AV in our everyday

The world of AV touches many of us in our daily experiences from going to the shops or in normal times, attending a business conference or show. I've worked on many projects where these environments feature a sizeable chunk of AV infrastructure and it's crucial to get all the elements right for a successful performing system.

An obvious key part of these systems is the hardware, and certainly a key consideration of designing such installations is the hardware elements of what drives those systems. This would typically include amplifiers, speakers, microphones, screens and projectors. A lot of thought usually goes into these items, and rightly so, as they form the backbone of all major systems.

What is less obvious is the cabling and accessories that connect all these together and make the hardware a useful completed system, but these less obvious elements can be the weakest link in the chain and result in poor performance of even the best hardware, if not chosen correctly.

Connecting it all up

Key considerations in these vital elements are cable construction, connector resilience and the environment that the cables and connectors will be exposed to. For this reason, it is important to understand the full system requirements and ensure cable selection is made correctly.

It is also important to understand how the connectivity will be run and plugged together. For example, if connecting cables from a desktop fitting to a floorbox and then up to a wall, this may involve several HDMI connections within one total run, in which case it is best to use Active Cables for each length to ensure maximum performance.

Similarly, if installing fixed microphones or remote audio inputs in a building, it's important to be aware of existing cable runs and understand the best routing. If that routing also involves cables being installed in ceilings, then it's likely that these are subject to Euroclass standards for fire safety performance.

What can go wrong?

One project I was involved with at a Cambridge College gave me the chance to see how **not** to do it. During the survey of the existing system in the main chapel, the client explained how there was a constant hum on the microphones. On assessing this, I discovered some new lighting had been installed with power cables running alongside the existing microphone cables. Doing this will induce a voltage into the microphone cable causing the hum in the microphone input. An easy fix once spotted, re-routing the cables to avoid a direct parallel close existence to each other.

Well shielded cables with good copper content in both the main conductor and outer shield also significantly help with such issues.

What to assess for different signal types?

Different considerations are required for different signal types. Here is a quick breakdown of what should be considered.

- **Audio Cables**
    - **Total Cable lengths**, try to keep to less than 15m, otherwise use a different transmission format.
    - **Connectivity needed at each end**, this can be RCA Phono, TRS 3.5mm or XLR
    - **Routing considerations**, is it secure from tampering, clear of voltage cables?

- **Speaker Cables**
    - **Type of Speaker Output being used**, could be 4 ohm, 8 ohm, 100v and 30 watt or 1000 watts, all of these will affect the cable conductor size required.
    - **Total Cable lengths**, not usually an issue but certainly longer lengths could require a larger cable conductor
    - **Routing environments**, indoor, outdoor, subject to Euroclass?

- **Coaxial Cables**
    - **Type of signal being transmitted**, Satellite, TV, Cable TV signal, CCTV, CCTV with power, BNC Audio Video?
    - **Distances involved**, indoor local connections or across the building network?
    - **Termination requirements**, BNC, F-Type or high-end Video?
    - **Routing environment**, indoor, outdoor, subject to Euroclass?

- **HDMI Signals**
    - **Specification of signal requirements**, 1080p, 4K 30Hz or 4K 60Hz 4:4:4
    - **Type of system requirements**, local equipment being connected in a room or a full-blown video distribution system?
    - **Routing environment**, Direct A to B connection or through other terminations such as floor boxes or wall plates?

How to avoid those pitfalls?

Audio cables need to have strong connectivity both from the inner cable to connector and connector onto equipment. This should include a tight pin for positive terminal and tight outer ring for the negative terminal. Gold plating gives long life by preventing material corrosion, which would inhibit signal performance. Cable construction must be of OFC copper in 26 or 28AWG overall size for both

inner conductor and the shield, and with this construction, cable lengths of up to 20 metres can be tolerated.

Speaker cables are usually driven by the system power so where 18AWG gauge cables might be suitable for small speakers up to 50watt a small room, 16AWG or 14AWG is a more common size for 8 ohm or 100v systems up to 150 or 200 Watts. As these are usually contained cables then these are also more likely to be subject to Euroclass requirements. Speaker cables are not usually restricted by lengths and runs up to 50m can be used.

Coaxial Cables are usually chosen for the application such as CCTV, Satellite or TV installations. Although some cables perform better at longer lengths than others, this is not usually a driving factor in cable choice as it's more down to the attenuation performance required for the application.

HDMI Cables are fussy beasts and the HDMI signal itself is quite complex. For example, where you might terminate audio cables, speaker cables or coaxial cables with your own connector after routing, that is not something to ever consider for HDMI as the signal is far too complex and sensitive for this. With 19 pins in use, not only does it feature multiple pins but is also complicated by the very nature of how it works. When you plug a cable in or turn on a piece of equipment, up to three signal handshakes need to take place before a full signal will even get passed down the cable.

How it's made, matters!

Construction of the cables makes a key difference in performance from using stranded cores within the data cables to using solid cores. How each pair is foil wrapped and the sizing of each core all makes for a cable that performs well or doesn't. It is also about speed of data and whilst many debate, "its digital so will either work or won't" that's not quite true. Whilst an initial picture might be established using an economical solution, if using with picture sources that are delivering high resolution, fast moving scenes, poor performing connectivity can let the end result down resulting in picture juddering or the loss of pixels of information during an essential movie scene.

HDMI and the bigger picture

HDMI Connectivity is also subject to different system requirements from individual equipment to a local TV, to full HDMI Distribution across a large building. In all instances good cables are essential, but then other hardware comes into play such as HDMI Distribution over IP or HDMI Extenders, and the performance of these also needs careful scrutiny to achieve success.

Generally, when dealing with HDMI distribution systems, this will also involve data cables being used for the core back bone of a network. Ideally these should be HDBaseT approved Cat6 cables but any reputable CAT6 UTP cable solid code will provide a good basis for optimum performance.

Working with a quality brand.

What also helps is to work with a brand that knows how to define its products for best performance and ease of installation. Cables should always use OFC copper materials with enough copper strands and size to give good performance over reasonable distances. Well shielded cables should always be selected to avoid outside inference from disturbing the signal along with flexible sheaths that allow for best routing.

Performance of accessories is also a key element; these can sometimes be used to achieve connectivity over large buildings and can also become a weak link if not specified correctly. Choosing accessories such as HDMI extenders that perform well against the system requirements can prevent embarrassing end results and ensure confidence with the finished system installation.

Sometimes there are also other benefits in choosing good accessories such as support for IR equipment, or saving the need for additional power requirements if devices have PoC.

Conclusion

So, for a full picture of system installations and to get audible visible results, be sure to choose products designed for performance and durability.

Check those key factors when looking at different signal types, consider carefully application, cable routing and customer expectations on performance.

Work with a brand that are experienced in designing products for performance, with all that in the fold, you won't go far wrong.