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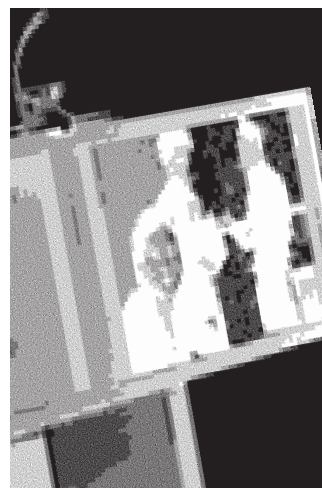
## V I D E O C O N F E R E N C I N G

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In many ways the application of conference technology to traditional presentation and meeting spaces seems like a natural extension of both the use of the spaces and the technology that has been integrated within them. (For the purpose of this discussion, we will consider the term *conferencing* to mean the more traditional concept of teleconferencing—implying an audio conference application—and videoconferencing, since this includes both audio and video, and the rules and “best practices” for deployment apply equally to both.)

While many readers might expect this to be a section on encoding AV and the modern forms and protocols of digital networks, it is not. The most concise discussion of network topics appears in the *Voice and Data Communications Handbook*, published by McGraw-Hill, a book of more than 750 pages! Aside from the impossibility of tackling such a topic in only a few pages, experience has demonstrated time and again that the encoding and transport of signals across the network actually is quite simple. That’s right—it is simple, despite the fact that the forms and methods change every day as the global telephone network adapts, grows, migrates, morphs and weaves through our personal and business culture. The really tough part of successful conference deployment is found, instead, in the traditional elements of audio, video and room layout—all of the areas that we might have assumed are “no-brainers” for experienced AV and presentation professionals of today. Far from being “no-brainers,” space planning and AV technology deployment are the great stumbling blocks of conferencing. Incomplete or incorrect planning and deployment on the room side of the conference equation lead to 99 percent of all failures to deliver on expectations in this most powerful of communications. Why that is and how to avoid this pitfall is the subject of this discussion.

For many people, the idea of a presentation space acting as a real-time videoconference presentation space appears to be a simple step in the general application of technical elements. If the space in question has been developed for live local presentation, with the now typical elements of large screen projection of video and computer sources; live interaction and drawing via a whiteboard or flip chart; and the ability to display the audio portion of any video element, along with, perhaps, voice reinforcement of the local presenter, then it is easy to assume that all we need to add is a camera to show the live image of the presenter, and some sort of A-D digitizer (codec or COder-DECoder) attached to a network, to transport the information to another location. With those additions, the assumption is that we are ready to conference. That assumption is the result of traditional audiovisual thinking, which pigeonholes conferencing into a narrow subset of presentation. Anyone who has encountered this approach knows, however, how deficient the end-result will be when judged in the context of the ability of an end-user to achieve live two-way communication between two or more geographically dispersed groups.

For both those who implement and those who use the systems, videoconferencing (VC) is a far less forgiving medium than one intended for in-person meeting and presentation. Small oversights in planning videoconferencing systems can result in devastating consequences.

We also find that the elements that have the greatest influence on the success for the end-user of a videoconference system are determined at the outset by the space planner and AV systems provider.

It is very useful to consider the proper planning and deployment of videoconferencing within the context of the separate elements of room or space plan, and AV elements.

## VC room or space planning

For clarity of discussion, we have divided this section into the following sub-sections:

- Room construction, including wall construction, windows and window treatments, ceilings and HVAC;
- Interior design and finishes;
- Furniture design, including placement and layout;
- Room acoustics and acoustic treatment; and
- Room lighting.

The initial layout and construction of the space affects all the elements that are discussed in other sections of this book, including acoustic characteristics and performance, general and ambient light control, and overall comfort.

### Room requirements

We begin with general room requirements. The total floor space required for VC is much greater than we have become used to for general local presentation and meeting. In architectural terms it is not uncommon to find a rule-of-thumb applied that allows for up to 15 square feet of floor space per participant in a traditional presentation or meeting room. If there is a front-of-room presenter position at a podium, and if there is some use of in-room technology (projection devices, whiteboards, etc.), then this figure may increase to as much as 20 square feet of floor space per participant, but rarely any more than that.

It is here that we have our first conflict. In videoconferencing we have to consider not only the issues related to local viewing and hearing but also the issues of being seen and heard by people at the far-end of the connection. This means that we must consider sight lines and angles of participant interaction that go beyond traditional presentation environments. As a rule we should allow not less than 30 square feet and generally not more than 45 square feet of floor space per participant in a videoconference space. Though two to three times what we are used to allowing, this amount ensures that local participants will see one another and the display of local and remote electronic images. It also ensures that participants at the far-end will see and hear everyone arriving at their location via the connection, and that all will see and hear at a level of quality that does not detract and, in the best deployment, even enhances the communications.

Having determined the required size of the space, we can move on to the actual renovation or construction of the space itself. Again the requirements here are generally less forgiving than those applied in local-only meeting spaces. In the most basic sense this is because, by sheer definition, at least some of the participants in a conference-based meeting are not actually in the room. As such, we cannot count on the typical human mechanisms (the human ears and brain and our ability to locate sound in three-dimensional space) to manage any acoustic anomalies.

If we are, for example, in a room that is adjacent to a double-door entry to the building, then knowing this we can take the inevitable doorway noise into account as we filter the sounds we hear both inside the meeting room and coming from that adjacent entryway. Within our own physical and local environment we have the ability to isolate local unwanted noise from local “sound of interest” (voices of other people, etc.), and place the unwanted noise in an inferior position in our conscious thought pattern. We are able to do this because we know where the noise is coming from and (usually) what is causing it. We may be annoyed by the noise, but we

generally are able to ignore it. As soon as we add conferencing to the meeting equation, however, we add the element of electronic pickup and reproduction of all sounds. For the people at the far-end, the unwanted noise is much more difficult (if not impossible) to ignore. They do not have the ability to isolate it in three-dimensional space (the microphones eliminate the spatial reference) and they often do not know what is making the noise. The brain of the far-end participant will devote more and more conscious observation and thought energy to trying to work out these elements, in an attempt to isolate and finally “ignore” the unwanted sound. We have already stated that they cannot do this, however, due to the electronic separation between the locations. Thus they are left with an impossible task that takes up more and more thought energy, eroding the perceived quality of the spoken communication over time. Frustration and exasperation quickly set in, and the communication flow quickly falls apart.

This, then, is one reason we must pay even greater attention to the acoustic and visual issues for any presentation space that will be connected via conference to another. Minor, seemingly insignificant anomalies we often ignore in the local environment become significant impediments to smooth communication with people at the far-end of any connection. In short, we must always ask ourselves, “What does this look like and sound like to the people at the far-end?”

In order to guarantee that the final conference environment will have a solid foundation, we begin with the construction of the walls, floors and ceilings for videoconference spaces.

**Walls:** Conference room walls should be built from slab to slab. That is, there should be no gaps from the concrete of one floor to the concrete of the next floor. Resilient, gypsum board mountings should be used to close any gaps. The thickness of the gypsum board should be  $\frac{5}{8}$ " or more (one layer of  $\frac{5}{8}$ " and one layer of  $\frac{1}{2}$ " bonded together would be ideal) on the inside of the room, with  $\frac{1}{2}$ " thick (or as required by local building codes) appropriate for the outside of the walls. There should always be a difference in thickness between the materials used on the inner versus the outer walls. That difference in thickness subdues mechanical coupling (vibration) between the two layers. A good overall wall thickness is 6". It is recommended that “offset stud” construction be used, typically a 6" header and footer with 3.5" verticals attached in an alternating pattern one toward the outside of the footer, the next toward the inside and so on.

Fiberglass dense batting or mineral rock wool, 4" to 6" thick (the equivalent of R-11 to R-13) should be placed in the wall space. The thickness of the batting is not critical. The critical aspect is that it must be loosely placed in the wall space, not compacted to fit. The resultant wall will have excellent acoustic isolation from the outside world. More significant acoustic isolation can be achieved by placing an additional barrier layer within the wall space. Typically this barrier will be made of a dense polymer material, about  $\frac{1}{8}$ " thick, and the improvement regarding loss of sound transmitted through the wall will be roughly a factor of 10. These materials are available from a variety of manufacturers.

**Windows:** Windows usually present the equivalent of an acoustic nightmare (as well as altering the way a camera renders colors and brightness). They not only transmit room sound, but also allow unwanted outside noise to intrude on the conference space. In the event that windows cannot be avoided, it becomes essential that window treatment of some sort be used. This treatment should match the interior look and feel of the space, while providing a high level of sound and light block. Typically a heavyweight drape (24 ounces or more) of heavy fullness (not less than 6" fullness on not less than 8" centers per fold) is preferred. In all cases, the use of sheer draperies or standard vertical or horizontal blinds should be avoided, due to their inherent inefficiency in blocking sound and light, and the fine lines they create within the camera field of view.

**Ceiling tiles:** These should be high-quality acoustic tiles, ideally 1"- thick compressed dense-core fiberglass. An added benefit of this kind of ceiling tile is that it works well with the indirect lighting as specified elsewhere in this section. To reduce any extraneous noise from leaving or entering the room via the ceiling space, the ceiling tiles can be blanketed completely from the plenum side, with a minimum of 6"- thick unfaced dense fiberglass batting or mineral rock wool, (the equivalent of R-15 to R-19). Here again, a barrier layer will improve the performance, but all local building codes must be followed for allowable materials in the various aspects of room acoustic modifications. To make entry and exit from the ceiling space easier, the blanket and barrier do not need to rest on the ceiling tiles, but may be suspended above it.

**Air conditioning:** It is critical that all air-handling equipment (blowers, heat exchangers, solenoid valves, etc.) be located outside the physical meeting room space. This will prevent the noise burden associated with such equipment from affecting the participants of any meetings held in the room. Location of air-handling equipment within the ceiling space of a conference room often renders that room unusable for video or audio-only conferencing.

The air vents should be of open construction to eliminate "wind noise" while the system is running. These vents normally are specified as "low-velocity" diffusers. The number of air vents within the room should be sufficient to maintain a consistent temperature throughout the space. All HVAC ducts and diffusers should be oversized for the general application in the space, with minimum 2' diameter insulated flexible ducts and matching 2' noise dampening diffusers generally best. All ducts should be installed with gradual bends and curves rather than rigid 90-degree corners. This will minimize "thunder" sounds as the initial air pushes through the ductwork and into the room.

There should be a thermostat to control this specific room system independently of the rest of the building, and that control should be located within the room.

*Important:* Allow an additional 5,000 BTU of cooling capacity for a standard "roll-about" single-monitor VC system with extended in-room peripherals (PC, document camera, scan converter, etc.) and a minimum of 10,000 BTU for a dual display multimedia presentation system with large screen displays. For the comfort of the participants, the room must accommodate these heat loads, plus the heat load of a room full of people, with minimal temperature rise.