AV Integration Risk Management Solutions

What to look for when hiring a Design/Build AV Integrator

By: Michael Fay & Dan Nelson

Every commercial AV System project comes with risk. As consultants, we recognize there may be significant unfamiliarity, and even considerable anxiety when it comes to selecting and hiring an AV contractor, or systems integrator as they are often described today.

When private money is in play, it's a common temptation to skip the professional consultants and choose to work directly with a design/build integrator. But, buyer beware: not all systems integrators are created equally.

Paraphrasing what many have said, "I was put in charge of finding an AV contractor and I have little or no idea how to pick one, or what to look for. I'm just hoping that whoever we select… they know what they're doing, and they won't rip us off."

Sound familiar? If so, the following will provide indepth guidelines on how integrator's can and should manage and minimize the main, definable risk factors. These risks are often not recognized, understood or openly discussed before signing a contract. They should be.

Even if you plan to hire a professional AV or acoustical consultant, and send your project out for bids, many of the concepts outlined below hold true. Why? Because accepting the low-bid price is rarely the best plan. Again, why? Because even though they may "qualify" on paper, those firms that have the lowest overhead, (read least invested in providing a full spectrum of quality people, products and services) will almost always come in with the lowest bid.

We believe AV integration project risk can be distilled into these three main categories: Technical, Non-technical, and Intangible.

Technical Risk

Technical risks are those involving the specification, integration, and application of modern AV technology. Today, this is an ever-evolving landscape of compatible and inconpatible digital formats and standards. To properly address a customer's technical needs and risks, we believe the following elements play an important roll.

Design and Engineering Team: Does the integrator employ one or more (in house) systems designers and engineers with formal degrees and/or specialized training certifications? Do they use the latest computer-aided design, modeling, and documentation tools such as AutoCAD, Revit, EASE (Figure 1), and Modeler, along with any other proprietary software?

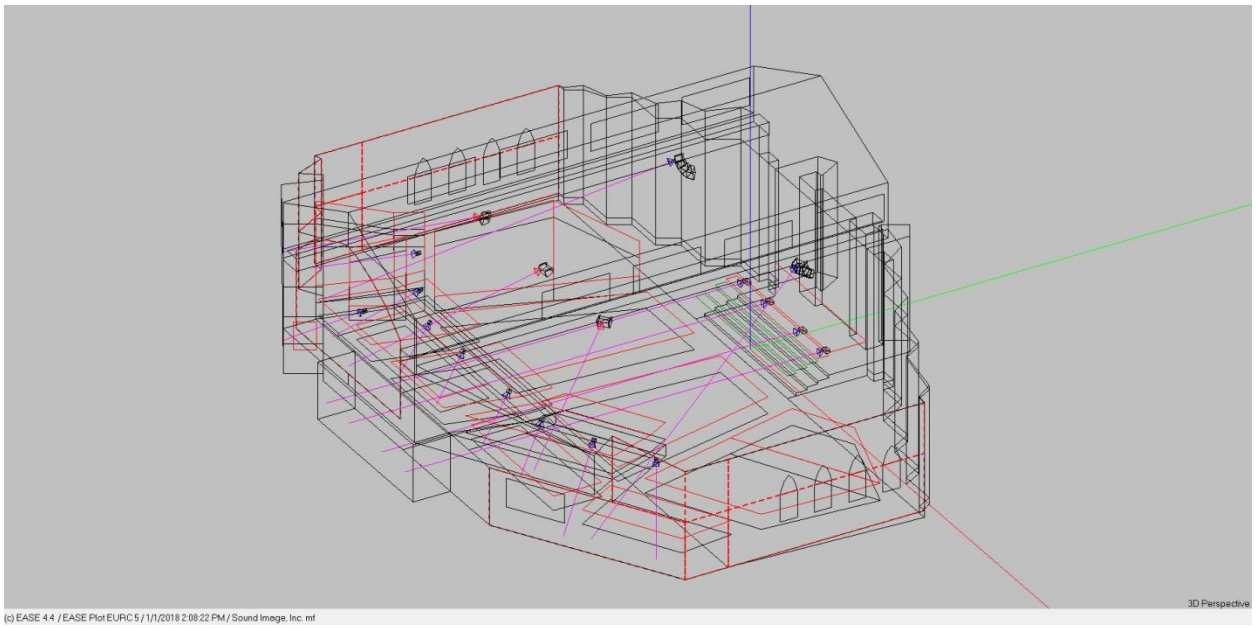


Figure 1 – EASE 3D Wireframe Model of New Church

The recommended approach is to fully engineer all projects. This includes 2D and 3D drawings for conduit, backbox and power layouts, rigging details, a certified structural review when applicable, single line diagrams, rack elevations, and plate and panels details.

While using the tools and techniques listed above are common practices for AV consultants, architects, and many of the better general contractors, we realize many end users have never been involved in the intimate details of a construction project, and are not accustomed to looking at construction specifications and drawings.

The best design/build contractors strive to present their intended intigration solutions in ways the general public can easily understand. Customers should be allowd to see their project on paper, or in a computer model as a wireframe, rendering, or virtual walk-though, before it's built. This allows questions, changes, conflicts, and mistakes to be addressed and resolved early so they cause minimal disruption; resulting in a project that's more likely to be completed on time and on budget.

During the design deveopment phase of a project, the design team should be able and willing to prepare proof-of-concept drafts to help the client see how some critical decissions are determined. For example, explaining and drawing or modeling sight-line studies (Figure 2), or drawing projection cones to help the cusomer understand projection conflicts. These "schematic drawings" may or may not need to be included in the formal construction drawings, but they provide valuable information during the project development.

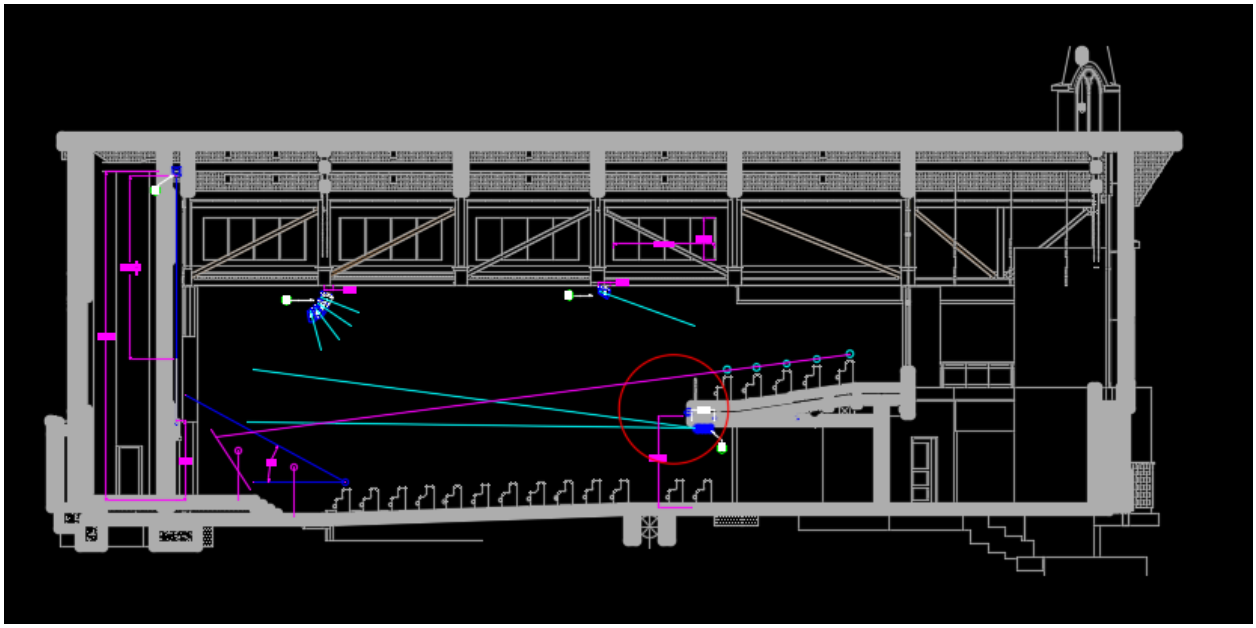


Figure 2 – CAD Sightline Study. Note the balcony slope sightline problem re. stage view.

Veteran Staff: As end users, consultants and integrators, we're all challenged by the ever-changing landscape of technology. How does anyone keep up with the myriad old and new products, formats, signal types, standards and vocabulary?

Integrators should have decades of colective audio, video, control system, and networking experience. The best integrators have a mix of young and veteran designers, engineers, project managers and installers.

When a dedicated, experienced staff is continuously exposed to, and engaged with the most advanced professional technologies and training, and enthusiastically backed by the manufacturer's of such technology, the knowledge base grows exponentially. The result: there is little that's beyond their capabilities to understand and properly integrate. Part-time, semi-pro, and home theater contractors generally won't have sufficient, on-going exposure to pro-level hardware and software.

Specialized Training and Certifications: With today's complex systems, product-specific training and certifications are also critically important for successful integration. Designers, project engineers, project managers, and lead technicians should hold certifications from multiple trade organizations and manufacturers.

Look for corporate and individual staff certifications such as APEx, CTS, CTS-I, CTS-D, EAVA, DCME, CCP, and RCDD.

Technology advances and/or product discontinuances: As mentioned above, keeping up with modern, professional AV technology is an on-going challenge. It's important that your contractor has daily product exposure, with ongoing brand and format awareness. This product awareness allows them to identify and recommend alternate products, when necessary, due to equipment incompatibilities and/or discontinued or delayed product delivery schedules.

One or more acousticians on staff: For a large number of projects, acoustic analysis and treatment may not be needed, wanted, or fit into the budget. However, when acoustical planning is required, the best integrators will have at least one acoustician who can properly evaluate, calculate, specify and oversee installation of the appropriate treatment(s).

Understanding and properly applying acoustic treatments is critical if maximizing speech clarity and overall sound quality are primary goals. EASE, Modeler, Smaart, and SysTune are some of the computer-aided design and measurement tools that qualified contractor's employ.

Acoustic modeling software such as EASE and Modeler play a key roll in the correct selection and placement of loudspeakers for a room. These tools allow for the evaluation of different loudspeakers and some reasonably sophisticated, predictive acoustical testing. This early design work is done to help evaluate the audio quality and coverage (Figure 3) in a sanctuary, classroom, auditorium, theater, stadium or arena, before it is constructed.

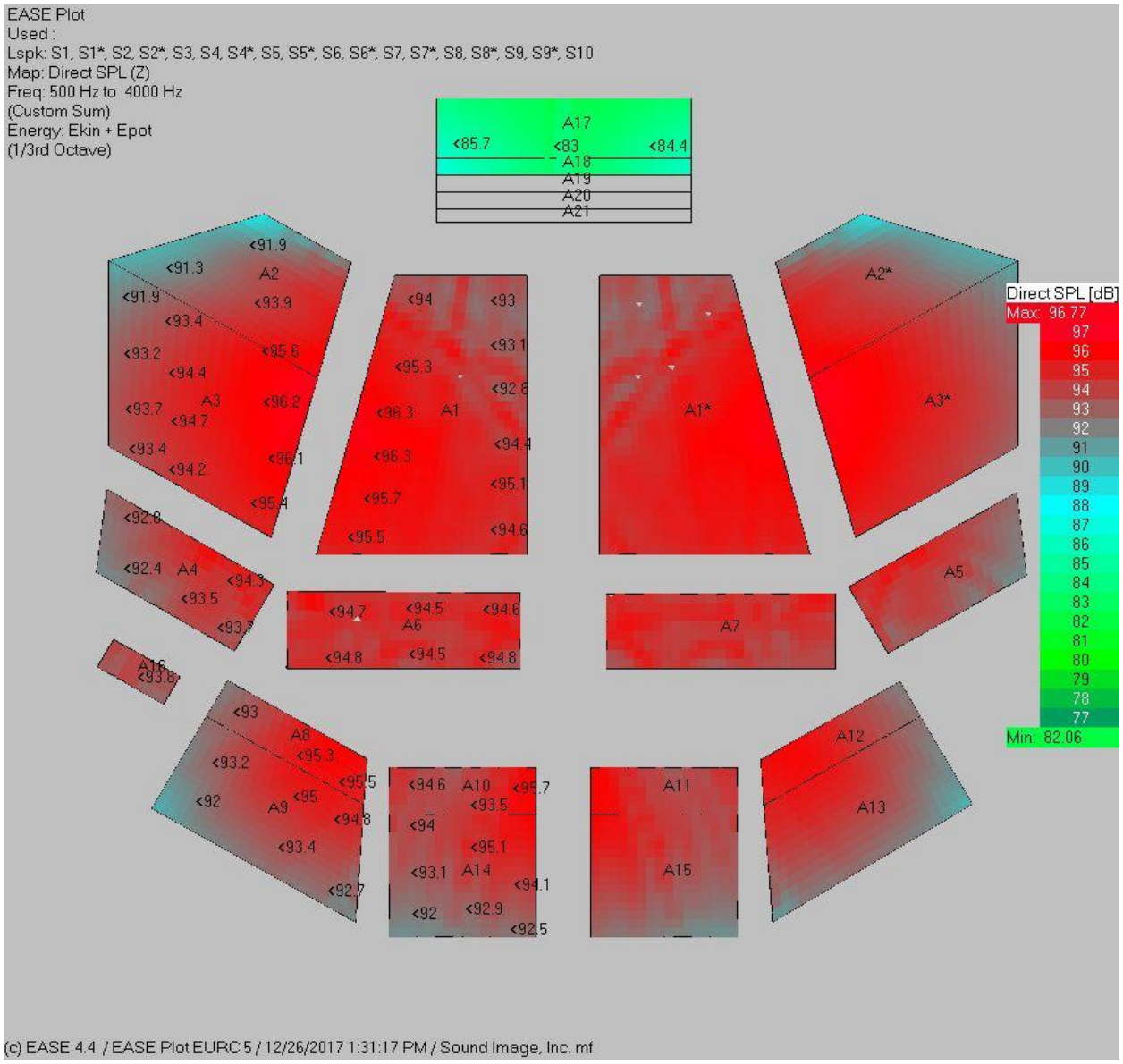


Figure 3 – EASE Direct SPL Coverage Map for New Church. Speech range of frequencies.

Most AV integrators do not employ an acoustical engineer. It's not manditory they do, but almost all projects that have, or plan to have an integrated sound system installed should have someone who's keeping an eye on the architectural acoustics. If your contractor doesn't have someone on staff, you should seriously consider hiriing a professional acoustician.

Authorized service center for most equipment: The best integrators will have an on-call service manager or department, one or more bench-level repair techs, and a three-tiered approach when equipment service is required.

While integrators may be authorized and have the ability to perform factory service on most of the equipment they sell, they may not believe it is the best use of their time and other resources to maintain a fully-stocked service department for the hundreds of products they probably need to support. This is how the three-tierd approach may be presented:

1. Troubleshoot the problem and fix it in the field when the problem is manageable at that level.
2. Bring the unit into their local shop for evaluation and servicing when the repair involves generic parts and/or when parts are easily and quickly aquired.
3. If necessary, send the malfunctioning unit back to the manufacturer for warranty or non-warranty service.

This three-tierd approach may have a few variations, such as advance replacement or loaner equipment when necessary, but in general it is the most time- and cost-effective for all parties concerned.

Provide first-use technical staff: Once you've been handed the keys to your new system, the first few events are critical to the perceived value of the investment. Unless you have seasoned professionals on staff to "run the show", it's highly recommended that the integrator budget for and schedule the project manager, and possibly one of the lead technicians, to either operate or provide oversight for the first one or two public uses of the new system(s).

This is important to help support the customer's technical team as well as to make sure the first impressions are well received. A well integrated system can only perform as well as the skills and talent of the people who are operating the controls.

Also, the contractor should include follow-up training, a few months after the systems have been in service, when the customer has a fresh perspective on what questions to ask.

Non-Technical Risk

Building a successful AV integration team involves more than technological know-how. This next section outlines our recommendations for the most common non-technical challenges that occur.

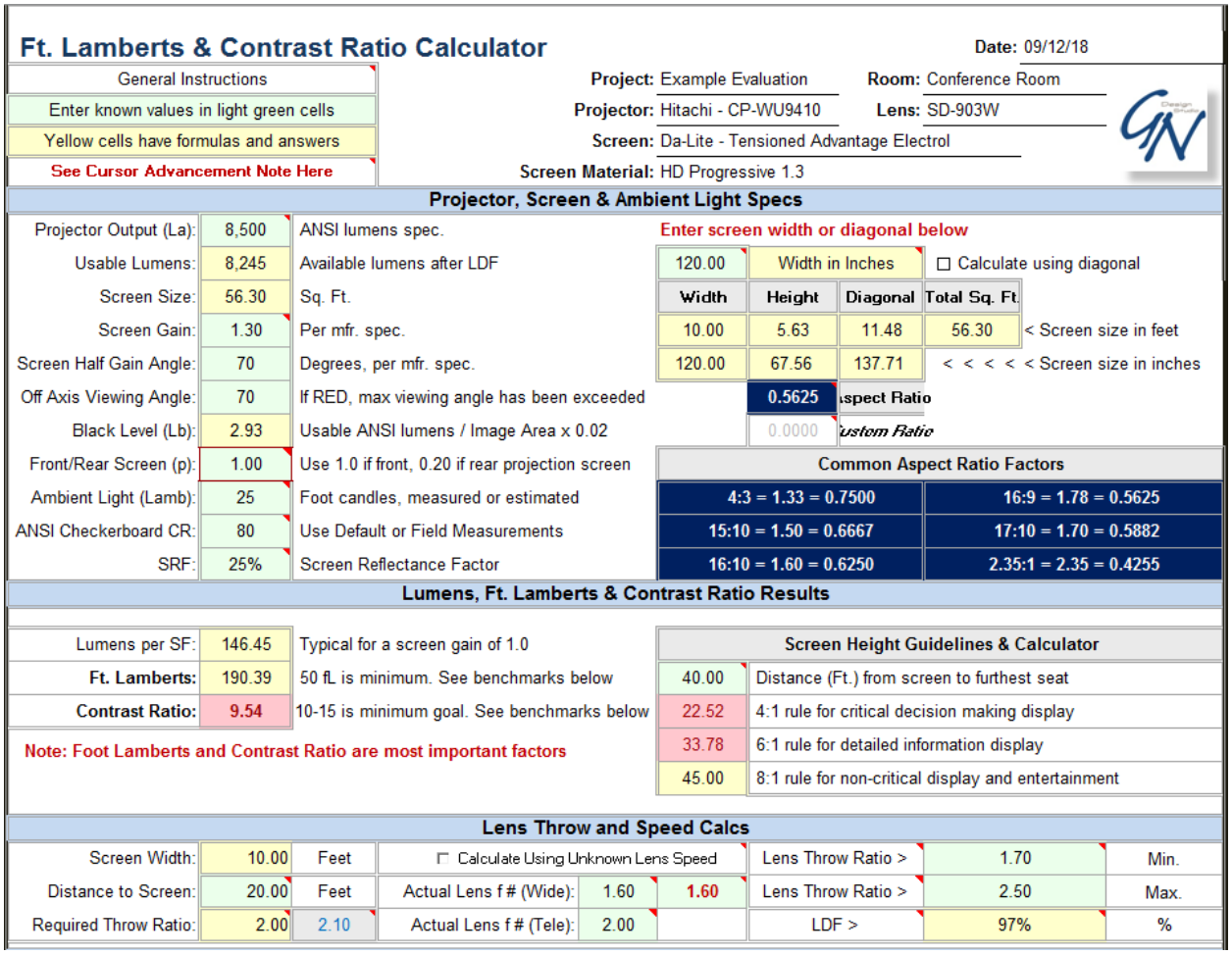
Managing client expectations: To meet or exceed a client's expectations should be the primary goal on every project. To do so the integrator must first fully understand those expectations.

In most cases, the overriding expectations are communicated through a list of "functional or operational" goals. The customer want's their new AV system to be able to do this or that. There is ususally nothing "technical" about their goals and expectations.

The contractor's lead systems designer should turn this list of goals into a scope-of-work (SOW) document, using the customer's vocabulary whenever possible. The integrator's design team should be very good at describing ideas, solutions and systems in plain, non-technical terms.

Once the integrator has a good understanding of the functional goals and expectations, they can prepare scope documents, configuration (Figure 4) and cost spreadsheets, charts, models and/or renderings to communicate and confirm the client's understanding of the system design, functionality, operations, and a rough order of magnitude (ROM) cost.

Limiting the use of technical jargon will increase the client's understanding of the project. Rendered 3D drawings help your customer get a better feel for what a room will look like and how it will function. Mock-ups, equipment demos, or tours of similar systems or facilities help client's understand how the final product might perform for them in their applications and environments.



Ft. Lamberts & Contrast Ratio Calculator — Date: 09/12/18

General Instructions
Enter known values in light green cells
Yellow cells have formulas and answers
See Cursor Advancement Note Here

Project: Example Evaluation — Room: Conference Room
Projector: Hitachi - CP-WU9410 — Lens: SD-903W
Screen: Da-Lite - Tensioned Advantage Electrol
Screen Material: HD Progressive 1.3

Projector, Screen & Ambient Light Specs

Projector Output (La):	8,500	ANSI lumens spec.
Usable Lumens:	8,245	Available lumens after LDF
Screen Size:	56.30	Sq. Ft.
Screen Gain:	1.30	Per mfr. spec.
Screen Half Gain Angle:	70	Degrees, per mfr. spec.
Off Axis Viewing Angle:	70	If RED, max viewing angle has been exceeded
Black Level (Lb):	2.93	Usable ANSI lumens / Image Area x 0.02
Front/Rear Screen (p):	1.00	Use 1.0 if front, 0.20 if rear projection screen
Ambient Light (Lamb):	25	Foot candles, measured or estimated
ANSI Checkerboard CR:	80	Use Default or Field Measurements
SRF:	25%	Screen Reflectance Factor

Enter screen width or diagonal below

120.00	Width in Inches	☐ Calculate using diagonal

Width	Height	Diagonal	Total Sq. Ft.	
10.00	5.63	11.48	56.30	< Screen size in feet
120.00	67.56	137.71		< < < < < Screen size in inches

0.5625 Aspect Ratio
0.0000 Custom Ratio

Common Aspect Ratio Factors	
4:3 = 1.33 = 0.7500	16:9 = 1.78 = 0.5625
15:10 = 1.50 = 0.6667	17:10 = 1.70 = 0.5882
16:10 = 1.60 = 0.6250	2.35:1 = 2.35 = 0.4255

Lumens, Ft. Lamberts & Contrast Ratio Results

Lumens per SF:	146.45	Typical for a screen gain of 1.0
Ft. Lamberts:	190.39	50 fL is minimum. See benchmarks below
Contrast Ratio:	9.54	10-15 is minimum goal. See benchmarks below

Note: Foot Lamberts and Contrast Ratio are most important factors

Screen Height Guidelines & Calculator	
40.00	Distance (Ft.) from screen to furthest seat
22.52	4:1 rule for critical decision making display
33.78	6:1 rule for detailed information display
45.00	8:1 rule for non-critical display and entertainment

Lens Throw and Speed Calcs

Screen Width:	10.00	Feet	☐ Calculate Using Unknown Lens Speed			Lens Throw Ratio >	1.70	Min.
Distance to Screen:	20.00	Feet	Actual Lens f # (Wide):	1.60	1.60	Lens Throw Ratio >	2.50	Max.
Required Throw Ratio:	2.00	2.10	Actual Lens f # (Tele):	2.00		LDF >	97%	%

Figure 4 – Custom Projection Calculator. Work through what/if scenarios re. screen size, projector brightness and contrast goals, and lens needs before installation.

Cost Flexibility: AV project costs can be somewhat flexible. During the first scope development meeting the owner should expect the designer to ask (presuming they haven't already) what their budget is for the installed systems. This can be a delecate question, but one that must be asked and answered in some form. If the customer isn't willing or able to share that information the designer should offer good-better-best budgetary allowance options based on their experience designing similar systems.

Good designers can design complete systems, at various price points, which provide most if not all the client's expected functionality. This is possible because various manufacturers sell the same basic functionality at a wide range of costs.

How is this possible? In the pro AV market, you usually get what your pay for. You will almost always pay more for added/advanced features, overall component quality, reliability, efficient customer service, and brand-name recognition.

The labor rates, shipping costs, and taxes will vary somewhat based on many local and regional factors, but the differences in equipment cost can range dramatically. For example, a good wireless microphone system might cost $500-$1,000 per channel. The best wireless systems can run three to four times more.

Obviously, the more complex the system(s), the more time it takes to design, document, install, and commission the project. While labor rates may vary from one company to the next, labor is usually the single most expensive line item for an integrator. If you need to save significant money, keep the systems as simple and well defined as possible.

Of course there are limits to how hard you can squeeze a budget. But, if the integrator is operating in a fiduciary manner, an initial good-better-best budgetary ROM might vary +/- 30 - 40%, or more, from the mean of the "better" options.

You never want to tell a integration company that cost is no object. Trust us when we say, "you have no idea how much damage they can do to your bank account". A $100,000 dollar system can quickly turn into a $200,000 dollar project by upgrading just one piece of equipment from good to best; such as the mixing console.

Here are two critically-important tips: First - The upper mid-range of the pro AV market is the sweet spot. Here you land in the "better" budgetary slot, but generally get the best bang for your bucks.

Second - once you determine your budgetary slot, make sure the designer stays in that lane throughout the design. You never want to connect a few high-end pieces of equipment to a low-end signal path. It will probably work, but you'll be waisting lots of money. Think weakest-link-in-the-chain theory.

Brand Flexibility: Well established integrators are able to offer, buy direct, and support a wide range of brands. Beware of contractors that only offer a narrow range of hardware options. There are many reasons to be cautious here, such as bad credit ratings or poor service records. Most manufacturers screen their potential vendors carefully, some much more carefully than others.

Request weekly status reports: These can be as simple as sending a weekly email to the owner's rep stating, "everything is on track". Or, bring up problems like, "the painters are a week behind schedule. If this continues much longer it will impact our ability to do our work, which may impact the project completion schedule".

Industry Trade and Training Affiliations: Sustaining membership and participation in industry organizations such as Avixia, NSCA, AES, NAB, SMPTE and SynAudCon are another good indicator that the integration firm is seriously committed to the industry in general, and has made a commitment to professionally educate and certify its employees.

Scheduling and coordination with other trades: When working on new-construction projects, AV system integration is considered a "late" trade. It is common for the AV installation schedule to be highly compressed because other "earlier" trades are running behind schedule; while the owner still demands a specific completion or "first use" date.

While we all wish this was not an all-to-common scenario, well established integrators figure out ways to adjust and adapt, because they recognize there is little they can do to prevent construction delays caused by others.

Generally, the best way to minimize scheduling and coordination conflicts is for owners to issue a contract to their chosen integrator as early as possible in the project schedule. This may seem counterintuitive, but it's not. There are many preliminary design and/or submittal steps the contractor must complete, plus there are also many review and coordination actions that can and should be ongoing, months before any equipment is ordered or wire pulled.

Experienced contractor's will have worked under these conditions for many years, and know how to best manage and mitigate the obvious challenges that arise. For example: Contractors should carefully monitor the progress of the jobsite, and schedule equipment orders and manpower to be ready just ahead (1 to 4 weeks depending on scale and complexity) of the date(s) the jobsite is actually ready for them to do productive, on-site work.

A classic example of bad planning and coordination looks like this: Too often the AV contractor isn't engaged until after the electrical contractor's power budget, and underground and rough-in conduit and raceway work is well past the point of no return. When mistakes are found, the time and cost of a workaround solution is often prohibitive. Bottom line: time and money are wasted, or the end product is substantially compromised.

Supply chain disruptions: There were numerous supply chain disruptions in 2011 caused by problems ranging form raw material shortages, to flooding on the east coast, to the tsunami and reactor problems in Japan.

In such cases, the integrator must quickly recognize, evaluate, and confirm the impact of such "global" issues with their vendors. Then they must be able to maneuver and/or substitute all impacted products so their projects are operational on time, or with minimal delays, while meeting all substantial completion deadlines. Ask your contactor how they've handled such scenarios.

Inventory Control: Integrators must monitor and properly maintain their base-line stocking inventory on items such as bulk cable, rated rigging hardware, connectors, and common accessories, etc.

Ask your potential integration partner how they manage their stocking inventory. If the names Home Depot or Lowe's come into their response, say thank you very much and move on.

In-house fabrication shops: Does the integrator have in-house paint, wood and/or machine shops for custom work? These are helpful in many ways related to cost and time savings.

Can the integrator fabricate custom rack and wall panels to spec? Can they provide lazer engraving on their panels? Can they build custom equipment racks? Can they match custom colors and finishes if needed?

Intangible Risk

Industry leaders are able to go well beyond the technical and non-technical components noted above. Next we'll outline the intangible assets we believe set the best integrators appart from others. These are commonly-provided at no extra cost, yet they bring useful and/or significant value to your relationship with the firm you're about to hire.

Project back-up and archiving: Does the integrator have on- and off-site backup servers? All projects should be archived electronically in at least two off-site locations, and saved indefinitely.

When requested, your contractor should offer no-cost copies of electronic files for completed projects that are paid in full. Archiving should include as-built plans (Figure 5), O&M manuals, and control and DSP programming files.

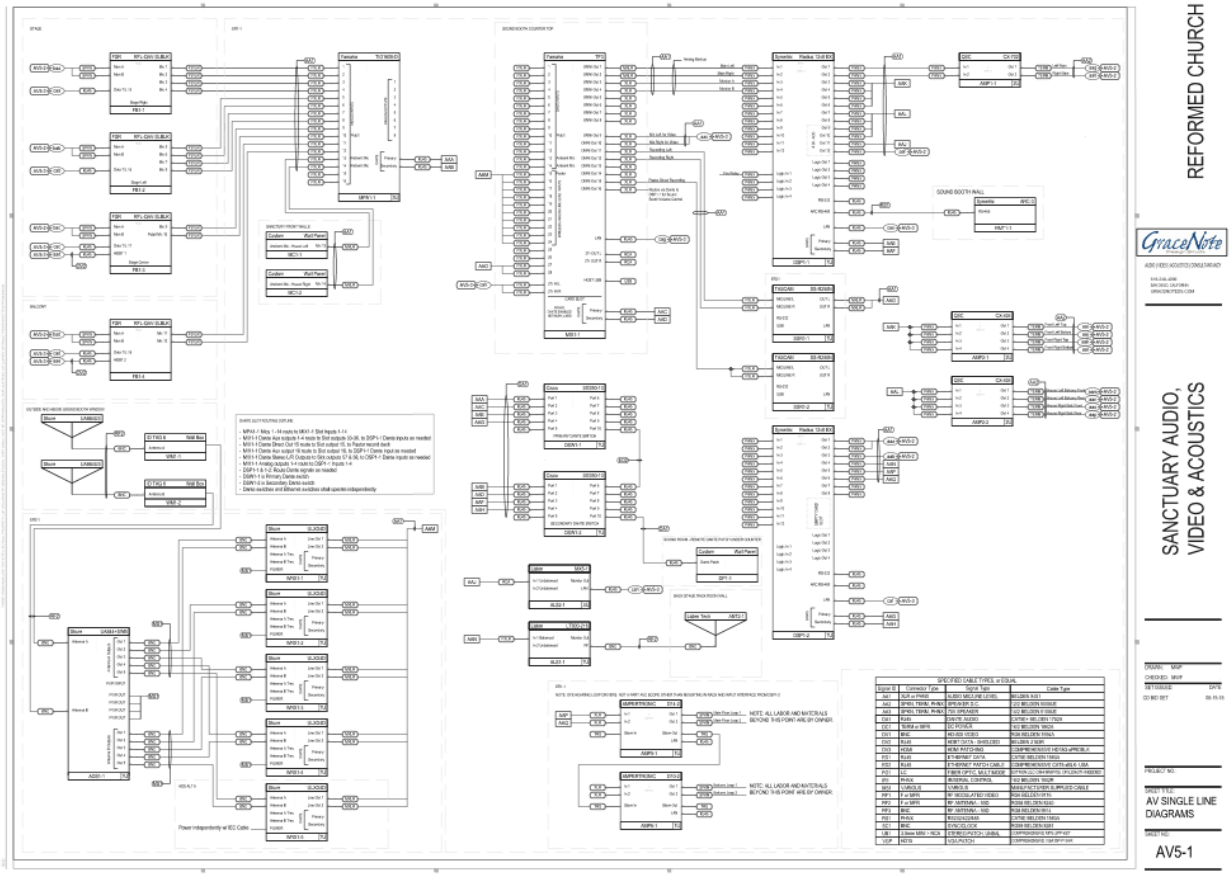


Figure 5 – Single Line Construction Document. These should be updated as needed, and finalized and archived as as-built docs when the project is completed.

Business Ratings: Your integrator should have and maintain excellent ratings in these three critical business categories: Bonding, safety and financial.

1. Bonding: Regardless of need, ask for the contractor's bond rates and a letter of bondability. These are usually tiered, based on the contract value. Bond rate progressive tiers might look something like this: For the first $500k the rate is 1.50%. For the next $501k – $2.5M the rate might be 1.00%. And for the next $2,5M – $5M, you might see 0.80%. The lower these percentages the better, because it means their bonding company sees them as a better risk.

2. Safety: EMR (Experience Modification Rating) is a safety ranking. A very good rating would be something like 0.65. 1.0 is average. Lower is better. 0.65 means the contractor is rated 35% better than average. This means their employees work in a safe manner, and have a lower than average accident rate, which translates into lower insurance costs.
3. Financial: Ask for the contractor's Experian Business Credit Ranking Score. A score of 88 out of a possible 100 is good. Higher is better on this scale. Experian's Recommended Action for a score of 88 would be: "Low Risk".

Industry clout: Does the integrator have a long-standing, elite reputation in the AV industry? If so, many of the industry's leading manufacturers will seek out their designers and engineers for collaboration and/or new product review and testing.

What does this mean to you the customer? It means that when the integrator needs extraordinary service to fill a need, solve a problem or create something that doesn't currently exist in a catalog, they get results. Further, when something extraordinary is needed, they can usually call on the president or owner of a company, who then makes sure their client's needs are properly met.

Brainstorming: Given the amazing technical innovations that are a part of our everyday lives, it's not uncommon for a client to call and ask, "Can we get together and talk about some functionality we want to include in our current or new facility? We just don't have a good idea what the best, most cost effective, most future-proof solution is for what we want, and we also aren't sure if we can afford any of it."

The best design/build integrators (and consultants) love these opportunities, and are usually willing to have this type conversation without asking to be paid for their time, knowledge and experience. Truthfully, this is where many of the best collaborative projects begin. Their attitude should be, "there's money to be earned later; right now let's get creative".

Prequalification: The top design/build integration firms are consistantly "short-listed", and designated as "pre-qualified" by many of the world's leading AV consulting firms. It's ok to ask which consultant's your prospective integrator is short-listed with. While not foolproof, their response should speak clearly to their qualifications and experience when judged by some of the toughest critics in the industry.

Certifed Payroll: Can your integrator provide a certified payroll if requested? Again, this may not be necessary for your project, but the best integrators are able to provide this service if required.

Scheduling Flexability: Ask you integrator how they handle limited-access and/or night work schedules? Are they willing to work through the night to accommodate a facility's daytime schedule. Is there a cost premimum for such work?

Summary

High-quality AV integration is an extremely difficult business to succede in year after year. For the end user, selecting the right firm can also be difficult, so much so that it may just come down to taking a leap of faith, based on less than ideal options.

Our recommendation is to get at least five bids, and let the bidders know you plan to throw out the highest and lowest offerings. This is an old-school concept, but you'd be supprised how this forces the bidders to focus more carefully on their estimating processes.

If you have the time, energy, and technical knowledge to work directly with a design/build integrator you should find the guidelines set forth above to be invaluable. If you don't think you can handle all the technical, non-technical and intangible risks, your best course of action may be to hire a professional consultant to help guide you through your project.

Michael Fay is Owner/Principal at GraceNote Design Studio, an audio, video and acoustic design consultancy; a sustaining member and graduate of multiple SynAudCon workshops; a member of AVIXA and the Acoustical Society of America; an SDVoE Design Partner; former Integration Division general manager and senior design consultant with Sound Image; and former editor of Recording Engineer/Producer magazine.

Dan Nelson CTS-D, RCDD, is a Senior Systems Designer with The Sextant Group, a national technology and acoustical consultanting firm; and a member of AVIXA, the Acoustical Society of America, SynAudCon, AES and BICSI.