re saying and you can understand, and we can begin to talk more fluently on the subject.

Comment by [Participant]: Well, a final project would support continuous interaction between representatives of each of the communities and that would be in itself --
Response by Bob Massof: And maybe that's part of what goes into this planning grant. We need to develop a common language.

Response by [Participant]: From our perspective, we really need you guys to help us and I think this would be a perfect collaboration to provide both directions.

Closing

Comment from Earle Kennett: I think we're coming to an end. And I want to thank the final panel who sat up here, especially Kurt, for your presentation, but for the whole panel, Marsha, for your passion, for the final panel and I think we had a great discussion here. We've got a tremendous list.

Give a hand, a round of applause for the panel. Well, we've got a lot of thinking to do, and we'll send out everyone e-mails and kind of give you our plan of action and we'll provide the forum. We'll decide what that is, you know, a website, an FTP site or however we do that and give us – and start getting you involved in this effort. You know, it's interesting. I've been here 20 years and I've been involved with a number of councils and committees that get started, and you know, NIBS is an interesting organization because we have a membership. We have several thousand people that participate but we're not a membership-governed organization. It's very interesting.

So we're not like AIA or IES. So we have the freedom to do what we want. We're governed by a board of directors who represent the building community. They are self-elected. They tend to be past presidents of the different organizations representing the different sectors, building codes, home builders, architects, engineers and including about six presidential appointees. So that board governs us. But they allow us, you know, a large amount of flexibility in setting up committees and councils and task groups based on areas that the industry want to go, and many times the associations are so formalized with so many rules and procedures it's hard to get going in some of those organizations. I've been part of a lot of meetings that have taken place, many of which were successful and some of which resulted in committees that are still ongoing at NIBS. And I'll tell you, I think your interest level is as high as any that I've seen in the first meeting.

So I think Stephanie is certainly excited. Stephanie is an architect and I've known Stephanie for what 20, 30 years. Anyways, it's kind of scary. She was 11 years old when I hired her in AIA when I was there. But nevertheless, she's a good judge and she runs a lot of projects for the VA and she's got a huge Department of Energy project. What we do with our staff here is they get assigned to committees and councils and some of these groups, and it's kind of a volunteer effort. You know, they've got a day job with federal agency clients doing real work, and so when I put this on them, it's kind of volunteer. And you know, she's got two very big councils, one on building enclosures and one on high performance buildings, and she has been begging me to take her off of them. She's like, please.

So anyway, we're hiring a new staff person and I finally told her, okay, I'm getting you off the high performance and by December you won't have to do the building envelope. And as I was sitting here I said, you know I'm going to expect you to do this one, and she said, oh no I'm all excited about this. You know, she's the other volunteer that can work with you to develop this. So anyway, I'm excited about it. I appreciate all of your interest, participation, excitement. I think it's always great when we bring in new groups, new professions, new sectors to work with us in a multidisciplinary way. I sort of just for your own interest laid out our annual report there if you want to pick it up and take a look at all our programs.

We do report to Congress and we report to the president, so -- you know, not that anybody in any of those places ever reads it but at least it's in the legislation and it gives us some recognition.
And so I personally on behalf of Stephanie and the rest of the employees appreciate the time that you’ve spent here, and especially for the doctors who make the big salaries. You know, this was really, you know, an expensive and extensive effort.

But the last person that I want to give my appreciation to is this guy over here that really started this. And you know, I’ve known him and he’s a constant reinforcement of what good things people can do and how much, what comes at you in life, whether it’s your boss or the agency you work for or a physical impairment, that you just get up every morning and you put your clothes on and you go and you fight the good fight, and he has done that for the last 40 years.

Comment by Vijay Gupta: Well, I don’t know if I deserve all that but I thank Earle. We met [on this idea] about six months ago at GSA and I can recall Earle, one day I said we’ve got [to do something].

And it’s a problem, [and] because [it’s] my own problem, they’re not doing anything. So we talked for a little while and we met and we funded a small project to correct that, and we met a few times; and so that’s where we are. After all that, this is the effort of all these people: Earle, Stuart Knoop, Greg Knoop, Tom Sachs, Tom Williams, Marsha Mazz, Jim Woods and Stephanie.

Marsha supported it all the way. She gave us the idea [about accessibility], she told the VA to set rules so we can do that. So thank you, Marsha.

Response by Marsha Mazz: I told you to quit running your mouth and that’s exactly what you did.

Comment by Earle Kennett: Well, I think we all give Vijay a round of applause. Thank you all again.
Appendix A: Rationale and Objectives of Workshop

Workshop on Improving Building Design for Persons with Low Vision

We negotiate and appreciate the world around us – the natural and built environments – with all our senses, but for those of us with sight, it is our vision on which we most depend. Whether we are fully sighted or when vision is less than optimal, visual clues aid us in our interactions with our surroundings – supplemented by non-visual clues such as acoustic, thermal and tactile ones.

Any lack of clarity of the visual clues or defect in our ability to see can reduce our abilities to navigate the constructed environment safely and to understand it.

The National Eye Institute (NEI) of the National Institutes of Health (NIH) estimates that, currently, more than 38 million Americans age 40 and older experience blindness, low vision (the term, “low vision” may also be rendered as “visually impaired”) or eye disease such as macular degeneration, cone rod dystrophy, glaucoma, diabetic retinopathy, or cataracts. This number is expected to grow to more than 50 million Americans by year 2020. NEI further states:

Low vision is defined as a visual impairment that is not corrected by standard eyeglasses, contact lenses, medication, or surgery and that interferes with the ability to perform everyday activities. It is most commonly described in terms of remaining visual acuity (central vision) and visual field, peripheral, or side vision.¹ Loss in central vision causes difficulty in detail discrimination (e.g., reading and discriminating fine detail and color). Peripheral vision loss causes orientation and mobility problems, such as having difficulty seeing curbs/steps or difficulty seeing in lowlight conditions.

Source:


As low vision affects an increasing percentage of the population, the need to accommodate persons with low vision in the constructed environment is critical and must be addressed.

Many modern buildings, including many federal buildings, are designed with large areas of glass for daylight and views and with extensive artificial lighting. Glare from both sources is a major source of distraction, discomfort and impediment to vision for many who use these buildings. Also, many newer building interiors favor monochromatic or low-contrast treatments that are difficult for persons with low vision to negotiate.
While the pathologies and treatment of low vision disorders are biomedical research and medical issues, assuring optimal access to the built environment for persons with low vision is a design issue. Design of natural and artificial lighting to minimize glare is beneficial to all sighted persons, and use of color and value contrast to improve visual clarity of the environment is especially helpful to persons with low vision.

Whereas many issues of accessibility have been addressed by the Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA), accessibility for persons with low vision has not. It is the goal of the General Services Administration (GSA), working through the National Institute of Building Sciences (NIBS) and with the U.S. Access Board, to begin a process of improving building design to better accommodate all types of sighted persons.

To that end, NIBS proposes to host a workshop in Washington, D.C. on September 29th and 30th with participants from the fields of medicine (specialists in ophthalmology and low vision), architecture, engineering, interior design, lighting design, professional associations, government, academia, advocacy, research and development with the following objectives:

1. Identify existing guidance for design and obtain expert recommendations for new guidance for the following:
   i. Medical expert definition of eye conditions that impact a person's ability to navigate, interpret and use the built environment.
   ii. Mitigation of large changes in lighting levels such as between the outdoors and the interior, from one level of interior illumination to another when moving from space to space, and within spaces between one surface and another.
   iii. Mitigation of glare from daylight through windows and other openings, from artificial lighting fixtures, surface reflections, etc.
   iv. Mitigation of visual confusion due to poor contrasts of color and value in surfaces and forms, including wall finishes, work surfaces, furnishings, etc.
   v. Improvement in building spatial organization to assist in wayfinding by persons with visual impairments.
   vi. Enhancement of safety and ease of use by persons with visual impairments in areas such as toilet rooms, offices, doorways, corridors, stairs, elevators and escalators.
   vii. Enhancement of occupant performance and productivity in work spaces where reading accuracy (e.g., visual acuity) is important

2. Identify research that would be useful in developing and advancing this guidance.

From the results of the workshop, a plan of action will be proposed to develop draft guidance for GSA to consider for inclusion in its publication, *Facilities Standards for the Public Buildings Service*, and for the U.S. Access Board to consider for inclusion in the ADA/ABA *Accessibility Guidelines*. 
Appendix B: Agenda

Workshop on Improving Building Design for Persons with Low Vision
September 29th and 30th 2010
National Institute of Building Sciences
1090 Vermont Avenue, Suite 700
Washington, DC 20005
Phone: 202 289-7800

Wednesday, September 29

7:30am - 8:00am  Sign-In and Continental Breakfast

8:00am – 8:30am  Welcome

Henry L. Green, Hon. AIA, President, National Institute of Building Sciences (NIBS)
Susan Brita, Deputy Administrator, U.S. General Services Administration

8:30am – 8:45am  Opening Remarks and Introductions

Vijay Gupta, PE, Fellow ASHRAE, Chief Mechanical Engineer, Office of Design and Construction Programs, Public Buildings Service, U.S. General Services Administration
Earle Kennett, AIA, Senior Vice President/Chief Operating Officer, NIBS

8:45am – 9:00am  Synopsis of Objectives for the Workshop – Inclusive Design

Gregory Knoop, AIA, Principal, Oudens Knoop Knoop + Sachs Architects, Chevy Chase, MD
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<tr>
<th>Time</th>
<th>Session</th>
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<tr>
<td>9:00am – 9:15 am</td>
<td>Overview of the National Institutes of Health and the National Eye Institute</td>
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<td><strong>Cheri L. Wiggs, PhD</strong>, Director, Low Vision Program, National Eye Institute, National Institutes of Health, Bethesda, MD</td>
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<td>9:15am – 10:00am</td>
<td>Keynote: <em>Definition of Low-Vision and its Impact on Accessibility and Performance</em></td>
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<td><strong>Robert Massof, PhD</strong>, Professor, Lions Low Vision Research and Rehabilitation Center, Wilmer Ophthalmological Institute, Johns Hopkins School of Medicine, Baltimore, MD</td>
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<td>10:00am - 10:10am</td>
<td>Break</td>
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<td>10:10am – 10:30am</td>
<td>Process for Developing Standards for the U.S. Access Board</td>
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<td><strong>Marsha Mazz</strong>, Director, Office of Technical and Information Services, U.S. Access Board, Washington, DC</td>
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<td>10:30am – 11:30am</td>
<td>Panel – <em>Requirements and Accommodations for Persons with Low Vision</em></td>
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<td>Moderator - <strong>Vijay Gupta</strong></td>
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<td>Panelists:</td>
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<td><strong>Suleiman Alibhai, OD</strong>, Low Vision Services, Plc., Vienna, VA</td>
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<td><strong>David L. Munson, IALDAFF</strong>, President, FineArtLight LLC, Manchester, MO</td>
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<td><strong>Dennis W. Siemsen, OD</strong>, Low Vision Service, Department of Ophthalmology, Mayo Clinic, Rochester, MN</td>
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<td>11:30am - Noon</td>
<td>Discussion</td>
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<td>Noon - 12:45pm</td>
<td>Lunch and Discussion (con't)</td>
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<td>12:45 pm – 1:45pm</td>
<td>Panel – <em>Existing Standards and Design Guidance</em></td>
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<td>Moderator - <strong>Tom O. Sachs, AIA</strong>, Oudens Knoop Knoop + Sachs Architects, Chevy Chase, MD</td>
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<td>Panelists:</td>
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<td><strong>Priscilla Rogers</strong>, Center on Vision Loss, American Foundation for the Blind, Dallas, TX</td>
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<td><strong>Debra E. Babcock, PMP</strong>, AWSS/Special Projects Office, Internal Revenue Service, Washington, DC</td>
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<td><strong>John Brabyn, PhD</strong>, Director of Rehabilitation Engineering Research Center on Low Vision and Blindness (NIDRR), Smith-Kettlewell Eye Research Institute, San Francisco, CA</td>
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<td><strong>Jeanne Halloin, IES</strong>, President, Harts Design Inc., Okemos, MI, Asst. Professor, Michigan State University</td>
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<td>1:45pm – 2:45pm</td>
<td>Discussion</td>
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<tr>
<td>2:45pm – 3:00pm</td>
<td>Break</td>
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3:00pm – 4:00pm  Panel – *Impacts on Vision – Glare, Contrast, Color*
Moderator - **Gregory Knoop**
Panelists:
- **Frederick Krimgold, PhD**, Director, Disaster Risk Management Program, Virginia Tech Advanced Research Institute National Capital Region, Arlington, VA
- **Mariana Figueiro, PhD**, Program Director, Assistant Professor, The Lighting Research Center, Rensselaer Polytechnic Institute, Troy, NY
- **Mary Ann Hay, IALD, LEED AP**, Vice President, Director, Architectural Lighting Design, Syska Hennessy Group, Inc., New York, NY

4:00pm – 5:00pm  Discussion

6:00pm – 8:00 pm  Dinner at the Crowne Plaza Hotel (Discussion continues)

**Thursday, September 30**

7:30am – 8:00am  Continental Breakfast

8:00am – 8:30am  *Summary of Day One*
**Earle Kennett**

**Design Solutions**

8:30am – 9:30am  Panel – *Natural Lighting*
Moderator - **Thomas Williams, AIA**, National Accessibility Officer, GSA Public Buildings Service, Washington, DC
Panelists:
- **Mark J. Mazz, AIA**, Architect and Consultant, Hyattsville, MD
- **Mariana Figueiro**
- **Gregory Knoop**
- **James E. Woods, PhD, PE, Fellow ASHRAE**, Indoor Environmental Quality Consultant, Charlottesville, VA

9:30am – 10:00am  Discussion

10:00am – 10:15am  Break

10:15am – 11:15am  Panel - *Artificial Lighting*
Moderator - **James E. Woods**
Panelists:

George S. Sexton, III, IES, IAID, Lighting Consultant, Washington, DC

Robert Dupuy, LC, IALD, Associate Principal / Lighting Studio Team Leader, Interface Engineering, Portland, OR

Mary Ann Hay

Eunice Noell-Waggoner, IES, LC, President, Center of Design for an Aging Society, Portland, OR

11:15am – Noon Discussion
Noon - 12:45pm Lunch and Discussion (con't)
12:45pm – 1:45pm Panel – Interior Design
   Moderator - Gregory Knoop
   Panelists:
   Eunice Noell-Waggoner
   Erin M. Schambureck, IIDA, CID, LEED AP, Schambureck Interiors, Rochester, MN
   Priscilla Rogers
   Roberta Null, PhD, ASID, President, Common Place Design, Whittier, Calif.
   Jeanne Halloin

1:45pm – 2:45pm Discussion
2:45pm – 3:00pm Break
3:00pm - 4:00pm Panel – Next Steps – Guidelines
   Moderator - Earle Kennett
   Panelists:
   Cheri L. Wiggs
   Debra E. Babcock
   William Holley, PE, Chief Engineer, Office of Design and Construction, Public Buildings Service, GSA, Washington, DC
   Patrick Fee, Director, Office of Facilities Management and Services Program, Public Buildings Service, GSA, Washington, DC
   Kurt Knight, PE, Director, Facilities Quality Service, Office of Construction and Facilities Management, Department of Veterans Affairs, Washington, DC
   Priscilla Rogers
   Marsha Mazz
John Sporidis, PE, Principal, Arup, Washington, DC

4:00pm – 5:00pm  Discussion and wrap-up
5:00pm  Workshop Adjourns
Appendix C: Participants and Biographies

List of Participants

Workshop on Improving Building Design for Low Vision Persons
September 29th and 30th 2010
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1090 Vermont Avenue, NW, Suite 700
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Gupta, Vijay, PE, Fellow ASHRAE, Chief Mechanical Engineer, Office of Design & Construction (ODC), PBS
Holley, William, PhD, PE, Director, Engineering & Project Delivery Resources Divisions, ODC/PBS
Kennett, Earle, AIA, Senior Vice President and Chief Operating Officer (NIBS)
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Knoop, Stuart L., FAIA, Retired Principal, Oudens Knoop Knoop + Sachs
Mazz, Marsha, Director, Office of Technical and Information Services, U.S. Access Board
Sachs, Tom, AIA, Principal, Oudens Knoop Knoop + Sachs
Williams, Thomas, Architect – National Accessibility Officer, PBS/GSA
Woods, James, PhD, PE, Fellow ASHRAE, Indoor Environmental Quality Consultant

**Biographical Sketches**
(Biographical sketches of the participants may be found on the FTP site: http://files.nibs.org/; user name: lowvision; and passcode: lowvision.)
Appendix D: Reference Material

Published References


Osterhaus, W. (Date NA). Design Guidelines for Glare-free Daylit Work Environments. (Publication information not available – Article obtained from Google Search).


Tuaycharoen, N. and Tregenza, P.R. 2007. View and Discomfort Glare from Windows. (16 pages) (Publication information not available – Article obtained from Google Search).

On-line References

Alzheimer Knowledge Exchange: Why is Lighting Important to Older Adults? www.marep.uwaterloo.ca.

American Foundation for the Blind: Creating an Accessible Environment for Older Individuals Who Are Visually Impaired.


Appendix E: List of Issues

Issue 1: What are the effects of energy-efficient lamps and fixtures on persons with low vision.

Issue 2: What Approach is needed to develop “Guidelines”?..

Issue 3: Is there a need for a different kind of Practice?

Issue 4: Based on available references, can we develop “viable” design standards and guidelines?

Issue 5: Can a new chapter be written with a structure for PBS P100 that is performance based and does not disaggregate lighting design by professional disciplines (i.e., integrates subject matter in Chapters 2, 3, 5, and 6)?

Issue 6: Is there a metric for the ratio of scotopic/photopic interactions?

Issue 7: Do we need a State-of-the-Art Literature Search?

Issue 8: What are the top issues for developing design guidance (i.e., Low-hanging fruit design issues)?

Issue 9: What are the top research topics that need to be undertaken (i.e., Identification of R&D Opportunities)?

Issue 10: What are the recommendations for long-term activities?

Issue 11: What environmental and perceptual data on natural/daylighting are available from buildings with low vision occupants?

Issue 12: What design guidance on natural lighting for low vision persons can be provided in the short term?

Issue 13: How can energy codes and LEED™ “Points” be made compatible with lighting design criteria that accommodate low vision persons?

Issue 14: How can improved lighting and zero net energy goals be achieved while improving health care?

Issue 15: How can the potential conflict between the goals of zero net energy and accessibility for low vision persons be resolved?

Issue 16: What environmental and perceptual data on artificial/electric lighting are available from buildings with low vision occupants?

Issue 17: What design guidance on artificial/electric lighting for low vision persons can be provided in the short term?

Issue 18: What design guidance on accessibility through contrast and signage attributes can be provided in the short term for persons with low vision?

Issue 19: What Principles of Universal Design can be applied in the short term for persons with low vision?

Issue 20: Why should we embark on a new guideline?

Issue 21: What additional education and training are needed for supervisors of employees with low vision?

Issue 22: How is accessibility for persons with low vision assessed during the design review process?
Issue 23: Should design guidance for persons with low vision be prescriptive or performance based?

Issue 24: What are the long-term and short-term targets for guidance?
Appendix F: Worksheet from Panel 7

Earle’s Discussion Points for Kicking Off Day 2.

1. Do we need a state-of-the-art literature search?
Yes, and anchor it around safety: Where do problems occur? What is the evidence of failure? We have to market the problems before we market the solutions.

2. What are the top issues for developing design guidance?
This is an opportunity to bring the issue of low vision to the forefront—as the research is being done and standards are being developed.

List common problems to be avoided.
--Glare
--Signage
--Accountability: have measurable criteria.

Kurt: If you define the design issues, we’re going to charge the architect to do something about it.
Tom S. We have to know what we’re designing to.
Earle: We can’t wait for standards.

Fred: We need to do the best we can with what we have now. We’re laying the foundation to take advantage of this group’s expertise. We should apply what is available now. We also have to recognize what’s not available and define research for it.
Jim: Fundamental changes are being made to achieve zero point energy. We should get in to lighting issues right away.
Robert D: Energy codes also must be considered. They are causing problems for designers, with Codes are requiring less light per space. Then there is LEED certification.
Kurt: 30% reduction in energy—this is a law.
Greg: We need to take a red pen to what already exists and eliminate problems, e.g., atriums in public buildings.

3. What are the next steps for R&D?
NIBS could coordinate this research. We will assemble a small group to develop a project list and get a consensus.

Greg: We may need to bring in people on the energy side.
Earle: EISA defines high performance buildings as comprehensive: energy, security, safety. It doesn’t specifically mention accessibility.
Kurt: But you also have to meet the energy criteria, and energy prices are going up.
Mary Ann: The energy codes (lighting) don’t take into account the three-D quality of the space. We need a time-out on the energy reduction codes.
Jim: We need to attack the myth of better lighting means using more energy.

4. Long Term Actions for the Group?
Fred: Can a Designing for Low Vision group have status within NIBS as a committee?
Earle: Yes. To start with, we could Task Forces--have monthly conference calls and set up a Web site.
Tom: And get GSA money.
Kurt: Let’s list some simple things we could do: small and safety-oriented, for guidance. For instance, lighting elevator buttons.
Debi: Things like contrast are low-hanging fruit. This group can provide guidance that can be implemented right away.
Vijay: It will take perseverance, but we can make a difference for low vision.
Appendix G: Erin Schambureck’s Lists, Compiled Subsequent to the Workshop

[Editor’s Note: these lists were contributed after the Workshop and have not been reviewed by the Participants. Erin was enthusiastically encouraged to compile these lists.]

Existing Design Standards that apply to Designing for Low-Vision:

- 1961- American National Standards Institute published ANSI A117.1, Making Buildings Accessible to and Usable by the Physically Handicapped
- 1968 - Congress passed the Architectural Barriers Act (ABA) (P.L. 90-480)
- 1984- several federal agencies (HEW, DOD, HUD, USPO) published Uniform Federal Accessibility Standard (UFAS)
- 1990s - Congress passed the Americans with Disabilities Act (P.L. 101-336) and when the U.S. Access Board published Accessibility Guidelines

www.AccessBoard.gov
- Architectural Barriers Act of 1968
- Americans with Disabilities Act of 1990
- Telecommunications Act of 1996
- Rehabilitation Act Amendments of 1998
- ADA Accessibility Guidelines (1991)
  Supplements:
  - state and government facilities (1998)
  - children’s environments (1998)
  - play areas (2000) and recreation facilities (2002)
- Transportation Vehicles (1991)
- Electronic & Information Technology (2000)
- ADA Final Rule Title III, Sept., 2010

Rulemaking in development:
- Outdoor Developed Areas
- Passenger Vessels
- Public Rights-of-Way
- Transportation Vehicles
- Information and Communications Technology
- Emergency Transportable Housing
- Medical Diagnostic Equipment
- Shared Use Paths
- Classroom Acoustics
- Human Measures –Anthropometrics.

- ASHRAE 90.1: Commercial lighting code. Code does allow for lighting in spaces designed for people with special light needs such as those with vision loss or age-related issues.
- ASHRAE 189.1—sustainability code for green buildings; provides for 10% less interior lighting wattage than ASHRAE
- Model Building code: ICC/ANSI A117.1
- Uniform Federal Accessibility Standards (UFAS) (note-these codes are similar to ADAAG)
- Draft Public Rights-of-Way Accessibility Guidelines (PROWAG)
• ANSI/IES RP-28-07 Standard developed for Senior Living
  o Should be adopted by the VA and CMS for nursing homes. Same principles apply to office environments and public buildings.

Brabyn – ANSI 703.8 standard for: Remote Infrared Audible Sign (RIAS) System

• 703.8.1 Transmitters. Where provided, Remote Infrared Signage Transmitters shall be designed to communicate with receivers complying with Section 703.8.2.
• 703.8.2 Remote Infrared Audible Sign Receivers.
• 703.8.2.1 Frequency. Basic speech messages shall be frequency modulated at 25 kHz (+/- 10% deviation), and shall have an infrared wavelength from 850 to 950 nanometer (nm).
• 703.8.2.2 Optical power density. Receiver shall produce a 12 decibel (dB) signal-plus-noise-to-noise ratio with a kHz modulation tone at +/- 2.5 kHz deviation of the 25 kHz subcarrier at an optical power density of 26 picowatts per square millimeter measured at the receiver photosensor aperture.

Knight: www.cfm.va.gov/TIL
Sustainability/ Energy Reduction
• EISA 2007
• Executive Order 13423 January 2007
• EPACT 2005
• Federal Leader in High Performance and Sustainable Building Memorandum of understanding

Standards applied to new VA buildings:
• Integrated Project Development
• Integrated Project Design
• 30% Energy Reduction
• 20% Water Reduction
• Day Lighting
• Sustainable Design
• LEED Silver
• Green Globe
• Greening Master Specification

Problems in designing for low-vision

As discussed in the Workshop on Improving Building Design for Persons Low-Vision held September 29th and 30th, 2010: the following areas identify the most prevalent problems areas for persons with low-vision as well as obstacles in the current system to providing adequate design solutions to serve their needs.

Awareness of this population group to the general public is limited. A major obstacle to designing for partially sighted people is that fewer than 5% of them use a white cane. Many can make normal eye contact and thickness of or absence of glasses is not an indication of low-vision. Without these “identifying” features most design professional may not understand how much of the population is positively or negatively impacted by their designs.

• Glare
• Daylighting
• Artificial Lighting
• Standards & Guidelines / Light levels
• Contrast Sensitivity
• Fixtures/Finishes

Glare

The difficulty inherent in quantifying glare poses a problem for establishing design guidelines that will minimize its effects. In many instances glare is subjective and will affect each person differently. In general the luminance of an object compared to the average luminance of the surrounding visual field will create a subjective measure of glare. If the object is immensely brighter than the surrounding area, the eye can not adapt to the image and perceives it as glare. This discomfort increases in persons with low-vision. While it is difficult to measure glare in a scientific manner, Glare has been subjectively described as Discomfort Glare or Disability Glare for clarification purposes.

**Discomfort Glare**: sensation of irritation or pain from high luminance in the field of view such as:
High luminance sources, large area light sources (windows or large artificial light), light sources close to the line of sight, or bright sources against a dark background.

**Disability Glare**: the reduction in visibility caused by intense light sources in the field of view such as: unshielded light sources (natural and artificial), light reflecting from highly reflective surfaces, or light being scattered within the eye.

Additional sources of glare:
- Oncoming headlights or a low sun on the horizon
- Unshielded windows
- Reflective floor or wall surfaces
- Poorly shielded light sources
- Uneven light distribution such as cone shapes of light on a wall can be confusing and make spaces difficult to navigate.
- Contrasts in lighting
- Computer screens

**Lamp Size**: The trend to reduce the size of the lamp and luminare while improving energy efficiency and light output results in higher lumen output and creates point source glare problems.

**Adaptability to Light**: The ability of the eye to adapt to changing light levels can also result in glare or complete vision loss until the eye adjusts. Low-vision persons tend to be slower to adapt to changing light levels. The fixed lighting levels at entryways create glare during daylight hours as occupants exit dark buildings to day lit exteriors and are unable to adjust to the brightness. The opposite is true in the evening when interiors are well lit and exterior areas are too dark to navigate.

**Heightened Sensitivity**: Low vision for many means additional sensitivity to glare. What might be considered discomfort glare to a sighted person could be disabling and painful to a low-vision person.

**Daylighting**:

Harnessing daylight to illuminate an interior space can be extremely energy efficient but it causes problems of its own for partially sighted people.

Day lit spaces change throughout the day as the sun moves. This creates changing shadows and moments of glare that can adversely affect a partially sighted person’s ability to navigate a space safely, and correctly identify obstacles like stairs or changes in elevation.
In day lit spaces it is harder to create transitions between lighting zones. A person walking from an adequately lit corridor into a bright, sunlight filled atrium will have trouble adjust to the light level and be incapacitated until their vision adjusts.

Reflective surfaces can be problematic with artificial light but they also compound glare problems from daylighting in spaces as well.

In the evening spaces reliant on daylighting can become too dark with not enough supplemental lighting for a person with low-vision to navigate.

Daylight also impedes the ability of a person to find the door in a wall of glass. This is a common scenario in many public buildings. The intense light level of the exterior creates glare and makes all the fenestrations look the same. Unless there is additional lighting or other architectural features to distinguish the door, even the average user may have difficulty exiting the building.

Daylight requirements in various standards don’t take into account the varied light-level needs of partially sighted people.

**Artificial Lighting:**

A function of the tendency to smaller lamp size as previously discussed is the increasing difficulty of evenly spreading the lumens produced by the light source. A smaller light source like a can-light can create “scalloped” effects on the wall making it difficult to understand the size and shape of a space. It can also make it more difficult to navigate circulation paths and find doors.

Poorly placed lighting at doors can impede the ability to read the sign for that door, find the door handle, or can create glare for someone walking through the door into a new space. There are no guidelines that point out the ideal location for supplemental lighting at doors and signage.

Light fixtures placed too far apart will create excessive shadows and widely varying levels of light. There is no way to regulate the variance of lighting levels in a given space.

Inconsistently placed lighting can mislead as well. Small accent lighting has been increasingly used at stairways to place light directly on the tread surface. This is a great idea if used properly and each stair and landing is evenly lit. However, as in one example, if only every third step is lit, even people with normal vision will have difficulty traveling up or down those stairs.

**Standards & Guidelines / Light Levels:**

As the purpose of this group is to create more guidelines, it is a good idea to note that some of the existing standards and requirements have been the sources of difficulty for designers trying to provide universally accessible spaces.

All Federal Agencies are required to incorporate the “Guiding Principles for New Construction and Major Renovation” in all new construction, and major renovations. Principle IV “Enhance Indoor Environmental Quality” includes:

> “Achieve a minimum of daylight factor of 2 percent (excluding all direct sunlight penetration) in 75 percent of all space occupied for critical visual tasks. Provide automatic dimming controls or accessible manual lighting controls, and appropriate glare control.”

Can these guidelines be faithfully met while producing accessible spaces for people with low-vision?

Standards and guidelines such as the energy codes use light levels base on young, normally sighted people. Light level requirements for the aging or low-vision persons can vary dramatically.

Competing energy codes in some jurisdictions and lack of enforcement in others can create an inconsistency in design requirements, or encouraging “fudging” the light levels required for different areas of a building.
The energy codes are based on a watt-per-square foot approach that allows “borrowing” energy that is not used in some spaces for use in high-impact spaces like lobbies. Unfortunately this means lower designed light levels than regulated in high-function spaces like egress paths and office spaces so the excess energy can be used elsewhere.

The lighting level for paths of egress is set by the NFPA. The amount of light required in egress stairs and corridors is the same. This light level is not enough for low-vision people to navigate, especially in the event of an emergency like a fire where vision may be additionally hampered by smoke.

The energy codes are continually being revised to lower the overall energy use in buildings. This also means lowering light levels which will only exacerbate the problem of lighting for low-vision.

**Contrast Sensitivity**

In general, people with low-vision also have reduced contrast sensitivity. Lack of visual contrast in signage, furniture, and interior and exterior spaces impedes the eye’s ability to distinguish objects and shapes from each other. This can make signage difficult to find on the wall, let alone read. This can also make it impossible for a low-vision person to find the path they need if doors are indistinguishable from the surrounding surfaces. Navigation can be dangerous if stairs are the same value as the floors leading up to them. Shadow and contrast are needed to read the visual cues of elevation change and obstacles in our circulation pathways. An all white space may be a beautiful, modern-looking design, but can be impossible to navigate for a person with low-vision.

Low-Contrast can also be applied to the physical texture of materials. Flooring materials with a different feel will indicate a change to a partially sighted person, just as detectable warnings on the street signal the need for caution at a cross-walk area.

Current standards don’t have adequate requirements for color contrast at stair nosings and handrails. The also do not address the color contrast of elevator buttons which can make it difficult to find the correct button in a dark elevator cab. Color contrast can also be useful at handrails in stairwells and public corridors, but this is difficult to regulate.

There are no contrast requirements for fixtures and accessories in public toilets. The all-white restroom will virtually disappear from view.

Conversely, too much contrast in the form of distracting patterns can create visual cues that, to the partially sighted, might look like stairs or obstacles when they are actually flat surfaces. This will significantly impair the ability to navigate a space and can be dangerous.

Low light levels will also decrease contrast sensitivity and make low-contrast signage or visual cues harder to read.

**Fixtures/Finishes:**

Finishes, fixtures, and equipment in exterior and interior spaces significantly impact how a low-vision person experiences and safely navigates a space. With lighting, this is one of the major areas we can make a difference. However, with so many population groups to design for, the low-vision population has previously been low on the list. There reasons designing for this group can be difficult, and also, standard design practices that could be improved.

**Obstacles:** Because most low-vision people do not use a white cane, the ADA guidelines for obstacle heights and locations are not as universally useful. A partially sighted person will not be able to see an obstacle protruding from the wall if it is not of a contrasting color to its background. Furniture is the major culprit in the instance, but free-standing signage and planters are also a problem. In short, items added to the building after construction can cause the most problems.

Large open floor plans without identifying features in the architecture or finish materials can make a person feel lost in a space if the walls are too far away to distinguish or assist in accurately gauging the size and layout of a room.
Signage: Current standards do not adequately address glare and contrast on signage and building directory standards are almost non-existent. There are also no signage regulations for wayfinding signage in public spaces. This could include contrast, letter size and font, as well as light level on the surface of the sign. Overhead way-finding signage is not repeated at a lower eye-level so users can get close to the signage to read it. Audible signage technology is under-utilized, especially in elevators where audible voice announcement of floors is not required and tones indicating arriving elevators are inconsistent.

Finish Materials: Highly reflective or transparent materials are popular in modern architecture but cause a myriad of problems for the partially sighted person. Transparent materials like glass curtain walls or interior dividers are “invisible” to the low-vision population. It can be almost impossible to locate a door in a glass wall with exterior glare impeding vision. Interior glass can also be problematic if the glass is full height and there is no distinguishing edge trim. Glass combined with mirrors is especially dangerous as the reflection can give misleading views of a safe path of travel, or oncoming pedestrians. Reflective flooring materials can also create misleading elevation change cues or disguise the path of travel, not to mention create debilitating reflective glare.

Transitions in flooring materials can be difficult to navigate for low-vision people. Their reduced visual acuity makes them more likely to stumble on an unseen elevation or texture change such as tile to carpet or sidewalk to grass. Partially sighted people are also more likely to have difficulty detecting major elevation changes such as exterior curbs at roadways, steps, or exterior landscaping. These areas are generally constructed out of concrete which is visually flat and blends in with surrounding concrete structures. There are limited regulations for where curb markings are required and it would be difficult to regulate the color contrast of exterior landscaping fixtures.

Building Layout: While not specifically related to furnishings or equipment, the interior layout of a building can be problematic for low-vision users. Inconsistent building layout of walls or furniture can confuse users new to the building and prevent them from orienting themselves within the space. Little emphasis is placed on wayfinding through a building without signage. Flooring material changes or contrasting colors as well as architectural features can help someone remember their path through a building. In a low-contrast environment it is difficult to remember how you got where you are without the use of signage. Diagonals and curved walls are also problematic for the partially sighted as they distort the shadows used to interpret visual cues and confuse physical orientation in a building. It is impossible to standardize the layout of public buildings to alleviate this navigation issue. There are good design principles that could be employed like locating stairs, elevators, and restrooms consistently throughout multiple floors and in central locations as well as sticking with right angles in major corridors to avoid disorientation.

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Design Solutions for the Low-Vision Population

- Rehabilitation
- Suggested Guidelines
- Glare
- Daylighting
- Artificial Lighting
Rehabilitation

The first steps to improve quality of life for a low-sight person are a series of rehabilitation techniques. Since low-sight often worsens over time, many adults may have adapted themselves to their vision loss without seeking the help of a professional who can give them tools and techniques to navigate the visual more safely and satisfactorily. Some of the tenets of vision rehabilitation are:

- **Magnification**
  - Physically bring objects closer.
  - Use optical devices to bring virtual images closer.
  - Use electronic aids to enlarge images.

- **Illumination/Contrast**
  - Improve the contrast of existing images.
  - Colors enhance contrast with different disease processes.
  - Most patients don’t use the right illumination, even if they have the right low vision aids.

- **Training**
  - Visual performance is a learned activity.
  - Understanding the basic concepts of the low vision aid.
  - Physical barriers to success.

- **Add eccentric viewing.**
- **Social and psychological services.**
- **Rehabilitation services.**

**Suggested Guidelines:**

- **Increase light levels!!!**
  - Provide light levels adequate for the task.

**Exteriors:**

- Bollards should be a minimum of 1 m high, and color contrasted with the background against which they will be viewed. They should also have a contrasting band near the top.
- Street furniture should be color contrasted with background—and offset from the main pedestrian route where possible.
- Provide contrast at exterior ramps and curbs to denote an elevation hazard and define edges.
- Darker value surfaces reduce glare.
**Entrances:**
- If there are steps, add a ramp, or signage to the nearest accessible entrance.
- 36" Clearance at doorways.
- Threshold edge ¼" or less or beveled edge ¾" or less.
- Handles – no higher than 48".
- A min. 3 sec. timer on automatic door closers.
- Highlight glazed doors and side panels with prominent signs, logos or decorative features at eye level.

**Carpeting and Mats:**
- Max ¼" high or less.
- Low pile.
- Tightly woven.
- Secured along edges.

**Ramps:**
- Slope 1:12 or greater (1:20 is better).
- Longer than 6′ – railings on both sides.
- 36" clearance.
- Non-slip surface.
- No more than 30" rise between landings.
- Landings 5′ long and level.

**Route of Travel:**
- No stairs.
- Firm, slip-resistance surface.
- 36" wide.
- Protruding objects detectable using a cane must be: within 27" of the ground or above 80", or protrude less than 4" from the wall.
- Objects that protrude beyond the plan of the wall should be of a contrasting color.
- Provide consistent levels of illumination in circulation zones.
- Eliminate extra noise and distracting sounds/echoes.

**Emergency Egress:**
- Both flashing lights & audible signals.
- Improve light level requirements.

**Signage for Goods and Services:**
- If above 80" AFF, letters should be 3" high and the information should be repeated at eye level for greater accessibility.
• Must comply with legibility regulations unless temporary or building directory.
• Non-glare finish, egg-shell or matte.
• Signs should be consistent, using prescribed typefaces, colors and graphics.

**Vertical Circulation – Stairs:**
• Uniform treads and sizes & riser heights.
• Nosing overhangs minimal.
• Handrails on BOTH sides.
• At stairs, increase the contrast between the risers and treads as well as between the handrail and the wall.
• At escalators, contrast the landing leading to the moving stairway. Provide user controls to slow stairway speed.
• Provide 2" wide contrasting nosings on stairs.
• Provide color contrast between stair tread and riser.

**Vertical Circulation – Elevators:**
• Must be on accessible routes.
• Automatically self leveling.
• Call buttons should be centered 42" AFF, and a min. ¾” diameter.
• Call buttons should be light numerals on dark backgrounds with high contrast.
• Provide adequate lighting, or lit buttons on control panels to enhance visibility. All buttons should be lit at all times. Temporary increase of lighting at control panel.
• Contrast threshold and door jambs to adjacent surfaces.
• Provide distinguishable auditory signals.
• Provide a protective door reopening device.

**Glare**
• Provide glare control:
  o Shades, drapes, and blinds
  o Changing the type and position of artificial light
  o Shields around monitors
  o Cubicle barriers
  o Focused vs. indirect light
  o Tinted glasses
  o Hats, visors

**Daylighting**
• Provide shielded sources of illumination.
• Control glare.
• Exterior Sunshades at windows and openings.
• Tinted glass, or light affected tinting/polarized coatings.
• Design to control light.
• Go back to basics:
  o Building orientation
  o Planned fenestration
  o Holistic design
• High light levels while avoiding glare.
• Provide artificial light sources with suitable controls to counteract the changing light levels in day lit spaces.

**Artificial Lighting**

• Aim for uniformity of illumination in circulation zones, avoiding strong shadows. This can be done while still providing visual interest.
• Provide sufficient general lighting.
• Provide increased task lighting.
• Provide transition light between spaces (like lights in tunnels on highways).
• Provide multiple lighting combinations and controls to accommodate for changing light needs throughout the day. Especially in transition zones.
• Lighting controls save energy and allow for changing light levels.
• Provide indirect lighting with appropriate light cut-off angles. Or direct-indirect lighting for increased illumination with uniform lighting levels.
• Coordinate fixture placement to avoid direct and reflected glare, and shadows.
• Provide high color rendition light sources.
• Evaluate color temperature of light sources within and environment.

**Contrast Sensitivity**

• Increase “visibility” with high contrast.
• Reduce camouflage and visual clutter.
• Use contrasting colors at edges of doors and cased openings to distinguish them from the surrounding walls.
• Contrast toilet seat to remainder of toilet or surrounding materials. Large flush handle contrasted to toilet.
• In a shower room or bathroom, contrast the handrails to the wall and floor materials. Contrast accessories as well.
• Contrast handles at doors to door color.
• Light switches should be color contrasted to background.
• Use value contrast where vertical and horizontal surfaces meet.
• Use contrast to make furniture “visible” in an open space.
• Color contrasting wayfinding in finish materials can help direct circulation.
• High contrast accents on equipment like stovetops can help low-vision users safely use the equipment independently.

**Fixtures/Finishes**

• Use tactile/visual surfaces for flooring.

• **Signage:**
  o Consistently placing signage in large print and Braille.
  o Reverse contrast is best for signage (white on black).
  o Provide signage that is solid at floor level, not post supported or tied to ropes.
  o Provide adequate lighting at signage so that it is not shaded when someone leans in to see it.
  o Consider supplementary auditory signage.
  o Use colors to identify different areas of the building plan and coordinate with signage.
  o Keep signage within the cone of vision, repeat overhead signage at a lower elevation where a user can approach it closely to read.

• Use matte surfaces or polarized coatings to prevent reflections.
• Use light colors on walls and ceilings to increase the light reflectance value.
• Use tonal or decorative features at corners to identify them.
• Use floor patterns to complement the circulation path.
• Use tactile surfaces for flooring to help identify changes in the circulation path.
• Provide a material or color change at worksurfaces edges.
• Contrast furnishings with floor materials, or us pattern to enhance the shape of furniture.
• Avoid over-furnishing public spaces.
• When using glass doors, countertops, and free standing display cases be sure that they are well defined and don’t have “invisible” edges.
• Lower cabinets so stored items are closer to the visual field.
• Provide single handled faucets plus a separate hot-water tap for safe usage.

**Building Layout and Design**

• Environments that optimize the use of vision all users to:
  o Travel safely and efficiently through and environment.
  o To perceive the spatial layout of key features in the environment.
  o To keep track of one’s location in the layout.

• Use environmental organization to promote wayfinding:
  o Corridors that line up, and flooring changes at circulation nodes.
  o Use logical, consistent layouts in building design.
  o Keep floor plan organization constant from floor to floor.
- Organize essential building elements such as elevators, restrooms, and egress stairs together and position at central locations for easy navigation.

- Create circulation areas without curves or non-right angles.

- Keep busy waiting areas separate from circulation areas.

- Increase safety:
  - Steps, stairs, drop-offs
  - Changes in surface elevation
  - Transitions in surface texture

- Alternative signage can be part of an overall solution.

- Make the entrance easily identifiable.

- Provide a place to sit and rest near the building directory.

- Avoid visual business in the lobby:
  - Create direct access to reception/information desk.
  - Avoid large or busy patterns in flooring.

- Avoid corridors with alternating dark and light areas.

- Use color and architectural features to create "landmarks" and promote spatial orientation.

- Eliminate extra/distracting sounds or echoes.

There are a number of other guides and resources for designing for low-vision accessible spaces that could be utilized as a springboard this committee’s discussions. A few of the suggested references are:

- Building Sight: A handbook of building and interior design solutions to include the needs of visually impaired people. JMU Publication. 1995

- ANSI RP-28-07 Standard developed for Senior Living.

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