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AV TECHNOLOGY

GUIDE TO SYSTEM INTEGRATION PRACTICES

Content contributions provided by:

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The merging of the computing and audiovisual worlds creates a synergy that magnifies the potential of each. It also creates new opportunities for everyone involved.

I. Introduction

Computer technology has advanced to the point where an incomprehensible amount of processing power exists in a microchip the size of a grain of rice. This has in turn advanced audio and video technologies to the point where we are on the verge of delivering true 3D images and true full-bandwidth audio – with an ever-diminishing level of distortion – on devices that be carried in one hand, using delivery systems developed in the IT world.

The merging of the computing and audiovisual worlds creates a synergy that magnifies the potential of each. It also creates new opportunities for everyone involved. To maximize the benefits of this convergence, knowledge must be shared between the worlds of pro audio, AV, broadcast, IT, and other technologically related fields. Collaboration requires a common language. It also requires that professionals in each of these fields acknowledge the special expertise that they bring to the table, and abandon the attitude that one field is bound to "prevail" over another.

AV technologies can enhance a myriad of business and communications objectives. For the user and the technology manager, all of these technologies converge in the areas of decision-making, budgeting and practices.

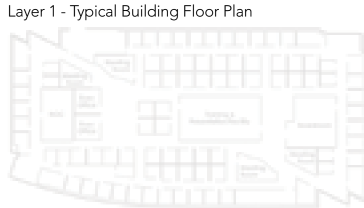
This Guide is intended to:

1. Demystify technology behind AV
2. Provide building blocks to achieving AV best practices
3. Help users communicate with professional AV systems suppliers

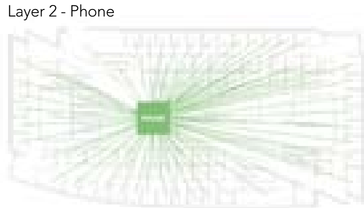
AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

CONVERGENCE IS THE KEY

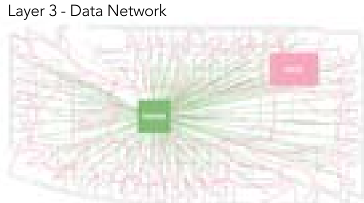
Layer 1 - Typical Building Floor Plan



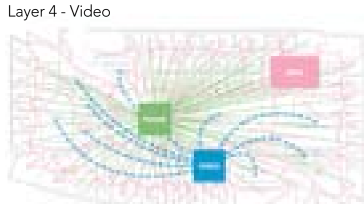
Layer 2 - Phone



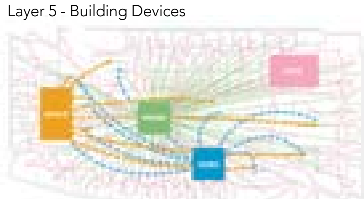
Layer 3 - Data Network



Layer 4 - Video

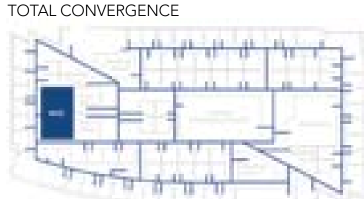


Layer 5 - Building Devices



OR

TOTAL CONVERGENCE



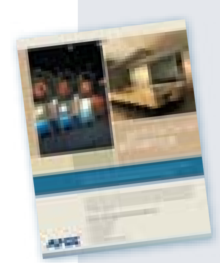
II. The Design And Implementation Team

AV systems have long ago advanced beyond the portable systems that were simply rolled into the room on a cart when needed, and returned after use. Installed AV systems have become an integral part of a building's infrastructure, like HVAC, lighting, and furnishings. Because of this, users rely on AV consultants, systems integrators and professionals from other disciplines involved in the AV system design and installation process if a successful outcome is to be anticipated. These include architects, engineers, general contractors, subcontractors, facility managers, and other specialty consultants.

In this section we will describe the functions various professionals serve in the design and implementation of an AV system.

ARCHITECTS

When a system is critical to overall business operations and being designed into a new structure, an architect and other specialists may be involved in system design. The architect is ultimately responsible for helping users translate their vision into a physical reality. That "big picture" is too often lost on the AV/IT integrator, whose focus is on the relative minutia (e.g., projectors, loudspeakers and floor-box locations, etc.). A successful outcome requires that all parties pay attention to these areas:



A CLOSER LOOK

AMX Architect Alliance Program AMX is a leader in providing education to help architects simplify the way people interact with technology. AMX is dedicated to supporting architects thru the education of:

- Building-wide Automation
- A/V System Integration
- Energy Management
- Asset Management
- Device Monitoring
- Digital Signage
- Distributed Audio & Multimedia

To find out more about the Architect Alliance Program, send an email to: Architect.Alliance@amx.com

1. COMMUNICATION

Make sure you have established open lines of communication with the architect, and that they understand your goals for the systems. Learn about their methodology for delivery of information (in documents and drawings). Set a schedule for regular communication with the architect and the client.

2. CONSULTATION

While standardized systems are appropriate in many cases, each project has its unique aspects. The key to working with architects is to listen. Approaching a project with understanding and empathy builds camaraderie. Speaking with perspective and candor shows honesty and integrity. Express your creativity with the language of possibility.

3. COLLABORATION

Commit yourself and your team to the success of the project. Successful and creative solutions come from joint exploration of potentials. Exploring alternatives, demonstrating out-of-the-box thinking, and respecting creative ideas that can come from non-technical sources can be equally valuable to the end result, and will build stronger relationships. *(Some of the preceding content originally appeared in an article by Craig Park AIA, Systems Contractor News.)*

DID YOU KNOW?

AMX offers AIA Continuing Education to Architects all approved by AIA and designed to help architects incorporate technology into projects.

A/V Control Systems for Commercial Properties
(1 hour, 1 CEU, HSW)

A/V Control Systems for Commercial Properties
(1 hour, 1 CEU, HSW)

A/V Control Systems for Commercial Properties
(1 hour, 1 CEU, HSW)

To find out more about AIA Continuing Education, send an email to: AIA.CEU@amx.com

GENERAL CONTRACTORS

One of the general contractor's (GC) concerns is the successful coordination and installation of all "architecturally integrated equipment". From the AV standpoint, this includes items such as front and rear projection screens, projectors, monitor and loudspeaker cluster mounts, and motorized window shades. These may be designed and/or provided by the AV designer or integrator, but they are often actually installed by the GC or one of its subcontractors. Since the GC has the overall responsibility for the installation, significant coordination with the AV contractor is required.

In addition, other fundamental issues need to be addressed. The first is whether the AV is subcontracted to the GC. The second involves how the GC controls the installation schedules. Since the GC and their project managers determine who works, at what time in the schedule they'll work, and priorities for work completion, there is an impact on the AV installation sequencing. Sequencing issues include the timing of cable pulls, and determining which areas will be ready for AV equipment installation. It's important to keep in constant communication with the building project's general contractor and communicate all potential concerns about the sequencing of AV equipment installation in the overall construction process.

A CLOSER LOOK

AMX Residential Builders Program AMX products do so much more than automate lighting, security, audio/video, and communications technology in the home; they create an experience for the homeowner. This builder program offers pre-packaged home solutions, product discounts and incentives and AMX Certified Dealer integration support.

To find out more about the AMX Residential Builders Program, send an email to: builderinfo@amx.com

Interior Designer - Responsible for furnishings and the aesthetic appearance of the building's interior spaces. The location of necessarily visible equipment (like screens, loudspeakers, displays, etc.) is a common topic of interesting dialog with the interior designer.

Mechanical Consultant - Primarily responsible for systems such as heating, ventilation, and air conditioning (HVAC), especially as they related to heat producing AV equipment and its location within a building.

"One of the best things about the AMX system is its usability. . . You don't need an advanced degree in technology. I would recommend AMX to any of my library colleagues and peers. For library plans of the future, these are not just bells and whistles. They really are an integral part of the libraries of today and tomorrow."

Princeton Public Library, Princeton, New Jersey

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"With AMX, the Denver Zoo added an entirely new element to our visitors' experience – one that doesn't have to be read off a sign or listened to from a live person. The content delivery solution we have with AMX allows us to get much more expressive with our messaging – the ability to handle it very efficiently and to increase the level of visitor enrichment, education and understanding."

Denver Zoo,
Denver, Colorado

Electrical Consultant - Designs the high voltage power distribution systems, and as well as conduit and cable tray layouts to support low voltage systems. For AV systems, the electrical consultant may also be involved with transient voltage and surge suppression (TVSS) systems, uninterruptible power sources (UPS), and an isolated ground system for AV gear.

Plumbing Consultant - Needs to communicate and work with AV designers in the routing and location of hidden infrastructure such as water pipes and gas lines as they relate to AV and electrical infrastructure.

Structural Consultant – Fundamental decisions and knowledge of building load capacities are important since large audio and video systems require significant structural support. The structural consultant provides these perspectives, and may also play a role when building structural members could potentially interfere in issues related to sightlines.

Lighting Consultant - Responsible for required lighting and specialized lighting control in spaces where AV systems are used.

Network/data/telecom Consultant - Since AV systems have become integrally tied to IT systems, consultants in these areas play a key role in the overall functionality of the successful AV project.

Acoustical Consultant - Analyzes the effect of building materials and interior design on the acoustical environment, and determines treatments or building plan alterations that best address any potentially negative acoustic conditions.

Security Consultant - Responsible for equipment such as cameras, microphones, video recording equipment and displays that may be used in security systems design and share infrastructure such as network access.

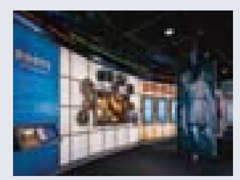
Life Safety Consultant - Life safety issues typically involve audio and/or visual alert systems, which may be tied into operating AV systems.

A CLOSER LOOK

Temple University
www.amx.com/markets/education/

The Temple University is a world-class center for teaching, research and health care. As such, it continues to aggressively integrate the latest technologies into its classrooms and labs. In just four years, the university has expanded its number of smart classrooms from 30 percent to more than 55 percent, with plans to further expand this number to 80 percent over the course of the next few years.

McCormick Tribune Freedom Museum
www.amx.com/markets/entertainment/

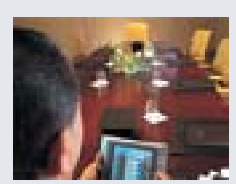


Located in Chicago, Ill., the McCormick Tribune Freedom Museum and is the nation's first museum with exhibit space dedicated exclusively to freedom and the First Amendment. The AMX Control System installed at the museum provides staff with a single point of control for virtually every piece of technology in the museum – from turning an exhibit on or off to adjusting the volume.

Pasadena City Hall
www.amx.com/markets/government/

Built in 1927 and listed on the National Register of Historic Places, Pasadena City Hall stands as the dominant building in the Civic Center Historic District. In 2007, the city completed an extensive building rehabilitation project, which included significant technology infrastructure and equipment upgrades to its City Council Chamber, including new wiring and audio/video (A/V) equipment.

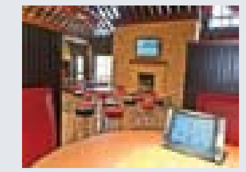
Conrad Hotel, Miami
www.amx.com/markets/hotels/



The hotel opened in October 2004 to an elite guest and meeting clientele. From the outset, the hotel had installed an AMX® Control System in its eight meeting rooms and grand ballroom. The system, based on award-winning Modero® Touch Panels and NI-3000 NetLinx® Controllers, puts control of multimedia presentations, lighting and sophisticated audio visual equipment in the hands of meeting leaders and executive guests.

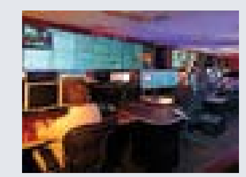
AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

Mobberly Baptist Churc
www.amx.com/markets/how/



The church wanted to integrate plenty of sensory technology into Elevation, because it knew that high-quality audio and video would attract kids. Mobberly envisioned a building with Plasma screens throughout, as well as an extensive multi-room distributed audio and video system; however, the organization knew that its staff would have difficulty operating a complicated system. Its solution? An AMX Control System.

Aetna Computer Network Command Center
www.amx.com/markets/noc/



Aetna's Middletown campus houses the company's impressive Computer Network Command Center (CNCC), which manages and monitors Aetna's Information Technology (IT) operations around the clock – 24/7/365.

III. Managing User Expectations

A common problem in any user –service provider relationship is when the user doesn't believe that they got what they paid for. This probably happens more often when the product or service is technology-based, since so many users have little understanding of exactly what it is that they are paying for. Every user comes to the table with a set of expectations of what they would like the provider to deliver. The problem happens when communication – the intersection of the message delivered and the message received – is less that perfect. In the attempt to communicate AV needs and expectations, the user is limited by lack of knowledge of what is technically possible. They may also have grandiose expectations of what modern AV systems can deliver.

AV professionals will help to educate your users on the true capabilities of the technologies they offer. Their emphasis needs to be about what can – and cannot – actually be delivered. There must be discussion of what is not possible. It will minimize misunderstandings and potential litigation.

Tips to manage user expectations:

- Understand needs, and develop a plan to demonstrate return on investment.
- Present solutions to their communications problems or challenges..
- In the early stages, do more listening more than talking.
- Develop a complete understanding of the user environment in which the AV/IT will operate.

READ MORE ABOUT IT

AMX System Design Library (SDL) Each SDL is a start-to-finish resource for designing a control and automation system in increasingly complex applications. The System Design Library includes all the materials needed to properly demonstrate/illustrate different solutions – all dedicated to help educate the user and manage their expectations. AMX offers SDL's for every market including: Business, Whole Home, Home Theater, Education, Government, Houses of Worship, MDU, Hotels, Entertainment, Healthcare, Broadcasting, Network Operations Centers, Retail, and Private Transportation.

For more information, go to
www.amx.com/markets/sdl.asp

"Another advantage of the AMX system . . . is that we can augment the system as our needs change in the future. We may not have the budget to purchase all of the technology we want at once, so it's nice to know that we have the flexibility to add individual items as we go."

Mobberly Baptist Church,
Longview, Texas

AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

IV. Managing The Project

There are three "generic" roles that are important in any AV/IT integration project.

- The Project Manager
- The Designers
- The Installers

"Having limitless possibilities is what I love about AMX – my control system can truly enable whatever I may want as my needs change in the future."

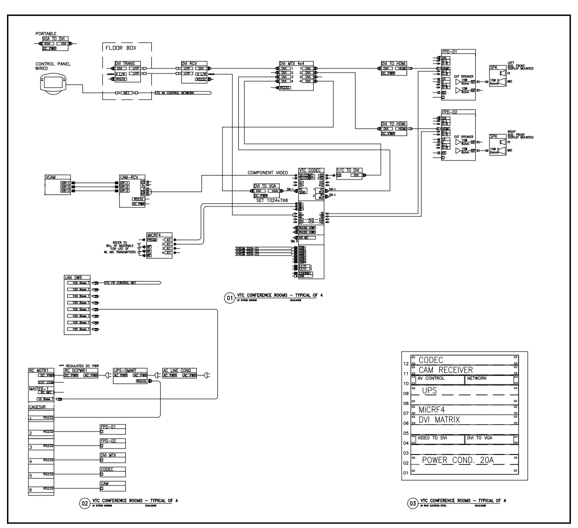
Francoudi & Stephanou

THE PROJECT MANAGER

The Project Management Institute (www.pmi.org), a professional association that creates standards and practices for project management, has developed a body of knowledge (PMBOK) that formalizes the functions of project management. The eleven functions are classified into three groups: General PM Processes, Basic PM Functions, and Integrative PM Functions.

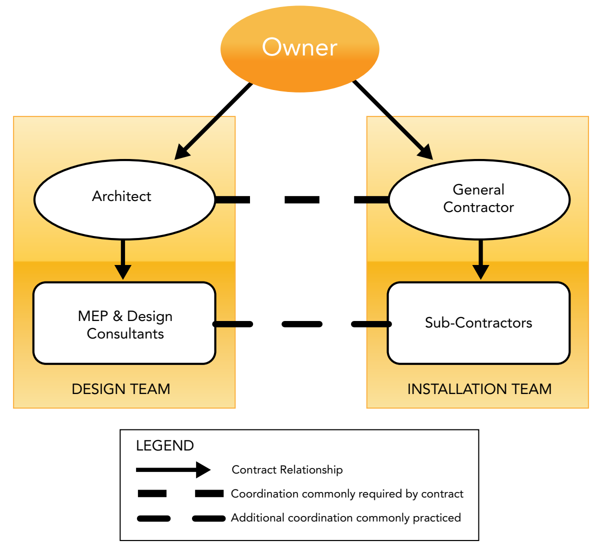
THE DESIGNERS

The designer has technical expertise to assess the user's needs and translates them into documents that convey the design intent to the installers, usually in the form of drawings and specifications. Designers exist in almost all trades. The designer may work with a separate project manager or may serve as the project manager for their organization.



THE INSTALLERS

Installers are responsible for interpreting the design intent depicted in the documentation created by the designer, and assembling the item or system in the manner described. By law, the installer may need to be certified or licensed, and may or may not be part of a labor union, which may affect how some projects are constructed in certain localities.



While coordination is required among members of the design team, contracts may require that all communication between parties flow through the contracted or sanctioned lines of communication indicated here by the dashed or solid lines. (Source: InfoComm International)

THE PROJECT TEAM

Any AV/IT project necessarily involves the combined efforts of multiple teams who may have different perspectives and interests in the overall project. *(The balance of this section references highlights from InfoComm's Best Practices book.)*

OWNER TEAM

This is the entity or entities that are the actual "buyers" of the AV/IT systems. The owner team may include several groups who participate in the project process:

- End-user
- Facility manager
- AV technology manager
- Building committee
- Buyer, purchasing agent, or contract representative

DESIGN TEAM

This group designs the building and the systems and may include the following groups or individuals:

- Architect
- AV designer
- Interior designer
- Mechanical consultant
- Electrical consultant
- Plumbing consultant
- Structural consultant
- Lighting consultant
- Data/telecom consultant
- Acoustical consultant
- Security consultant
- Life Safety consultant
- Other industry or trade-specific consultants

INSTALLATION TEAM

This group provides construction and installation services and may include the following groups or individuals:

- General contractor
- AV Integrator
- Mechanical contractor
- Electrical contractor
- Plumbing contractor
- Structural contractor
- Lighting contractor
- Data/telecom contractor
- Acoustical contractor
- Security contractor
- Life Safety contractor
- Other trade-specific contractors

MANAGEMENT TEAM

This group provides management services on the project and is usually associated with, or represents, the owner in some way:

- Developer
- Constructions manager
- Building management agency
- Move consultant

THE PROGRAM PHASE

During the program phase, the architect, AV/IT professionals, and other design team members discover the end-user's needs by examining the required application(s), the tasks and functions that support the application, and the wishes and desires of the end-user.

All of the information gathered in the program phase is interpreted and presented in a written program report. Once this document is distributed, reviewed, and approved, it becomes the basis for the design phase.

The steps in the program phase is summarized in the following flow chart:

(Source: InfoComm Best Practices)

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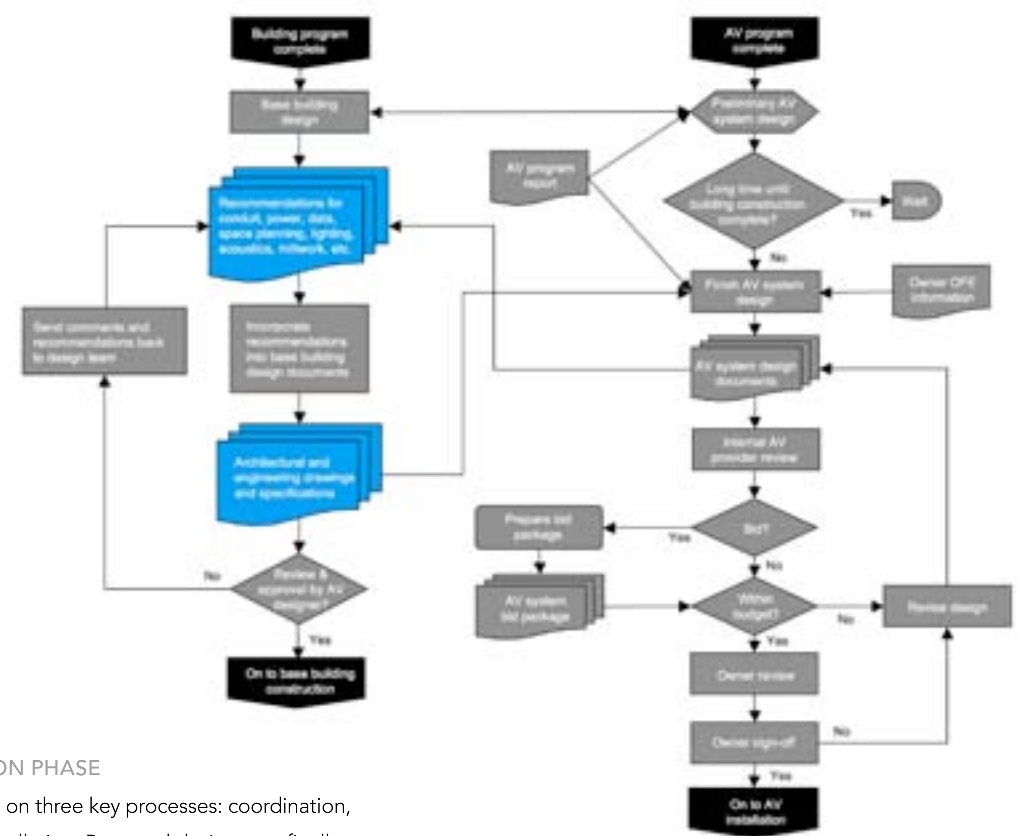
THE DESIGN PHASE

The design phase translates program information into drawings and specifications. It also includes two interrelated parallel processes, one for infrastructure involving the entire building design team, and one involving primarily the AV designer for the electronic systems.



(Source: InfoComm Best Practices)

THE CONSTRUCTION PHASE

This phase is focused on three key processes: coordination, procurement, and installation. Prepared designs are finally translated into physical form, and the systems are brought into functionality. The major step for the AV/IT professional in this phase include:

1. The construction kick-off meeting
2. Preparing the submittals
3. Procuring the AV/IT equipment
4. Preparing the site
5. Pre-assembling and testing the AV system
6. Site installation
7. Finalizing the documentation

During the construction phase, project managers need to coordinate the on-site activities of the various contractors to avoid potential conflicts. All trade should be aware of the activities of each of the others at the various stages of construction.

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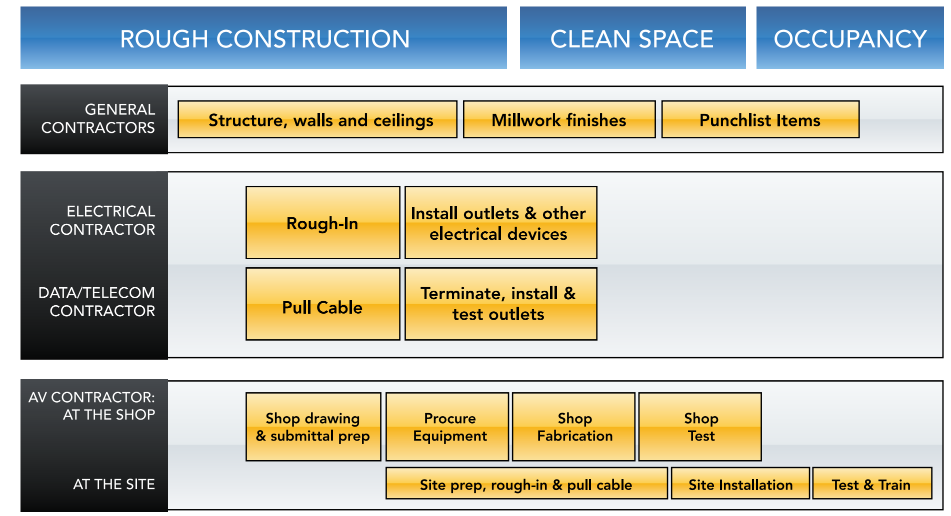
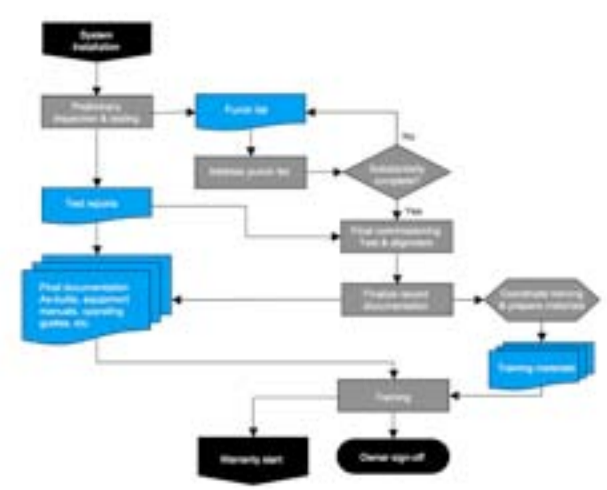


Relative schedules of the general, electrical, data/telecom, and AV contractors during the construction phase.
(Source: InfoComm Best Practices)

COMMISSIONING AND TRAINING

No integration project is fully complete until the system has been commissioned and the owners (and sometimes end-users) have been trained on its operation. System commissioning plays a pivotal role in the overall AV/IT integration project. The commissioning agent (usually the AV consultant or system integrator) ensures that the standards have been followed, verifies that all contractual obligations have been met, and checks that the system is ready to perform properly in its intended use. All aspects of the system are tested, adjusted and optimized.

After the commissioning process is complete, training is the next step to complete the handoff to the owner/end-users.



The commissioning, training, and sign-off process. (Source: InfoComm Best Practices)

PROJECT DOCUMENTATION

Projects documentation falls into three major categories:

1. Contract documents
2. Project drawings
3. Project specifications

CONTRACT DOCUMENTS

These documents describe and define the business issues associated with the project. They typically include scope of work, contractor performance requirements, proof of insurance, description of building issues, duration and deadlines for each project element, and exclusions to the contact. Although the building owner creates them, the AV designer may have input regarding some of these documents (e.g., descriptions of the AV systems elements and performance requirements).

Some of the specific documents included in the contract documentation include:

Liability/Insurance Bonding – AV/IT system integrators carry typical business insurance, including worker's compensation insurance, comprehensive general or commercial liability insurance, business automobile liability insurance, and employer's liability insurance. Installers in particular may be required to post performance bonds and payment binds, assuring the owner that performance work will be covered as well as any payments due to subcontractors.

"Many international companies from all over the world visit Telstra and have commented on how they have never seen anything like these conference facilities anywhere else. What we are really offering here is excellent functionality and extreme simplicity. The lines of sight, the levels of audio and video and the amount of technology we could only accomplish if we controlled everything with AMX. That's what makes it all come together."

Telestra,
Melbourne, Australia

AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

"We used AMX NetLinx Integrated Controllers because of its advanced programming capabilities and how easy it is to integrate with other manufacturer's protocols. Since the exhibit's completion, the system has required little servicing. AMX is solid as a rock."

Academy of Natural Sciences of Philadelphia, Philidelphia, Pennsylvania

Letter of Transmittal – this form is used whenever documents, drawings, samples, or submittals are sent. It clearly indicates the addressee sender, contact information, a list of what is sent (including date or revision number), and any action expected to be taken by the receiving party. This form is used whether the items are sent by mail, courier, overnight carrier, or fax.

Request for Interpretation (RFI) - As the project progresses, questions inevitably arise about the project. They generally revolve around three basic types of issues:

- Design issue
- Site issue
- Owner change or request

The structure normally set in place for this process is the request for interpretation (RFI). This process is usually based on a paper or electronic form established for the project and that includes the RFI originator, the RFI receiver, and a space to enter the question and the response.

Some RFIs are simply resolved by a clarification from the recipient of the RFI without a change in anyone's contract. Others may need resolution through a change in the construction contract. In the latter case, other structured communications, such as a change order, may be generated.

Request for Change (RFC) - A request for change (RFC) is submitted (ultimately to be approved by the owner) if the integrator or consultant wants to change contractual obligations, equipment models or specifications, or system design. When an RFC is generated (or answered) by the integrator, pricing and impact throughout the project must be included.

Issues that can trigger an RFC are:

- Change in intended use of the system.
- Discontinued product.
- Architectural, mechanical, or millwork changes.
- Discovery of system or product incompatibilities or function.

Any member of the project team can submit the RFC, although on an AV project, the integrator or consultant most commonly creates the document. An approved RFC then becomes a change order.

Change Orders (CO) - Despite extensive due diligence during the design and bidding processes to ensure an appropriate system design, design and contract changes, requested with a change order (CO), may be needed as the project unfolds. Because of its ability to change the contract scope and pricing, this is arguably the most important form used during the construction phase. A few of the many reasons for AV system COs are:

- Changes or clarifications in anticipated use by end-user personnel.
- Architectural, millwork, finish, or other physical changes to the installation site.
- Design conflicts, omissions, or errors.
- Change in product availability or specifications.
- Availability of new products or technologies.
- Discovery of hidden site conditions.
- Budget adjustments.
- Schedule changes and delays by others.

Punch Lists - The punch list is a key element in the project process, because it becomes the final checklist for a complete installation and contract closeout. Depending on the contract language and relationships, the punch list may be created by the AV consultant, the owner's AV project manager or the AV integrator's project manager, or other internal personnel.

The preliminary punch list may be internal to the integrator under many design-build projects, but is usually required for distribution to various design and owner team members under most other methods. The final punch list generated after the final commissioning test and alignment is usually distributed to the designated project team stakeholders under any method.

During the preliminary checkout, a preliminary punch list that includes all of the discovered system deficiencies, along with the possible resolution of each deficiency and the party responsible for each item, should be developed. This punch list should be distributed to the responsible parties for completion and should include due dates for completion of each item.

Each punch list is unique to the project for which it is generated, but some typical items that may appear on a punch list are:

- Poor AV connector terminations
- Damaged wiring
- Workmanship issues with equipment installation or aesthetic components of the work such as damaged wall finishes, undesirable cable management, and other problems that are visibly objectionable
- Physical installation issues such as projector positioning, loudspeaker locations, and alignment and integration of devices into furniture
- Delays in delivery of AV equipment
- AV equipment failures
- Slow delivery or no delivery of goods by non-AV service providers (e.g., millwork, electrical, and other contractors)
- Slow or no delivery of OFE or communications and network services

While some items are the direct responsibility of the integrator, some are caused by delay in work by other parties. To resolve these issues, the AV integrator must play an active role inseeking timely solutions from the other parties. Proper planning, documentation, and communication are crucial.

PROJECT DRAWINGS

Architectural Drawings

Architectural drawings are used by contractors to determine how to build all of the structure elements. Small jobs may have only one or two drawings; bigger jobs have entire sets divided into different groups based on the construction process. Architectural drawings provide a technical illustration of all construction details including:

- Site work
- Foundation
- Structure
- Electrical
- Mechanical
- Finishes
- Details

AV Facilities Drawings

AV plans describe how the AV system components are interconnected. These plans provide the equipment placement, interconnection schematics, and rack elevation drawings. The drawings used most often by an AV project team are:

- Floor plan
- Reflected ceiling
- Electrical
- Elevation
- Riser

AV Systems Drawings

Typical components of the AV design drawings package include:

1. Title page and index
2. Typical power, grounding, and signal wiring details
3. Floor and reflected ceiling plans showing device locations
4. Rack elevations
5. Custom plate and panel details
6. Miscellaneous details and elevations, including:
   - Speaking aiming info
   - Large scale plans, such as equipment or control room plans
   - Architectural elevations showing AV devices, their location, and relationship to other items on the walls
   - Custom-enclosure or mounting details for projectors, microphones, loudspeakers, media players, etc.
   - Furniture integration details
   - Any special circumstances or detail that may be required for the installer to properly understand the design intent

Project Specifications

Most construction projects in North America use the document format produced by the Construction Specifications Institute called MasterFormat. MasterFormat is a specifications-writing standard for commercial building design and construction projects. It lists titles and section numbers for organizing data about construction requirements, products, and activities. By standardizing such information, MasterFormat facilitates communication among architects, specifiers, contractors and suppliers, which help them to meet building owners' requirements, timelines and budgets.

(Some content from this chapter originally appeared in the AV Design Reference Manual, published by InfoComm/BICSI)

AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

V. Codes And Standards Related To The Av Industry

Because of the variety of building trades and professionals that AV/IT professionals deal with, they must be aware of, and in many cases comply with, a wide range of codes and standards. Many of these have been developed by industry groups and associations not directly related to AV or IT integration. However, because these systems are generally installed as part of construction or renovation in commercial buildings, compliance is expected.

AMERICANS WITH DISABILITIES ACT (ADA)

www.ada.gov

The Americans with Disabilities Act of 1990 (ADA) is a wide-ranging civil rights law that prohibits, under certain circumstances, discrimination based on disability. The law details specific design standards that establish facility requirements for disability access. The ADA Design Standards are referenced primarily for accessible design considerations (e.g., spacing between equipment and room layouts), but it also contains regulations concerning alarms and signage. It also addresses mounting heights and device and communication requirements applicable to AV designs and installations.

AMERICAN SOCIETY OF HEATING, REFRIGERATION AND AIR CONDITIONING ENGINEERS (ASHRAE)

www.ashrae.org

The American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), formed in 1959, is a global organization setting standards and guidelines and providing technical and educational information for heating, ventilating, and air conditioning (HVAC) and refrigeration.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

www.ansi.org

The American National Standards Institute, founded in 1918, empowers its members and constituents to strengthen the U.S. marketplace position in the global economy while helping to assure the safety and health of consumers and the protection of the environment.

The Institute oversees the creation, promulgation and use of thousands of norms and guidelines that directly impact businesses in nearly every sector: from acoustical devices to construction equipment, from dairy and livestock production to energy distribution, and many more. ANSI is also actively engaged in accrediting programs that assess conformance to standards – including globally recognized cross-sector programs such as the ISO 9000 (quality) and ISO 14000 (environmental) management systems.

ADVANCED TELEVISION SYSTEMS COMMITTEE (ATSC)

www.atsc.org

The Advanced Television Systems Committee, Inc., was formed in 1983 an international, non-profit organization developing voluntary standards for digital television. The ATSC member organizations represent the broadcast, broadcast equipment, motion picture, consumer electronics, computer, cable, satellite, and semiconductor industries. ATSC creates and fosters implementation of voluntary Standards and Recommended Practices to advance terrestrial digital television broadcasting, and to facilitate interoperability with other media.

AUDIO ENGINEERING SOCIETY (AES)

www.aes.org

The Audio Engineering Society was formed in 1948 as a professional society devoted exclusively to audio technology. The AES serves its members, the industry and the public by stimulating and facilitating advances in the constantly changing field of audio. It encourages and disseminates new developments through annual technical meetings and exhibitions of professional equipment, and through the Journal of the Audio Engineering Society, the professional archival publication in the audio industry.

CANADIAN ELECTRICAL (CE) CODE

www.csa.ca

The Canadian Standards Association (CSA) is a nonprofit membership-based association serving business, industry, government and consumers in Canada and the global marketplace. The CSA produces several documents and standards that affect AV in Canada. The Canadian Electrical (CE) Code is updated every four years.

The intent of CE Code Part 1 is to establish safety standards for the installation and maintenance of electrical equipment, including telecommunications. As with the NEC, the CE Code Part 1 is a voluntary code that may be adopted and enforced by provincial and territorial regulatory authorities. The CE Code Part 1 is the Canadian equivalent of the NEC and the Institute of Electrical and Electronic Engineers, Inc® (IEEE®) National Electrical Safety Code® (NESC®) in the U.S.

Construction Codes

Construction codes are governmental regulations that define the construction requirements for all aspects of building construction, including:

- Location
- Size
- Materials
- Plumbing
- Electrical

Construction codes are defined for a particular state, city, or jurisdiction. All persons working on a construction project, including AV installers, must follow the requirements defined by construction codes.

The International Building Code (IBC) is a construction code developed by the International Code Council® (ICC®). The IBC is often used by local officials when developing the building codes for a particular jurisdiction.

FEDERAL COMMUNICATIONS COMMISSION (FCC)

www.fcc.gov

The FCC formed the National Television System Committee (NTSC) in 1940 to develop television-broadcasting standards. The rules and regulations of the Federal Communications Commission (FCC) are codified in Title 47 of the Code of Federal Regulations (CFR). Title 47, Part 76—Cable Television Service (47 CFR 76), addresses multichannel video and cable television (TV) service. The rules and regulations of Part 47 provide for the certification of cable TV systems and for their operation in conformity with standards for TV broadcast signals, program exclusivity, cablecasting, access channels, and related matters.

INTERNATIONAL COMMISSION ON ILLUMINATION (CIE)

www.cie.co.at

The International Commission on Illumination - also known as the CIE from its French title, the Commission Internationale de l´Eclairage - is devoted to worldwide cooperation and the exchange of information on all matters relating to the science and art of light and lighting, color and vision, and image technology.

With strong technical, scientific and cultural foundations, the CIE is an independent, non-profit organization that serves member countries on a voluntary basis. Since its inception in 1913, the CIE has become a professional organization and has been accepted as representing the best authority on the subject and as such is recognized by ISO as an international standardization body.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

www.iec.ch

The IEC prepares and publishes International Standards for all electrical, electronic and related technologies — collectively known as "electrotechnology". The IEC, formed in 1916 in London, also manages conformity assessment schemes that certify that equipment, systems or components conform to its International Standards.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)

www.iso.org

The International Organization for Standardization is the world's largest developer and publisher of International Standards. ISO is a network of the national standards institutes of 157 countries, one member per country, with a Central Secretariat in Geneva, Switzerland, that coordinates the system. ISO is a non-governmental organization that forms a bridge between the public and private sectors.

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3000 RESEARCH DRIVE, RICHARDSON, TX 75082 • 800.222.0193 • 469.624.7153 fax • TECHNICAL SUPPORT 800.932.6993
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INTERNATIONAL TELECOMMUNICATIONS UNION (ITU)

www.itu.org

In 1865, after two and a half months of arduous negotiation, the first International Telegraph Convention was signed in Paris by the 20 founding members, and the International Telegraph Union (ITU) was established to facilitate subsequent amendments to this initial agreement. Today, ITU is a United Nations agency for information and communication technologies. There are four sectors within ITU of relevant to AV/IT industry:

Radiocommunication (ITU-R)

Managing the international radio-frequency spectrum and satellite orbit resources is at the heart of the work of the ITU Radiocommunication Sector (ITU-R).

Standardization (ITU-T)

ITU's standards-making efforts are its best-known — and oldest — activity.

Development (ITU-D)

Established to help spread equitable, sustainable and affordable access to information and communication technologies (ICT).

ITU TELECOM

ITU TELECOM brings together the top names from across the ICT industry as well as ministers and regulators and many more for a major exhibition, a high-level forum and a host of other opportunities.

NATIONAL ELECTRICAL CODE® (NEC®)

www.nfpa.org

The National Electrical Code (NEC), published by National Fire Protection Association (NFPA), defines recommended building codes that pertain to electrical systems, including elements of AV systems, and has been adopted by most North American areas to varying degrees.

The NEC provides guidelines for:

- Electrical power distribution installation.
- Conduit usage.
- Wiring composition for different spaces within a structure.

AV/IT integrators typically determine the codes that pertain to the specific area and follow the most restrictive code that covers it.

SOCIETY OF MOTION PICTURE AND TELEVISION ENGINEERS (SMPTE)

www.smpte.org

The Society of Motion Picture and Television Engineers (SMPTE) is a technical society for the motion imaging industry. SMPTE members are spread throughout 85 countries. SMPTE publishes American National Standards Institute (ANSI) approved standards, recommended practices, and engineering guidelines.

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA) STANDARDS

www.tiaonline.org

Telecommunications Industry Association (TIA) is a nonprofit trade association serving the communications and information technology industry in the United States. TIA is involved in standards development, and its members manufacture or supply the products and services used in communications.

NFPA®
NATIONAL FIRE PROTECTION ASSN.

AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

VI. Green Building

The Green movement has become a global phenomenon, and no industry is unaffected by it. While its direct impact is most obvious on the construction, manufacturing, and energy industries, the role in this movement played by AV/IT integration can be fairly substantial.

A CLOSER LOOK

AMX offers RMS AV Equipment Software & Smart Programming The AMX Resource Management Suite (RMS) is a comprehensive suite of software solutions for corporate and campus I.T. professionals, facility managers, meeting room users, homeowners and integrators looking for a way to manage, monitor and/or schedule rooms and their associated electronic devices.

This software application is designed specifically for the AV/IT Technology Managers to efficiently manage building systems and energy consumption by giving them a easy-to-use interface that can automatically shut down rooms and equipment that are not in use – all from their office. Versions are available for the following markets:

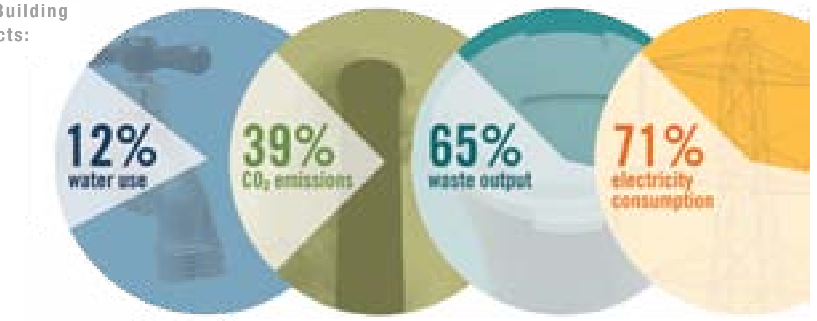
- ClassroomManager for Education
- HomeManager for Multi-Dwelling Units (MDUs) and Single-Family Residences
- ExhibitManager for Museums
- HomeManager for Multi-Dwelling Units (MDUs) and Single-Family Residences
- IntelligentManager for Government
- MeetingManager for Corporate/Presentation Facilities
- VenueManager for Entertainment and Broadcasting
- WorshipManager for Houses of Worship

For more information, go to www.amx.com/rms/

MAKING TECHNOLOGY GREEN • AMX •

There are at least four key areas where AV can be involved in sustainability and efficient energy use:

U.S. Building Impacts:



PRODUCT SELECTION

- Look for and place a priority on EnergyStar compliant products. EnergyStar is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy helping us all save money and protect the environment through energy efficient products and practices.

DID YOU KNOW?

AMX ViewStat Color Communicating Thermostat This one-of-a-kind device is EnergyStar rated and Title 24 compliant with 7-day programmable and 4 setpoints per day. The thermostat provides a 5-day forecast and more.

ENERGY STAR

- Ask suppliers if their manufacturing operation is RoHS compliant. RoHS stand for the "Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment", adopted in 2003 by the European Union. It restricts the use of six hazardous materials in the manufacture of various types of electronic and electrical equipment. It is closely linked with the Waste Electrical and Electronic Equipment Directive (WEEE), which sets collection, recycling and recovery targets for electrical goods and is part of a legislative initiative to solve the problem of huge amounts of toxic e-waste.

DID YOU KNOW?

AMX Products are RoHS Compliant AMX is proud to be a frontrunner of earth-friendly companies with over 350 European Union's Restriction on Hazardous Substance (RoHS) certified products.

"The AMX system is programmed to ensure the projectors are not left on by accident during off hours or when the building is closed, go into standby mode when not used, then shuts down, ensuring the equipment consumes very little energy. Judson University installed RMS to give the AV/IT technology support people an upper hand when it comes to maintenance. They monitor the status of rooms and help instructors solve problems real-time andutilize reports that track data on room and equipment usage - all important information for planning future needs."

Judson University, West Chester, Pennsylvania

INSTALLATION PRACTICES

- Use lead-free solder when making terminations.

SYSTEM OPERATION AND USE

- Emphasize the critical importance of intelligent AV control and management systems – not just because they can conserve energy, but also because they save the client money in the long run.

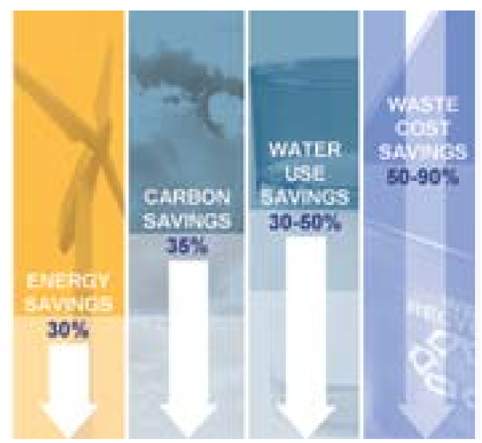
DISPOSAL

- When technologies or product are replaced, make sure that old gear is disposed of properly. There are companies that specialize in the disposal of business e-waste and equipment that may contact hazardous substances and materials.

The U.S. Green Building Council (USGBC) was formed in 1993 with the goal of transforming the building design and construction industries toward sustainability. USGBC members quickly began work on the Leadership in Energy and Environment Design (LEED) point system to establish a metric for building designers, contractors, and owners to track a project's "greenness." LEED Version 1.0 was released in 1998 and the rating system continues to evolve and diversify to address various project types: new construction, existing buildings, commercial interiors, and shell and core; as well as specific markets: schools, healthcare, retail, and residential.

LEED not only addresses the environmental issues one would expect, such as water management, recycling/reuse of materials, and energy efficiency, but it also focuses on health and productivity issues, such as indoor air quality, thermal comfort, and daylighting. The goal of green buildings is not simply to be better for the environment, but to be better for the people who live, work, and learn in them. With buildings representing nearly 40 percent of our total energy consumption and people spending nearly 90 percent of our time indoors, efficient and healthy buildings are becoming a major priority.

Average Green Building Savings:



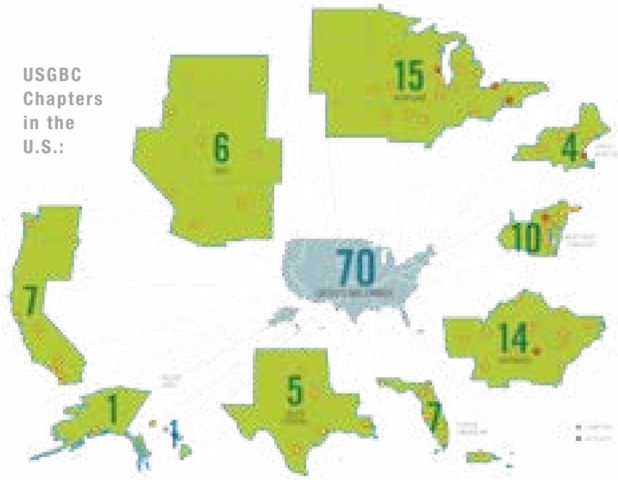
The LEED rating system is organized and awarded points in the following areas: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, and innovation in design. According to the number of points earned in these areas, LEED recognizes levels of achievement and assigns a certification value to the project, from basic to silver, gold, or platinum.

READ MORE ABOUT IT
LEED Compliance Checklist – AMX Solutions
With proper planning and design architects are integrating AMX hardware and software into building automation systems that are playing an important role in contributing to LEED (Leadership in Environmental Design) points as published by the USGBC.

For recommendations on how AMX control technology can help you achieve LEED points, go to http://www.amx.com/assets/whitepapers/Leed.Compliance.Checklist.pdf

AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

USGBC Chapters in the U.S.:



The interest in achieving LEED certification has grown drastically over just the last several years. In 2006, there were 400 LEED certified buildings; but the next year (2007), that number increased to 1,000. Currently, there are over 6,000 buildings in the pipeline toward certification. At least two federal agencies, 22 states, and 75 cities are now requiring that all of their new buildings achieve LEED certification.

LEED Building Lifecycle:

Though you won't find the term "AV" or any specific requirements for AV in the primary LEED rating systems, that doesn't mean AV has no impact on this system. There are at least 10 areas in the LEED point system where AV and the often-interrelated field of acoustics can affect, both positively and negatively, the number of points a project can earn.
Major AV/IT customer groups in the government, education, corporate vertical markets (among others) are recognizing the benefits of going green and are requiring, by contract, their design and construction teams to deliver green buildings. The AV/IT industries can help clients reach higher LEED performance today by becoming educated on how "Green AV" systems can be deployed. Projects that lose LEED points due to lack of understanding will not be a good excuse.

LEED CREDITS WHERE AV AND ACOUSTICS CAN HELP (OR HURT)

While LEED points are not directly awarded for the use of any specific AV, acoustics, or IT products, systems or technologies, but affect a client's point accumulation. Here are the LEED credit topics that may be relevant to an AV/IT integration project.

1. **Optimize Energy Performance** (1-10 points) measures energy performance of the building and its equipment verses baseline ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) guidelines.

2. **Enhanced Commissioning** (1 point) calls for an independent commissioning agent for major building systems, potentially including communications systems.

3. **Energy Measurement and Verification** (1 point) establishes and implements a plan to measure the building's actual ongoing energy consumption verses design assumptions.

4. **Rapidly Renewable Materials** (1 point) seeks to reduce the use of finite raw materials with rapidly renewable ones. For AV environments, this credit would apply primarily to specifying acoustical materials from rapidly renewable sources such as cotton batt insulation.

5. **Certified Wood** (1 point) encourages environmentally responsible forest management by specifying wood products from certified sites. This credit can apply to furnishings, including AV millwork.

6. **Low-Emitting Materials** (1-4 points) seeks to improve indoor air quality by reducing the presence of volatile organic compounds (VOC), such as urea-formaldehyde.

The LEED for Schools rating system specifically factors classroom furnishing and acoustical finishes into the VOC limits.

7. **Controllability of Systems** (1-2 points) encourages lighting and thermal control by individuals and groups to increase productivity. The lighting credit is consistent with recommendations AV professionals have been making for years. The thermal control credit could lead to greater AV control system management of temperature in commercial projects.

8. **Daylight and Views** (1-2 points) promotes the introduction of daylight and outdoor views for building occupants. LEED for Schools awards two credits for 90 percent of classrooms having daylighting, but also awards points for proper light control in AV mode.

9. **Acoustical Performance** (1 prerequisite and 1-2 points in the LEED for Schools rating system) encourages meeting ANSI standards and ASHRAE guidelines for classroom acoustics. The LEED for Healthcare rating system, currently under development, includes two credits for acoustics. Other LEED rating systems may include specific credits for acoustics in future revisions.

10. **Innovation in Design** (up to 4 points) awards points for exceptional performance beyond minimum LEED credit requirements or for innovative green building approaches not specifically addressed in the project's applicable rating system. This is where the AV industry can truly shine in demonstrating green benefits through the use of videoconferencing, energy management via AV controls, and other innovative uses of technology. *(Source: Scott Walker, CTS-D, LEED AP, Waveguide Consulting)*

WATCH THE VIDEO
Northern California Home Video AMX products do so much more than automate lighting, security, audio/video, and communications technology in the home; they create an experience for the homeowner. This builder program offers pre-packaged home solutions, product discounts and incentives and AMX Certified Dealer integration support.
http://www.amx.com/markets/wholehome/

AMX GUIDE TO SYSTEM INTEGRATION PRACTICES

VII. Industry Training And Certifications

These organizations offer excellent training programs and certifications for AV/IT integration professionals, covering a broad range of technologies and skills that they need to provide the highest possible level of service.

BICSI
www.bicsi.org
BICSI is a professional association supporting the information transport systems (ITS) industry with information, education and knowledge assessment for individuals and companies. BICSI serves more than 24,000 ITS professionals, including designers, installers and technicians. These individuals provide the fundamental infrastructure for telecommunications, audio/video, life safety and automation systems. Through courses, conferences, publications and professional registration programs, BICSI staff and volunteers assist ITS professionals in delivering critical products and services, and offer opportunities for continual improvement and enhanced professional stature.

Telecommunications Distribution Fundamentals Certificate
BICSI offers a certificate in Telecommunications Distribution Fundamentals to individuals who complete four BICSI fundamentals courses and successfully pass a written exam after each course (passing grade 75 percent).

This certificate program is designed to provide a basic knowledge of voice, data and video distribution systems within and between commercial buildings, as well as LAN and internetworking basics. It is ideal for noncabling professionals, such as architects, contractors, building managers and sales and marketing personnel.

Registered Communications Distribution Designer (RCDD®)
Those awarded with the RCDD designation have demonstrated their knowledge in the design, implementation and integration of information transport systems and related infrastructure.

BICSI telecommunications distribution design courses serve as a career path for those seeking advanced knowledge in this area. Several design courses are recommended for candidates preparing to take the RCDD examination.

Information Transport System (ITS) Installation Registration
The goal of BICSI's Installation Registration Program is to produce highly competent cabling installers in a minimal amount of time and at a reasonable cost. Upon completion of training, program participants should be able to conduct site surveys, pull wire/cable, and terminate and test copper and optical fiber cable to the highest level of specification (currently Category 6).

BICSI's program provides three levels of increased knowledge and experience: Installer, Level 1; Installer, Level 2; and Technician. The program offers core skills training, registration examinations, and structured on-the-job training (OJT) to meet the diverse needs of the telecommunications cabling industry.

COMPUTING TECHNOLOGY INDUSTRY ASSOCIATION (COMPTIA)
www.comptia.org
CompTIA Certification Programs
CompTIA certifications are a recognized credential throughout the IT industry, validating foundation-level IT knowledge and skills. CompTIA offers twelve certification programs in key technology areas:

- CompTIA A+
- CompTIA Network+
- CompTIA Server+
- CompTIA Security+
- CompTIA RFID+
- CompTIA CTT+
- CompTIA CDIA+
- CompTIA Linux+
- CompTIA Project+
- CompTIA Convergence+
- CEA-CompTIA DHTI+
- CompTIA PDI+

CompTIA University
CompTIA University offers education resources and tools designed to help solution providers grow their businesses and boost profitability.

- Education for Business Success
- Business Management Resources
- Business Assessment and Planning
- Business Building Links

CUSTOM ELECTRONIC DESIGN & INSTALLATION ASSOCIATION (CEDIA)
www.cedia.org
CEDIA programs are generally designed for residential systems installations.

CEDIA Certifications
CEDIA offers three levels of certifications:

Installer Level 1 - The Level I Installer is a person who works with supervision to install wiring, cable, components, and devices for low-voltage electronics in residential applications (including home theater, audio, video, home automation, radio frequency, telephony, and data networks). This person has at least one year of related field experience prior to taking the examination.

Advanced EST – The Advanced Electronic Systems Technician assists in the training and mentoring of new technicians, interacts with others, installs, troubleshoots, calibrates, programs remotes, works with subsystem integration and control, and ensures that the installation meets the design specifications. This individual must be a CEDIA Certified Level I Installer with additional knowledge.

Designer - The CEDIA Certified Professional Designer is a person who communicates with clients and design and installation professionals. Also, a Certified Designer selects the appropriate products and materials to design individual (integrated) residential systems (including alarm, telephone, cable television, satellite television, data, audio, video, home theatre, HVAC, and lighting control). This person has at least five years of related field experience prior to taking the examination.

CEDIA University
CEDIA University is comprised of more than 200 courses in five industry-specific colleges: Electronic Systems Technician, Electronic Systems Designer, Electronic Systems Project Management, Electronic Systems Business, and Electronic Systems Customer Relations. In addition, CEDIA offers "Basic Residential Boot Camp" for new employees, and "Advanced Residential Boot Camp", advanced technical training for lead technicians.

INFOCOMM INTERNATIONAL
www.infocomm.org
InfoComm CTS® Certification Program
InfoComm International offers a certification program with three certification designations, intended to develop the following skill sets and technical proficiencies:

CTS - A Certified Technology Specialist performs general technology solution tasks by creating, operating, and servicing AV solutions, while conducting AV management activities that provide for the best audiovisual resolutions of the client's needs, both on time and within budget. This certification is accredited under ISO/IEC 17024.

CTS-I (Installation) - Installs and maintains audiovisual systems by following specifications, schematics, codes, and safety protocols; administering installation process logistics; troubleshooting and problem-solving systems; maintaining tools and equipment; and communicating with clients, designers, other trades, other installers and staff to provide the best audiovisual solutions for client needs, on time and within budget. This certification is accredited under ISO/IEC 17024.

CTS-D (Design) - A CTS-D earns this specialized certification by demonstrating detailed knowledge of how to analyze, select, and plan seamless audiovisual communications equipment interoperation. The CTS-D demonstrates his or her experience in the form of complete specifications and drawings that deliver a desired outcome to meet a client's needs. A minimum of two years' industry experience accompanies the theoretical and practical competencies.

InfoComm Academy®
InfoComm Academy offers courses created through collaboration between members and staff and are delivered online, onsite, streamed, at InfoComm tradeshows and Integrated Systems tradeshows worldwide, and through licensed programs at client's offices. Courses taken at InfoComm Academy can help prepare AV professionals to sit for the CTS exams.

ISF COMMERCIAL
www.isfcommercial.com
ISF Commercial operates across the entire professional audiovisual industry to maximize the visual quality of commercial display systems.

ISF Commercial Certification Course
The ISF Commercial Course teaches the science of light and color and how the human eye reacts to the images it sees. Human factors and the viewing environment are then considered as part of the equation. Television standards, signal types, and the effects of video signal processing are examined followed by a close look at specifications and what they really mean in the viewing experience. Each display technology is reviewed in terms of performance capabilities as well as limitations and a screen basics course wraps up the detailed look at how it all blends together in what we see.

NATIONAL SYSTEMS CONTRACTORS ASSOCIATION (NSCA)
www.nsca.org
NSCA University
The curricula for NSCA University were developed by leading industry subject matter experts, and they encompass the best practices, skills and information needed for career paths as various as administrative support, sales, techs, installers, managers and executives. Programming extends to educate consultants, architects, system operators and other allied professionals in working within the commercial electronic systems industry.

NSCA University has five "colleges:

1. College of Business
2. College of System Sales
3. College of Project Management
4. College of Technical Knowledge
5. College of System Design

EST Training and Certification
The NSCA EST Training Series offers three different training levels:

Level 1 introduces new installers to the low voltage trade and provides them with a firm foundation on which to build. This level is appropriate preparation for the C-SI™ Exam.

Level 2 builds on the foundation set in Level 1 and continues to train the newer employee in fundamentals or is an appropriate entry point for the installer/tech who already has 2-4 years experience on the job. This level is appropriate for those working towards the C-EST® Exam.

Level 3 rounds out the systems knowledge for those in the EST Training, or is a good entry point for the installer who already has more than 4 years of experience but would like to sit for the C-EST® Exam.

SYNERGETIC AUDIO CONCEPTS (SYN-AUD-CON)
www.synaudcon.com
For more than 30 years, Syn-Aud-Con has been devoted to providing practical, in-depth training on the principles of audio and acoustics.

Sound Reinforcement for Operators
Provides knowledge that is essential for operating a sound system. Important subjects such as microphone selection, mixer setup, and signal flow are extensively covered. The emphasis is on the practical rather than the theoretical, using real-world explanations of potentially complex subjects.

Sound Reinforcement for Technicians
This seminar covers the theory behind how systems work, and demonstrates how to use instrumentation to look "under the hood" to troubleshoot systems. Advanced topics such a crossover adjustments and equalization are presented in a technical, yet practical manner. This course will teach you how systems work and how to fix them when they don't.

Sound Reinforcement for Designers
This course is designed to emphasize the codependence of room acoustics and sound system design. Initial topics include the measurement and prediction of the acoustic performance of enclosed spaces. Subsequent topics include the teaching of a sound system design process that is based on the room's acoustics.

Syn-Aud-Con Digital
This course is designed to provide a comprehensive introduction to digital audio, digital signal processing and networking. It will dramatically shorten the learning curve for understanding everything from data formats to networked audio systems. This course is for those already conversant in analog practices and techniques. It is assumed that the attendee is familiar with the principles taught in our Operators and Technicians seminars.

Manufacturer Certifications
In addition to certifications and training offered by major industry associations, many equipment manufacturers provide specialized training and certifications relevant to their technologies.

Users and technology managers are in a unique position to benefit financially and ecologically from the convergence of pro audio, AV, broadcast, IT and other technologically related fields.

Acknowledgements

This comprehensive AV/IT resource would not have been possible without the support and efforts of the following organizations and individuals:

- AMX
- BICSI
- InfoComm International
- National Systems Contracting Association
- Stiernberg Consulting
- The editors of AV Technology and Systems Contracting News, NewBay Media publications