

**Quality and Sustainability Standards Defining a Young Industry:
InfoComm International and Its Vision for the Future of AV**

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Technology Issues in Buildings

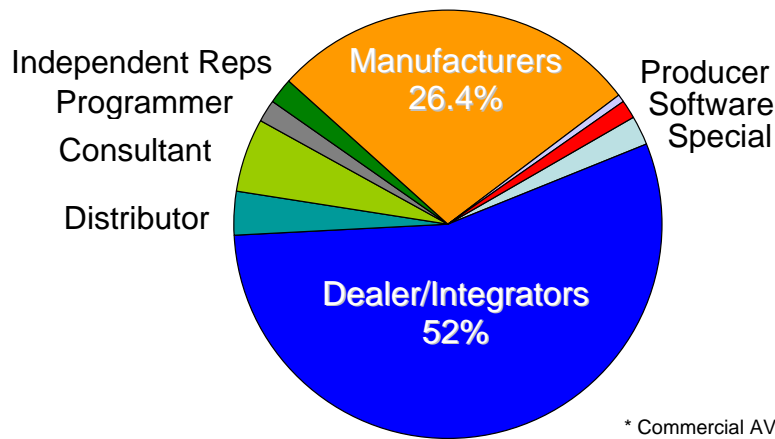
Within every building lies a myriad of technical systems that support the functionality of the structure and its inhabitants. Everyone is familiar with the basics: mechanical, electrical, and plumbing. These are so vital to every structure that a whole category of engineering is devoted to them: practitioners are called “MEP” engineers. Within the last twenty years, additional specialty engineers have been called upon as well: life safety, telephony, data network, physical security and surveillance, and audiovisual. Until recently these designers and the integration firms installing the systems worked apart from each other, utilizing different infrastructures, protocols, and standards. With today’s perspective this seems like an inefficient, chaotic, and perhaps ridiculous situation. With today’s mandates for conservation and sustainability, any material or energy wastefulness is under scrutiny.

No one is to blame for the disjointed aspects of building technologies. Each of these professions and their systems has experienced explosive growth in their market sectors, each with fast-paced technology development. This has led to redundant infrastructure, disparate control systems, personnel miscommunications, and many other ills of facility management. The trend towards combining different components of these technologies has been called “convergence”, defined by whatever market is being analyzed. Although convergence generally implies the use of data networks for system connectivity, the human condition within the building is still the central issue. This paper looks specifically at the audiovisual industry: the technological nexus of human interactions. This people-based industry is now proceeding to implement “performance” standards to reign in the inevitable future confusion of convergence, with quality and sustainability held as ideals. InfoComm International is the ANSI Accredited Standards Developer (ASD) at the helm of these efforts.



The Audiovisual Industry: Installed Technology

The audiovisual industry has evolved from audio reinforcement, film presentation, and specialized product use such as slide and overhead projectors. Systems were eventually connected to broader industries such as television, telephony, and data networks. What we know of as modern audiovisual systems has only been in existence since the advent of the personal computer and the videographics projector, both developed in the early 1980's. During the 25 years since then, thousands of designers, contractors, architects and engineers have succeeded to "integrate" audiovisual systems into buildings: with a variety of results. Simply put, the audiovisual industry is a construction industry subcontractor with unique skills and products- and difficult coordination requirements. Hundreds of manufacturers have strived to build products that can be readily incorporated into architectural and interiors designs using traditional construction techniques. Many hundred others have ignored the necessity to integrate their products within buildings. InfoComm International is the trade association that unites all aspects of this broad industry. It includes membership through the entire chain of products and end-users, from manufacturing to technology mangers. Product distributors, design consultants, systems integrators, control system programmers, and staging professionals fill the in-between roles of merging technology, architecture, and people. All of this happens on an International basis.



The Membership of InfoComm International by Business Type

As the audiovisual industry has developed through this technology evolution, so have the construction industry and the other building technology industries. Building designers have come to rely on industry-wide standards for data networks and telephone systems. The TIA (Telecommunications Industries Association) and the EIA (Electronic Industries Alliance) have supplied numerous standards supporting technology construction issues. However, the techniques of audiovisual systems integration have been developed by individual consulting and integration firms, completely without standards as a basis for design or performance. This has magnified the false notion that the audiovisual industry is disconnected with construction and should be considered as an “afterthought” aspect of construction. Nothing could be further from the truth: audiovisual technology should be the primary driver behind any architectural design that intends to incorporate group meetings, presentations, training, communications, control systems, acoustics, signage, and many other facility features. Ignoring the integration of audiovisual technology during the programming phase of architectural project management leads to many problems later on: and does not allow the realization of what can become an excellent venue, with high value for the client.

Audiovisual Equipment Standards

Although there are no specific standards from within the audiovisual industry, there are many standards from allied industries that are used to create audiovisual systems. Most of these standards define equipment-oriented issues. These include connectors, signals, sizes and shapes of devices, measurement of equipment output parameters, measurement of acoustics parameters, etc. These standards allow the interoperability of audiovisual devices that is essential for successful system integration. The standards-setting bodies that are most prominent are:

- AES (Audio Engineering Society)
- ASA (Acoustical Society of America)- in conjunction with:
- AIP (American Institute of Physics)
- CEA (Consumer Electronics Association)
- CISPR (International Special Committee on Radio Interference)
- EIA (electronics Industry Alliance)
- ESTA (Entertainment Services & Technology Association)
- IEEE

- ITU (International Telecommunications Union)
- NFPA (National Fire Protection Association)
- SIA (Security Industry Association)
- SID (Society for Information Display)
- SMPTE (Society of Motion Picture and Television Engineers)
- TIA (Telecommunications Industry Association)
- VESA (Video Electronics Standards Association)
- and many others

Without the efforts of these associations, our computer monitors and televisions would have no pictures, our live theatres would be dangerous and dark, our classrooms would still be only “chalk and talk,” our movie theatres would have no movies, and our radios and home theatre systems would be quiet- or at best, full of interference. Clearly there is a broad base of standards that support our entertainment and communications requirements.



Because of these standards, audiovisual practitioners hold a reasonable chance that there are techniques to connect devices together in such a way that they will work as a system. However, there are so many possibilities for mismatches and idiosyncrasies of signal types and control that specialists may spend days troubleshooting systems after they are “complete.” To complicate matters, there are no definite design and adjustment parameters that allow these specialists to calibrate the systems in a predictable, repeatable, manner. This leads to mismatches with client expectations, wasted manpower to re-adjust, and, in the worst cases, to lawsuits. Yes, a universe of physical equipment standards exists to reign in some of these problems- but it is not enough. Technicians and engineers state that a project is “done,” but is it “done-done?” The final adjustments are performed at the whim of the technicians- if at all.

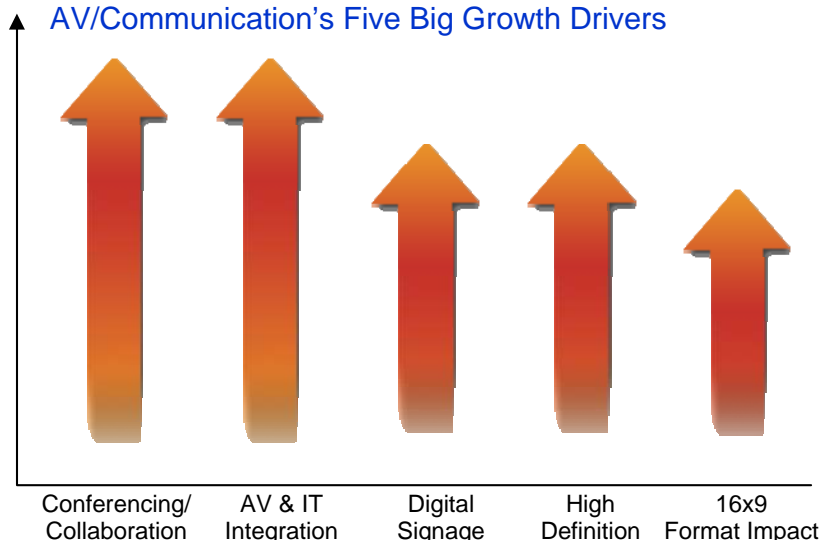
What is missing is how the audience, the architecture, and the technology interact. Everyone has experienced this disconnect- there are no clear expectations that one has when entering an audiovisual-enhanced entertainment, government, hose-of-worship, or themed venue. What are missing are the standards that codify the performance of the systems, apart from the individual components. The obvious conclusion is that the standardization of the interactions of system devices and people within the venue is the ultimate goal to solve many of these problems.

Audiovisual Performance Standards

To meet these requirements of the construction industry, InfoComm International has created a “Performance Standards” Program. This program addresses the needs of the InfoComm membership: audiovisual systems standards that define this triad of audience/architecture/technology. This technology only makes sense when it is incorporated within an architectural venue, with a live audience. What’s more, the program includes these entities in their entire international framework. After all, the emphasis is on the physiological and ergonomic needs of the presenters and the audience. These are universal and unchanging needs. The need for these guidelines is amplified every day, as the InfoComm constituency grows along with its client base. This base is experiencing tremendous growth, as global demand continues to expand in both vertical and horizontal markets. The InfoComm Performance Standards Program became an ANSI ASD in May 2008, and follows the guidelines of ANSI and ISO for formal standards development. The Program’s required ANSI documentation has benefited greatly from the recommendations of the SES (Standards Engineering Society.)^{1,2}

¹ *SES 1:2002 Recommended Practice for Designation and Organization of Standards*, Standards Engineering Society Miami, Florida, 2002

² *SES 2:2006 Model Procedure for the Development of Standards*, Standards Engineering Society Miami, Florida, 2002



There are now four Performance Standards Task Groups formed, actively working on very diverse topics:

1. The Audio Coverage Standard will define the Sound Pressure Levels that should be met for a variety of audiovisual venues. This includes the issue of how uniform the coverage should be, such that each member of the audience has the same aural experience. Because this is a “real-world” criterion, it includes the ambient noise of the venue.
2. The Projected Image Standard will describe the relationship of image contrast and brightness, with respect to the ambient light in the audiovisual venue. These are the two most important parameters of audiovisual images (after size) that have to do with how well an audience can see an image. This is such a wide-ranging topic that CEDIA (Custom Electronic Design and Installation Association) members are also participating, adding the perspective of the residential market.
3. The Videoconferencing Lighting Standard will define where and how much light should illuminate the participants, their workspace, and the displayed image, optimizing the reality of the conference experience. All of this is also visible to the cameras in the room, which have some different illumination requirements than the participants. This Standard is being jointly developed with the IESNA: The Illuminating Engineering Society of North America, also an ANSI ASD.
4. The Design Package Components Standard will outline the various unique specifications and drawings that comprise an audiovisual design. These parameters of audiovisual system designs vary widely from one consultant to the next, and from one integrator to another. The intention is to present a more unified picture

of the design intentions to the architectural and engineering communities working on the audiovisual-enhanced projects. These outlines are not intended to suppress creativity; rather, they will relate the universe of variables and possibilities to the rest of the design team on the project, and to the construction team.

These first four standards are only the beginning of what InfoComm International membership envisions as a suite of guidelines that will raise the level of excellence for the whole industry. Other potential topics run the gamut of audiovisual variables, in every aspect of this unique profession. Topics in program audio systems, speech reinforcement systems, video systems, presentation displays, control systems, power and grounding, room acoustics, presenter and user ergonomics, and others will be considered in the future. In each case, a “systems” approach will be at the heart of the standard, with particular attention to the presenter, the audience, their relationship to each other, and their relationship to the space. In each case, an affordable, understandable, and repeatable means to achieve the intention of the standard will be incorporated. The use of technology to enhance the audiovisual experience is the foundation of this program.



Green Audiovisual Systems

According to Architecture Week, March, 2004, “When we think about the causes of ‘global warming,’ what commonly comes to mind are gas-guzzling cars and smoke-spewing industrial processes. But a lion's share of the pollutants that cause global warming are attributable to architecture... Residential and commercial buildings are conventionally thought of as consuming 38 percent of energy in the United States. But when he (Edward Mazria, an architect) adds in industrial building operation consumption and the embodied energy of building materials, he calculates that architecture's share is actually closer to half the country's total energy consumption. Similarly, architecture is responsible for 46 percent of U.S. carbon dioxide (CO₂) emissions.”³ What about our presentation technologies in these buildings? Is the only thing green about audiovisual the amount of green that it costs?

For approximately four years, audiovisual professionals, particularly designers, have been talking about the topics of sustainability and conservation more and more. The beginning of this concept was introduced by *Sound & Communications* journal in 2005.⁴ Many AV designers have wanted to participate in the “green” initiatives of the architectural design community, but simply did not know what to do. There has been recognition that the audiovisual industry is a contributor to pollution and energy waste due to the use of electronics equipment and its consumption of power. On the other hand, there is also a sense that the audiovisual industry can provide tremendous benefits to the reduction of energy use and to improve the quality of life in buildings in many ways. At last, within the Performance Standards program, and InfoComm’s collaboration of design professionals, there is a framework to begin to tackle this enormous change in the way the audiovisual industry goes about its business in an environmentally-conscious manner.

The impetus to pursue Green AV is primarily market-driven, as evidenced by some significant architectural trends. The “American College and University Presidents Climate Commitment” and the “2030 Challenge” both endorse a self-imposed, voluntary impetus towards environmental responsibility through architecture. Carbon neutrality, energy consumption reduction, adherence to LEED, and EnergyStar device purchasing are components of these initiatives. Audiovisual systems are playing an important role in all of these areas.

³ Smith, Susan, *Architectural Global Warming* Architecture Week, March, 2004

⁴ Bocchiario, Joseph III, *Green Audiovisual Systems*, Sound & Communications, February, 2005

As InfoComm has begun its Standards program at the beginning of the green building movement, it is possible to consider energy efficiency and sustainability issues at the same time that the fundamental physiological needs are being addressed. In the case of each of the four standards described above, there are specific elements being discussed that pertain to “green” building issues. InfoComm members describe this as “Green AV,” and have formed a SIG, or Special Interest Group, to discuss them in depth. This group’s participation overlaps with the Performance Standards program, and as such there is a heightened awareness of the issues. Many of the members have achieved the LEED AP (Leadership in Energy and Environmental Design Accredited Professional) status from the USGBC (United States Green Building Council.) The LEED program of USGBC is the one set of benchmarks that is universally recognized in North America for energy and sustainability criteria, education, and accreditation.



Behind the scenes, there is a groundswell of activity that is driving the membership’s participation. Two factors are driving the rapidly-expanding green audiovisual movement. First is a desire by responsible engineers to improve our environment through conservation. This is the altruistic and ethical reason. The second reason is economic and

business-driven. Architects and engineers are increasingly being tasked with creating LEED certified projects. Many of these projects are government and education buildings, but now the proven cost-effectiveness of LEED has spread to all buildings. Similar programs and ideas are being developed in many other countries and incorporated in their building codes. Since the audiovisual industry is a subset of the construction industry, this directly affects the attitudes of audiovisual designers.

To be specific, the “green” audiovisual issues that are closely aligned with the InfoComm Performance Standards being created are:

1. **Audio Coverage Standard:** The maximum loudness of a venue must be defined in order to prevent human hearing loss. This is defined in terms of “maximum SPL”, or Sound Pressure Level. Some of the guidelines for this concept are provided by the H.E.A.R. Association (Hearing Education & Awareness for Rockers). Other potential LEED points in this category include LEED for Schools (acoustic considerations to optimize audio intelligibility in classrooms), and LEED Innovation points for paging and public announcement systems. ANSI Standard #S12.60-2002, “Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools” is the pre-cursor to this forthcoming InfoComm standard, as the acoustics in a room and the audio system are intimately linked. Points are awarded for this compliance under the LEED for Schools for New Construction and Major Renovations guidelines
2. **Projected Image Standard:** The power consumption of video projectors is related to their efficiency, size, contrast ratio and brightness. Clarifying the requirements for each installation can optimize the power consumption that matches the venue’s idealized viewing parameters. “Right-sizing” the projection device based on a standard definition of the performance measurements can save energy long-term. This can be particularly important where there are large numbers of displays in the building, such as schools, public terminuses, etc.
3. **Videoconferencing Lighting Standard:** This has already been a bellwether for Green AV. In June 2008, the Green AV Special Interest Group partnered with the TIA (Telecommunications Industries Association) in submitting a proposal to the USGBC to allow LEED “points” for videoconferencing rooms as an exchange for employee transportation to places-of-work. If the USGBC allows this credit, the Videoconferencing Lighting Standard will play a central role in defining the lighting criteria in innumerable venues. Providing

a standard to the architectural and lighting design community ensures both a level of quality and of consistency, and fulfills the ideals of the USGBC in creating LEED points that are standards-based.

4. Design Package Components Standard: The incorporation of sustainability and conservation parameters within design specifications can lead to widespread adoption of the InfoComm Green AV ideals. InfoComm has entered into discussions with CABA (Continental Automated Buildings Association) to outline some of the powerful synergies of combining audiovisual control systems and building automation systems. Some of the other topics, although not necessarily in the standard, that are being discussed:
 - a. Sustainable material packaging and recycling of packaging
 - b. Recycled materials in the products themselves
 - c. System Power system management using advanced audiovisual control systems
 - d. Human interface issues (ergonomics)
 - e. Audiovisual system power and grounding
 - f. Unification of audiovisual control systems with other building automation and lighting systems
 - g. Distribution of design documentation in an environmentally-friendly manner
 - h. Awareness of the architectural design community of the possibilities of audiovisual's contributions to projects such as those above.

The green initiatives, when fully realized, will go beyond the issues of conservation and sustainability. Quality of life in the building and its benefits are an area that audiovisual systems can greatly enhance. Workplace ills such as headaches, fatigue, loss of productivity, and others are often addressed by better-designed systems. Distortion, glare, ergonomic inefficiencies, etc. are documented contributors to audiovisual-user stressors. Well-delivered announcements, the use of public displays and signage, and technology for the disabled are additional areas where audiovisual technology can improve inhabitants' experiences. A shift towards the use of Rich Media to replace in-person classes and meetings can reduce transportation to schools and places-of-work. Efficiencies that can be realized from integrating with other building systems will be investigated. We are just beginning to brainstorm the myriad of possibilities of the audiovisual industry's contributions to green buildings.



Besides the systems issues, there are movements towards Green AV on the equipment side. Audiovisual equipment manufacturers are beginning to construct and classify their equipment as “Energy Star” rated, indicating efficient use of electronics design and attention to standby-mode power consumption. Control systems manufacturers are providing education to engineers about the audiovisual system’s ability to tie together all building management systems including lighting, climate control and others. Some manufacturers are taking back old audiovisual components to recycle or refurbish. Most manufacturers are paying attention to use of toxic substances such as lead and mercury in their products- a direct result of the European “RoHS” (Restriction of Hazardous Substances) requirements. All of these ideas are recognized in the USGBC (United States Green Building Council) Point System. The credit categories in this system are very specific, and are widely understood and codified in the LEED certification process. A building is certified at different levels through this LEED system, according to how many points it has achieved, verified by LEED Accredited Professionals (LEED AP).

However, these categories only touch on the possibilities that the audiovisual industry has to offer, particularly in terms of the LEED goals of high-performance buildings being “economically profitable” and “healthy places to live and work.” Audiovisual designers have identified many ideas for the limited number of “Innovation” credits in the LEED system as outlined above- but have been frustrated by the fact that these credits are often used by other aspects of the building design. Clearly, if AV is to have more influence, additional AV-related sections must be

added to the certification process. It is the intention of InfoComm to utilize the Performance Standards Program to influence the USGBC in this direction.

Standards Development with a “Green” Process

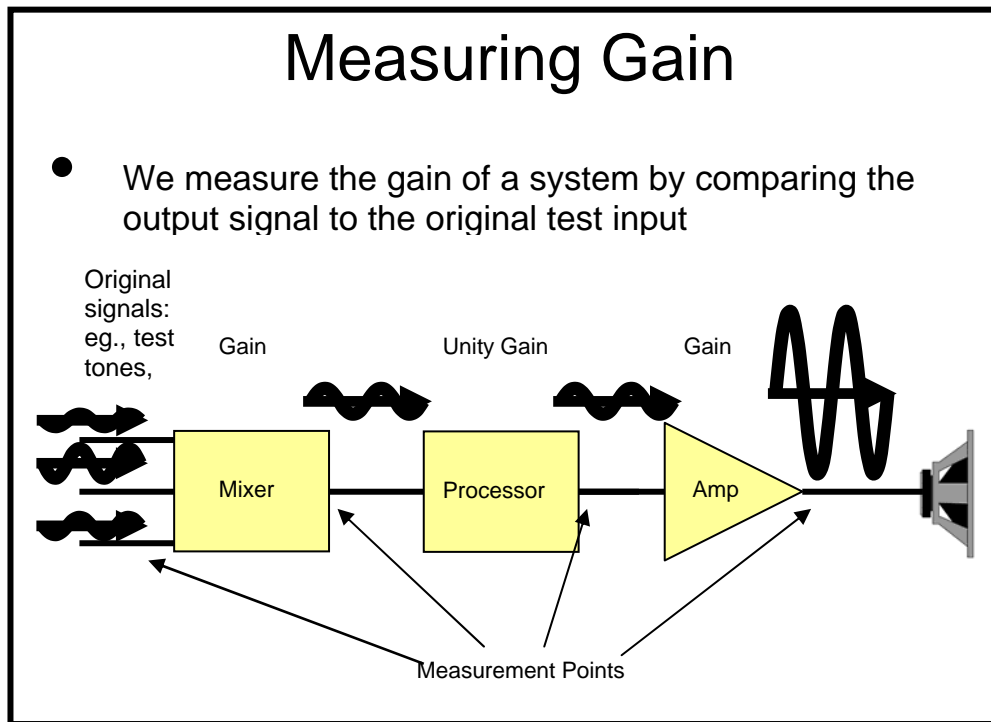
InfoComm is not just paying “lip service” to green initiatives. InfoComm has deliberately implemented green processes to create its green standards, using the following techniques:

1. Use of global-based teleconferences in place of face-to-face meetings
2. Use of web conferences in place of face-to-face meetings and to replace document mailers
3. Use of a paperless, web-based collaborative document development application provided by KAVI Corporation, called “docdev.” This allows all aspects of standards development to be completely resident on secure, redundant servers:
 - a. Calendar distribution and meeting notifications
 - b. Reference library distribution
 - c. Wiki-based document editing (WYSIWYG online, real-time editing)
 - d. Commenting
 - e. Balloting
 - f. Public Review
 - g. Auditing
 - h. Standards maintenance

Building Commissioning Supports Standards

In parallel with the Performance Standards Program, and feeding to and from this program, InfoComm has formed the PCWG (Project Commissioning Working Group). Where the Performance Standards Program provides the “what” of best practices and standards, the PCWG provides the “how.” For over 2 years, dozens of volunteers have worked to define the issues of audiovisual system “commissioning.” This is a term adopted from the architectural community, and describes the work of the entire project from idea-gathering through design, construction, testing, and turnkey handover to the client. At the heart of this effort lies the ideal of creating unified test procedures, or a

“battery of tests” that audiovisual integration firms can use to verify that the system is performing both to specification and to a standard (if one exists.) InfoComm is following the model of the BCA (Building Commissioning Association) towards documenting inexpensive, simplistic procedures with meaningful reports. Since InfoComm has just begun its Performance Standards program, however, the PCWG has outlined what the standards should be to support the commissioning process. Two of the initial PCWG documents have thus become the foundation for the work of the Performance Standards Committee. Over 80 different necessary tests have been identified to date. Many of the topics are knowledge areas from within the InfoComm Academy Design and Installation Schools. The PCWG would ultimately like to create a book that would be a pocket reference for field technicians as their final product.



An example of an InfoComm Academy instructional slide from the Installation School track

The importance of this effort to InfoComm membership is revealed by who the initial participants are. These core members of the PCWG had worked for several years through InfoComm’s ICAT (Independent Consultants in Audiovisual Technology) and Systems Integration Leadership Council (SILC) on project-oriented best practices

ideas that led to the creation of the InfoComm book.⁵ They were joined by the stakeholders of the industry: the systems owners and end-users of the Technology Managers Council. This book addresses the urgent requirements of the AV industry of that time and through tomorrow: clarifying the process of audiovisual project contracting and consulting through project management. The book became a foundation for the adoption of PMI (Project Management Institute) principles. Hundreds of students have now taken the InfoComm Academy audiovisual-based project management courses as a result: *PMA211 Project Management for AV* and *PME311 Project Management for Executives*. Many of these students have subsequently sought PMI's PMP certification (Project Management Professional.) First came the logistics and the ground rules for working in tandem with the rest of the design and construction industry. Next came the specific technical requirements for creating quality systems. Finally, audiovisual performance standards have a framework in which to be applied in a professional manner.

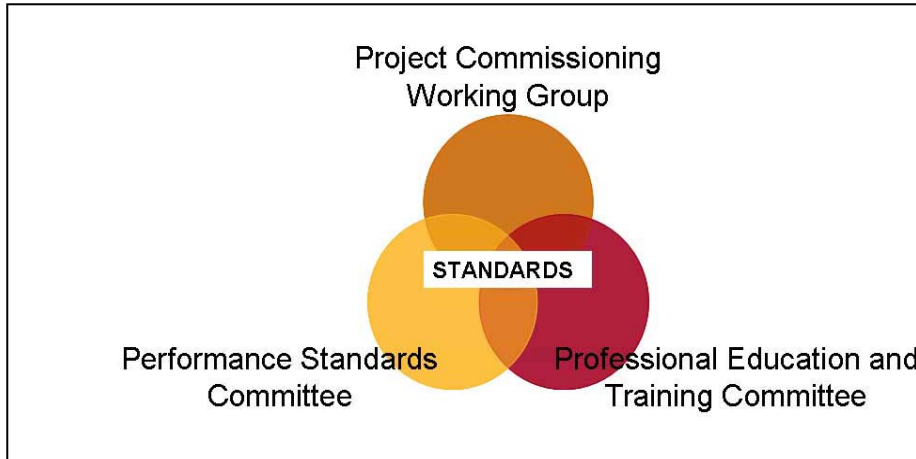
Education Supports Standards and Best Practices

InfoComm Academy[®] is the professional training branch of InfoComm International. This very significant program offers hundreds of courses online, streaming on-demand, in classrooms throughout the world, and during trade association conferences in over 7 countries. This year, InfoComm Academy recognized the significance of the Green AV movement to such a degree that 10 seminars concerning Green AV were conducted at InfoComm 2008 in Las Vegas. InfoComm has engaged industry experts (such as architects and construction managers) knowledgeable in the LEED system to help teach this new concept to audiovisual professionals. On-going development of such courses will ensure that audiovisual remains integrated on all levels with the green architecture initiatives.

InfoComm educational programs are created from industry requirements and course materials from its membership, which are crafted into courses by professional staff. Courses are delivered by a combination of InfoComm staff and volunteer membership. In all cases, the courses are scrutinized by committees of volunteer professionals who strive to ensure accuracy, relevance, and industry-wide "best practices." PETC (Professional Education and Training Committee) is the decades-old volunteer base that oversees this process. Because the audiovisual industry has sprung from so many different areas of technology, and so many practitioners with different techniques, the job of defining best practices can prove to be very difficult. Most of the performance standards that are being considered

⁵ InfoComm International, *Audiovisual Best Practices: The Design and Integration Process for the AV and Construction Industry*, 2004

for development in the future will be a direct result of the countless hours of research and debate that have gone into the educational program.



The triad of the InfoComm Performance Standards Program

Professional Certification Supports It All

None of the above would make any sense without a broad base of qualified experienced professionals creating the audiovisual systems. To recognize the professional development efforts of these individuals, InfoComm offers certification examinations developed on a world-class level. It has taken decades to hone this program to its present level of excellence. The CTS and CTS@-I credentials are ANSI accredited under the International Standard ISO/IEC 17024 General Requirements for Bodies Operating Certification Schemes of Persons program. Thompson testing centers administer these exams worldwide, testing for a basic audiovisual skill set (CTS) and specialized audiovisual systems installation knowledge (CTS-I). In the near future, audiovisual design knowledge (CTS-D) will join these first two certifications in ANSI and ISO recognition. There is no way to express how much the dedication of hundreds of volunteer and staff individuals have contributed to creating this important keystone for the audiovisual industry. Continually under revision, the certification program is eager to adopt performance standards as the basis for a robust body-of-knowledge.

The Future Looks Bright

Although it is barely one and one half years old, and has no actual standards to show for it, the groundwork has been laid within InfoComm to begin to produce meaningful, necessary standards. Behind these efforts are brilliant, dedicated volunteers, with a passion for their work, a social conscience, and an eagerness to have standards established as the basis for their designs. It is not the audiovisual professionals and manufacturers who will benefit the most from these standards. It is the millions of students, audiences, jurors, sports fans, and worshipers who will enjoy audiovisual systems that are standards-based, properly calibrated, ecologically responsible, and ergonomically sensible. After all, people pay their hard-earned money for a quality experience, and have higher and higher expectations as technology advances. Audiovisual is now ubiquitous throughout society, and has become part of the fabric of our lives. The constituency of InfoComm International deserves nothing less than the best experience possible, and finally, standards will be at the heart of it all.