System Design Group

City of Kelowna Council Chamber
Audio Visual Systems Review and Concept Design Report

Prepared for:
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File: 5547

October 1, 2006

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1.0 Introduction

The City of Kelowna council chamber is an existing facility with a number of functional or performance AV system issues that have been identified by the City staff. This report will address the issues and possible solutions where available. Some of the issues may be results of the physical room environment and may not be able to be addressed without significant expense or renovation of the room shape or layout. Where there are several options for possible solutions, we'll outline those along with the costs and benefits of each one.

2.0 Audio System

The council chamber audio system currently uses a combination of lavalier clip-on microphones with an IRP Voice-Matic microphone mixer managing the microphones. The clip-on microphones were chosen to minimize the level variation caused by council members talking "off mike" and to minimize the space taken up by combined microphone/loudspeaker stations. The microphones are controlled by each council or staff person, with no central control available.

While clip-on microphones can provide more uniform pickup level for broadcast or recording use, they are not the ideal solution for sound reinforcement. The microphones point upwards towards the loudspeakers, and are located well off-axis from a talker's mouth. To compensate for their location, the microphones have some frequency response compensation (high frequency boost) built in to the design which can increase the likelihood of feedback. Clip-on microphones also suffer from level variation when the user turns their head to the side, rather than speaking directly forward. This is exaggerated if the microphone is located off centre on the user's chest.

The staff microphones are desk stand mounted cardioid microphones intended for close talking applications and are not well suited to this application. They suffer from proximity bass boost when someone speaks at close range and a rapid fall off in level when the talker is more than a few inches away from the windscreen.

The best solution for a council setting is a short shotgun microphone mounted so that it is normally about 12" from the talker. That covers a wide range of talker movement, it prevents handling and clothing rub noises, it eliminates the bass boost cause be people talking to close to the microphone, and it leaves the desk below it clear for binders or paper.

The current IRP Voice-Matic mixer is fairly primitive auto-mixer technology that is extremely difficult to setup in a manner that won't clip off the start and end of words or sentences. It is also very sensitive to small variations in microphone output sensitivity for gating threshold. The IRP mixer is prone to being triggered by any sound of adequate level, it doesn't discriminate between speech and clothing rub, which creates many false triggers, and that lowers the feedback threshold substantially when more than one microphone is active.

There are newer and more sophisticated audio mixers which are easier to configure, easier to control, and easier to manage the number of open microphones. Newer digital mixers also offer more dynamic level management so that press feed outputs and record outputs can have more

uniform levels, and the system can manage some degree of level variations caused by people speaking too loud or too quiet, or off-mike.

The other advantage to digital signal processor (DSP) based mixing is the degree of control offered when coupled with a touch panel based control system. Remote microphone on/off, remote level controls, automatic gain control (leveling), multiple mixes of audio for different destinations, feedback suppression, and the possibility of including support for teleconference and video conference audio with echo canceling are just a few of the features that can be included. Because the DSP based systems are programmable, they offer the ability to have the system configuration upgraded or enhanced without buying additional hardware, so equalization and limiting can be added in software, and even the system configuration can be changed in software without rewiring hardware.

The current ceiling speaker layout is not really adequate for reasonable coverage of the council or gallery. There's far too much distance between speakers for uniform coverage of the council or gallery at seated ear level, and that increases the likelihood of causing feedback in microphones located closer to the speakers, as those speakers have to operate louder to have an adequate sound level between them. The 4" Atlas Soundolier ceiling speakers are also inadequate in bandwidth for any AV playback requirements, and that would limit the multi-use capability of the room.

If the speakers are not able to be zoned to receive different mixes of microphones, then the system will be prone to premature feedback. The sound system should provide the gallery and councillors with the equivalent sound level of a person speaking at a distance of eight feet. The sound system makes up for the distance between talkers and listeners without sounding over-amplified. This sound level has the effect of making the sound system unobtrusive, so the audience directs their attention to the talker and not the sound system.

Microphone control

If all the microphones are left "on" all the time, the auto mixer tries to balance the overall level within the limits of feedback. There is a limit to how much amplification is possible for any one microphone in a room with that calculation based on the total number of "live" microphones. Currently that microphone feedback management is all handled by the IRP automixer.

The easiest way to improve the maximum available amplification is to turn the unused microphones off until they're needed. With a orderly and formal process such as a meeting, there's usually only 2 or 3 microphones that have to be active at the same time, the meeting chair and one talker, or if there is an active discussion, the two participants and the chair. If the microphones are individually switched on/off by the council members it is possible to get more amplification in the room before feedback. This has the added advantage of reducing the ambient background sound pickup for Cable TV coverage and recordings of the meeting proceedings, and improving privacy for council members speaking to each other during a meeting.

In the simplest and least expensive audio system, the microphone control can be left to the individual council members with a pushbutton switch on the base of the microphone. In the more complex audio system, that microphone control would be extended to the Clerk or Mayor so that microphones can be activated remotely if a talker forgets to activate their own microphone, or if there's a more formal Robert's Rules methodology for activating microphones in the sequence the talkers had requested to speak, the Clerk or Mayor can activate them in sequence.

The audio system could be changed to use gooseneck microphones mounted at each council and staff position and presenter's podium. The presenters may use a wireless lavalier (tie-clip) microphone since they often will not sit for their presentation, and may need to move around.

In the simplest audio system, there'd be a button at each council or staff microphone that would light up when the microphone was activated so that each person would know when their microphone was live. The presenter's microphone could be remotely activated and adjusted in level by the Clerk.

In the more complex system, the microphones could also be activated by either the clerk or mayor. In the most advanced system option the microphones can be activated in the order that they are queued through a "request to speak" button on each council desk, with a visible indicator for queued/live status at each position. The list of speakers in the queue would be visible on the mayor's and clerk's control panels. The queue may be by-passed, and microphones random accessed by the clerk or mayor using the touch panel. The clerk and mayor may mute any or all microphones at any time through the touch screen control.

The Request to Speak Queue display on the touch panels would have an indicator that shows when a councilor has already spoken to the agenda item and are in the queue for a second time. There could be the ability to have two amendment levels to the queue so that the main motion queue can be suspended until the amendments to the motion have been handled, and then discussion can resume on the main motion.

There could also be a system setting that would allow the microphones to be operated by the automatic microphone mixer for committee meetings where strict speaking order control is not required. The operating levels of the microphones will be adjusted automatically to accommodate a small range of variation in speaking level. It isn't possible to have unlimited automatic level adjustment for speech reinforcement without creating a feedback problem, but minor variations in level between various talkers can be compensated for. It is *always* recommended that microphones be turned off when someone is not speaking to reduce the feedback potential and ambient noise pickup.

Individual microphones would also have mute buttons so council and staff can have private conversations or can turn the microphone off for coughs and throat clearing. The status of the individual mute buttons will be reflected on the mayor and clerk's touch panels. These could be a momentary button that only mutes the microphone when the button is held down, or they can be a push ON, push OFF function if that works better with the City's procedures.

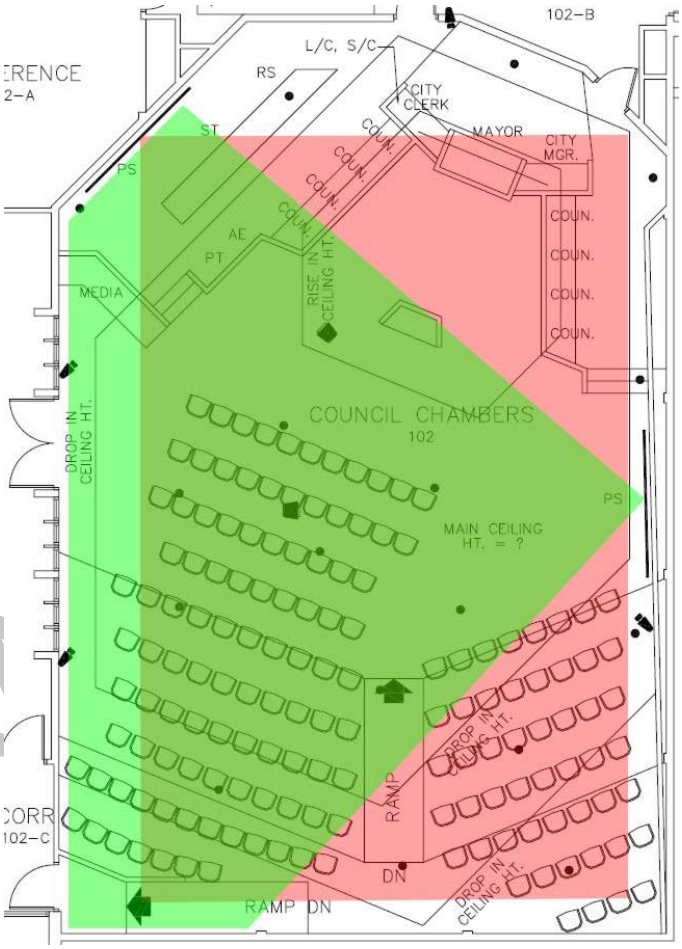
The sound system will provide the gallery and councillors with the equivalent sound level of a person speaking at a distance of eight feet. The sound system makes up for the distance between talkers and listeners without sounding over-amplified. This sound level has the effect of making the sound system unobtrusive, so the audience directs their attention to the talker and not the sound system. The gallery loudspeakers would be ceiling mounted, and should be changed to high quality units so that AV playback and voices sound completely natural, and distortion-free.

The mayor and council desks currently make use of ceiling mounted speakers for speech AV playback support, and the amplification of the presenter's microphone to the mayor and council. It would be worth considering modifying the council desks to implement the individual desk mounted speakers in the upstand to allow the council to be amplified across the desk horseshoe. The council desks would each have a small loudspeaker in what is called a "mix-minus 3"

configuration. This allows each seating position to hear everything else that is being reproduced with the exception of their own microphone, and the person either side of their seat.

3.0 Video System

The current video display system is not located for optimum viewing for the gallery or council seating. Far too many people are having to view the material at an extreme off-axis angle and the screens are too small for the maximum viewing distance in the rear 1/3 of the gallery. The red overlay defines the maximum viewing angles for the staff screen and the green overlay defines the maximum viewing angles for the side wall screen.



The maximum usable off-axis viewing angle for front projected images is +/- 45 degrees for medium size text. For small text or small object details, the viewing angles will be less than that.

The minimum screen size for viewing computer application text (10 point is typical for web browsers, spreadsheets and GIS mapping systems) can be estimated by taking the maximum viewing distance and dividing that by 4 to determine the screen width. Then the screen height is determined by multiplying the screen width by 0.75. Those calculations will result in an equivalent image size to sitting four feet away from a 15" computer monitor on a desk, so this is not an extravagant screen size estimate.

The distance between the seating in the rear of the house right section to the screen behind the staff desk is roughly 60 feet. The minimum screen size for those seats would be roughly 11' high x 15' wide. The available unobstructed screen height on the screen behind staff appears to be less than 6' high, which would result in an image less than 8' wide. This is just over half of the size required, or is only adequate for a viewing distance of 32'.

The distance between the seating in the rear of the house left section to the screen on the side wall is roughly 44 feet. The minimum screen size for those seats would be roughly 8.25' high x 11' wide. The available screen height appears to be about 6' which would also have a screen width of roughly 8', which would only be effective for a viewing distance of 32'.

The ceiling is quite low to provide a suitable sized screen with the depth of gallery seating as it is configured now.

The projection screens do not provide convenient viewing for all the council and staff, much of the council are too far off axis. A more suitable approach would be to have LCD flat panel monitors on

the desk to provide a high resolution image without compromise in viewing angle, light conditions, or obstructions between the viewer and screen.

These LCD desk screens can also be used to display local computers if the desks are so equipped, or to display an agenda from a dedicated agenda computer under the Clerk's control. Switching can be provided at each seat position to allow the LCD monitors to view the presentation feed, or the local computer, or a third option of an agenda computer feed. It is also possible to leave the agenda on the network and have the local computers point to that URL on the network using a web browser on the local computer.

The video system will use offer several conventional video sources, plus specialty video source devices to convert other media types to a video format, eliminating the difficulties of combining overhead projection, DVD and video tapes and computer material in a single presentation. This moves from a convenience to a necessity if broadcast, internet video streaming and video conference capabilities will be included in the system, as that is the only way to share the non-video material at a distance.

Video Sources

Video Document Camera (Elmo)

The video document camera serves the basic function of an overhead projector, allowing the presentation of overhead transparencies, opaque documents and drawings, or 3D objects that will fit on the light table. The video document camera consists of a high resolution video camera with integral upper lighting, similar in size and configuration to an overhead projector. The most significant advantage is that the document camera can be conveniently located near the presenter as it does not project an image itself, it feeds a video signal to the permanently mounted video displays. This eliminates the difficulties of having the presenter look into a bright light source, and having the screen size be dependent on the overhead projector location, with the associated image keystone distortion problem. There is no cooling fan to create additional noise. The video document camera also allows the paper presentation material to be included in the video taped minutes of the meetings or used for video conferencing. The unit produces an XGA resolution output similar in quality to a laptop presentation, allowing the same text size to be displayed. This unit would be located on the presenter's desk, and could be permanently mounted, or could be removable if desired.

The current Elmo document camera is a lower resolution composite video model. The latest models offer full motion XGA (1024x768 pixel) resolution images, so they can display a 10 pt. font printed page in crisp detail.

Ceiling Camera

The new generation of ceiling cameras can capture high resolution images of large format architectural drawings up to A0 or poster boards. The camera can zoom in to make a door symbol on a 36”x48” drawing appear full screen. The camera is mounted in the ceiling and has a defined image area that should be aligned with a table location.

DVD Player

A DVD player should be considered as well, as these are the most common video source currently. It is possible to use a combination VCR/DVD player if support for international multi-standard videos is not required.

Digital Cable Box/Tuner

A digital cable box or tuner is a useful addition to an AV system in a public facility like this, as it allows special presentations beyond civic meetings.

Computer Presentation Capability

A connection for a permanent or portable presentation computer could be provided at the presenter’s desk. This would accommodate either a PC or Mac running 1024x768 pixel (XGA) resolution. This would allow for PowerPoint type presentations, display of computer applications such as databases, spreadsheets, AutoCAD drawings or maps, Internet or Intranet Web-browsers or other business software. XGA is the highest practical resolution for use in a large scale display system. The text and icons tend to be too small when using 1280x1024 resolution unless a larger display is used. The wide screen aspect ratios of the Mac Power Book computers present some problems if the presentation is left in the wide screen format, as those images are smaller in height when projected on a standard video screen (due to the black bars top and bottom). See the discussion below on wide screen video displays for more information.

Additional computer inputs can be provided for the staff seating positions to allow fast and easy switch over to other computer displays that may be relevant to council or committee meetings. At a minimum level, the computer inputs could be shared between two adjacent staff seats. At a more complete system level, a computer input can be provided for each staff seating position, which would allow those seats to be equipped with permanent network computers for each seating position. This allows any staff person to source a presentation without leaving their seat, and it also allows for the possibility of using the room as an EOC or similar function where information must be shared with a large group, or several people need to generate information and have it displayed to the gallery and the people at the council and staff desks.

The most current generation of laptops have very high resolution attached displays (1400x1050 and 1600x1200 pixels are common, plus various wide screen variations) that are far beyond the ability of most video projectors to accept and display. The signals are also sufficiently high in video bandwidth that they can’t be carried very far over affordable video cable. These laptops have the ability to set the external monitor outputs to more sensible resolution for a video projector (XGA 1024 x 768 pixels) but this is seldom set by the laptop user. One possible solution for the presenter’s laptop inputs is to add a scaler that automatically senses the signal bandwidth and changes it to a more practical 1024 x768 pixels for projection and display on LCD monitors. That could be located at the presenter’s location to minimize the signal losses before the signal is scaled.

Video Display Systems

Gallery Displays

The primary video displays for the gallery are the large screen rear projection systems on the side walls. For the depth of gallery seating being considered, these displays would need to be much large in size to be viewable in the back row. Currently they are constrained by the ceiling height at the wall. Raising the ceiling height would obviously be quite complicated.

An option to consider might be suspending three or four large flat panel displays over the gallery to provide better viewing angles and a more suitable image size for the gallery depth. This was necessary in Prince George Council Chamber which also had a low ceiling and a deep gallery seating section. It is possible to provide equivalent image resolution and size to the optimum sized wall mounted projection screens by locating the screens closer to the gallery.

The cost of the flat panel displays have dropped considerably in the past few years, so this is an option worth considering.

Desk Video Displays

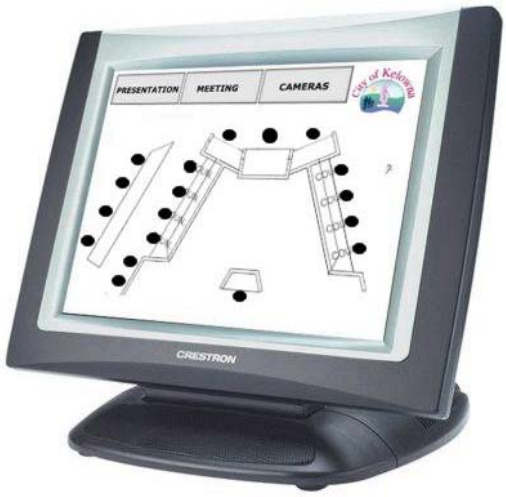
The staff and council desks could make use of 15” LCD flat panel displays, one per desk. The cost of these monitors have dropped significantly in the past 3 years and are now a cost effective solution where space is tight and heat output must be limited. The high resolution and contrast ratio provide very good display quality for small details as those found in ACAD drawings and maps.

The individual in-desk monitor feature could be combined with individual computer inputs to allow the room to be used for computer training or EOC type functions, as well as computer based presentations from each seating position. Each monitor could display the individual local desk computer or either of the two main screen display images. The council could have access to their agenda during the meetings, either from a local computer or a distributed agenda display signal. This system would be able to co-exist with the control and routing functions defined for the council activities. This training capability makes the room suitable for corporate rentals as well, if that is within the program of the City of Kelowna.

4.0 AV Control System

If any degree of central control of the audio and video systems are required, then an AV control system will be required. The control processor is modular so it can be scaled as needed to suit the complexity of the AV system, but the basic processor and related modules will be required.

The control system will integrate the function of the many devices in the presentation system and the room. All of the necessary controls will be hooked to this central processor allowing them all to be controlled from one control panel.



There would be a main control panel which could be located at the clerk's desk, presenter's desk, or the mayor's desk. There could also be an ancillary control panel at the mayor's desk that shows the speaking order and meeting control functions if those are implemented. The touch screen would have controls for audio, video, lighting, screens, etc. From the control panel, they can control microphone switching for speaking order, activate/deactivate the audio feed to the Press, control the video input source selection, the transport of the VCR, the slide unit, camera selections and zoom, and other required functions.

Because the touch screen can be reprogrammed, it is easy to adapt the unit to changing operational requirements by changing the screen programming. As long as there is a control hardware interface for the device to be addressed, the changes are relatively easy.

The clerk's 12" touch panel would be a desktop adjustable tilt type. The mayor's touch panel could have a 10" desktop adjustable tilt screen and a smaller footprint. This would provide convenient display for the mayor so they are aware of the next 5 to 7 speakers in the queue, and have meeting control, but aren't faced with all the other system control features. This would eliminate the need for writing down speaking order as people raise their hand indicating a desire to speak.

It is possible to make that display of the order of speaking queue available to the council monitors as well, which has an advantage in that they know how far down the list they might be. This display would be in lieu of the AV presentation material or the agenda.

It is also possible to add voting capability to the system using the control system. Voting buttons at each board member position would allow votes to be cast and tabulated on the screen of the mayor and clerk. The mayor can receive just the number of yes/no votes, while the clerk's display could also have the list of names of those voting yes or no, or are absent.

Help pages would be available for each touch panel page to assist in system operation. The control system also has the capacity to allow a tech support person to view the touch panel remotely in a web browser and assist the board in system operation from a network connected computer anywhere in the building.

5.0 Council chamber Press/Media Support

Press support will be provided for printed/radio media and for Cable TV coverage. The press tables will have access to media distribution panels with multiple audio outputs to allow the connection of tape recorders at the press table. This press distribution will be fed from the combined microphone and A/V playback mix. This press audio feed can be muted at any time from the control panel to prevent recording of any material deemed inappropriate.

The broadcast audio feed will be the same mix of microphones as the press feed, and will be capable of being muted at the same time as the press feed. This balanced audio line would all be transformer isolated. The broadcasters would also be fed a switched composite video signal that is the same as that being delivered to the chamber video displays. A scan converter would be included to convert the computer display to conventional video to allow it to be recorded or broadcast.

6.0 Audio and Video Conference Capability

Once the audio system upgrades are in place, most of the hardware is present to implement audio and even video-conferencing. There is one additional requirement for the audio system that is only used for conferencing applications, and that is echo canceling per microphones. With so many microphones the only way to manage the echo (this is sometimes heard on long distance phone calls) that is sent back to the far end is by having an echo canceller per microphone. This must be in place to implement audio or video conferencing and needs to be ordered at the time the system is initially purchased.

By adding a digital telephone hybrid to the system, it is possible to turn the entire audio system into a very high quality teleconference package. This would operate through the touch screen control and would only require that the hybrid have a connection to a conventional phone line. This same telephone hybrid could be used to add a voice-only caller to a video conference as well.

To add the video conference capability to the system would require access to the Cable TV camera video signals, and a video codec (code/decode - converts video to a compressed digital signal for network transmission and reverses the process for incoming signals). In addition, 3x ISDN or 1x T1 high bandwidth data lines would be required, capable of supporting a minimum baud rate of 384kBps to a maximum of 2MBps for 30 frame per second full-motion video. The image at 384kBps is still heavily compressed and will have some image artifacts but they would be no worse than a VHS tape recorded on very slow speed. The image at 2MBps is nearly equal to Cable TV pictures. The high bandwidth data link can usually be leased when needed from Telus.

A separate control system page would provide all the necessary controls to operate the video conference, including cameras, video and audio selection, dialing, etc.

7.0 Council Chamber Listening Assistance System

The best quality listening assistance system is an infra-red radiator system. This system ensures uniform pickup capability in the chamber with good immunity to AC noise. The IR system has an advantage over FM wireless systems in that the signal does not leave the room. The receivers can be used with walkman type headphones for people with mild hearing impairment, or neckloops for use with hearing aids equipped with a T-Coil switch. Unless there is a specific requirement for a larger receiver count, six receivers could be provided with the package. Some municipalities have been able to secure corporate donations for the purchase of the hearing assist systems.

8.0 Recording System

The most popular council Audio/Video recording device has been a VHS VCR that includes a counter that reads hours/minutes/seconds, and a shuttle/jog control. This would allow the minutes to be transcribed from a video tape. This allows for continuous recording of up to 8 hours without having to change tape. This also allows a record to be kept of any visual materials that are presented in the meeting, as any video support materials would be switched into the logging recorder. This system can be used in parallel with a conventional Dictaphone recorder, as the VHS recorder can capture any event that may fall in between the Dictaphone tape change-over in long meetings.

There are several computer based products on the market that allow direct archiving of the audio and video meeting recordings on a computer server. These systems are primarily intended for enterprise level corporate applications and court recording, where a steno pool would have access to the various audio recording for transcription. Some of these server-based transcription systems can be integrated with a streaming network media delivery, allowing meeting agendas and minutes, plus meeting audio recordings to be stored on a City server for retrieval by the public or the staff.

These computer based media storage and retrieval systems require a fair bit of management by the IT department, both in ongoing computer configuration and maintenance, but they offer numerous advantages if there is a standing requirement to provide more Internet accessible council content for the public.

The most recent audio-only option is an inexpensive digital audio recorder that uses a flash card as a media. This can support over 14 hours of recording in WAV file format. If the device is connected to a networked computer, it behaves like a USB mass storage device, and the audio recording can be moved to the computer or transferred to another storage device on the network. Then it would be available for transcription or review by a secretary in the steno pool, or by the clerk's department, simply by playing it back on the local computer using Windows Media Player.

Digital video recorders are becoming more available as well, able to replace the VCR as a media for both audio and presentation video signals. These devices can hold up to 50-100 hours of video on internal drives, and again when connected to a networked computer, they appear as a mass storage device, and those AVI files can be moved to any network storage device or location for later review.

9.0 Webstreaming and AV/IT Demarcation

Except for the audio and video outputs from the AV system, all of the basic media webstreaming configuration is primarily computer hardware and software that can operate in a stand-alone fashion. Windows Server package includes a basic web streaming codec, but it will not support a large number of simultaneous users (it's suited to a small intranet rather than internet use). It can be implemented as quickly as connecting the audio video feeds to a video capture card in a server. This type of product is not usually well suited to being supplied by an AV integrator, it's more of a computer vendor product.

The ability to append the related audio and video streaming media files to each section of the agenda and minutes files on the City website is also possible, but that involves a separate software package that can be quite expensive. That media software package would likely have a cost between $5,000 - $25,000 depending on how elaborate the capabilities must be, and likely

1/3 of a man-year in time to establish it's full functionality for the City. The primary market for software like this is very large multi-national corporations (IBM, HP, Xerox, etc.) that need to combine documents and training or marketing videos into a single web based presentation for use by their employees around the world. It can even incorporate the Power Point presentations and video with all the related documentation. There are currently a wide variety of software companies offering a software package like that.

The same software could be used to generate training programs for intranet use for the City, or training and information material for public programs, as well as assembling the media-enhanced minutes for public web access. That may help amortize the costs across several programs within the City.

Most cities have found that the cost to own a high bandwidth media server and internet connection that will support a large number of internet online users connected to the streaming server is prohibitive. It is often much less expensive to find a local service provider that can host a mirror server for the media files. They typically charge on the basis of traffic, bandwidth and number of connections.

There are other demarcation points between the AV system and the IT department's area of interest, beyond the webstreaming network and server configuration.

Where ever computers are used for presentation of material, the presentation computer and network configuration will be within the scope of the IT department. The AV system will pickup the video monitor output and any audio output from those computers, and deliver that to the room.

If the AV system is upgraded to include a control system, the control system is capable of remote support and operation over a network. This would allow someone in another location within the City's network to login and access a browser based replica of the touch panel in the chamber. This can be used to help a new user through the system operation, or to troubleshoot a problem during a meeting by viewing the state of the control system. It is also possible to run an executable application on a remote computer on the network and have the same functions without needing a web browser. It does require ActiveX controls on the remote computer, so permissions may need to be set by the sys admin.

10.0 Service Agreements

A service agreement for the AV system can be tendered or negotiated for the period after the warranty expires. The cost of the service agreement can vary widely depending on the following factors:

1. Scope of service covered by agreement (some equipment, all equipment, select systems, etc.)

2. Required speed of service response and resolution of problem.

3. Requirements for stocking spare parts and equipment.

4. Determination of which items are to be supplied as part of the agreement versus purchasing needed repair or replacement items at an agreed upon markup over cost.

5. Requirements for providing 'loaner' equipment with agreement.

6. Required schedule for regular service or maintenance.

7. Methods for handling items that are normally outside of service agreement (operator error, major building failures such as fire or burst pipes, electrical failures etc.).

A service agreement could range in price from $2,500 to $25,000 annually with the range of possible parameters for these items alone. Further discussion to identify cost/benefit analysis and the service priorities would be advisable.

The typical arrangement for most cities seems to have the IT department acting as first responder to determine what has happened, and to see if it is possible to fix the problem using a reset button. If that isn't adequate to restore function, then often the IT department can grant network access for the AV contractor to log in to the control system and audio processor to determine what has happened and if it is a remotely repairable issue or a hardware issue that requires a service call.

With enhanced features and functions comes more vulnerability to unforeseen problems. Because so much of the system configuration is done in software in modern equipment, there is always the possibility that software glitches will be discovered in the manufacturer's firmware or software, or in the AV contractor's programming.

We routinely find that the AV industry has followed the computer industry into the cycle of fast product turnaround and introduction with inadequate product testing. The primary issue being that manufacturers test equipment for the expected use and application, they don't test for error states or for situations or combinations of events that they haven't expected. An example might be that a power bump with the system in one state will have benign consequences, but if it is in the middle of some particular command implementation, it may have a catastrophic lockup that requires unplugging equipment from the wall to initiate a reset.

We have seen numerous recent examples of commodity type products like video projectors, which occasionally have communication errors that cause them to lock up and stop responding, and it can be a simple matter of the projector reporting their lamp hours in a different communication format than every other command string used, and it is sometimes misinterpreted by the control system, causing a lockup or shut down. It's sloppy product design done by a manufacturer not anticipating what issues that may create in practice.

It is usually left to the AV contractor to find these problems as the manufacturers invariably say their product works fine (in isolation), it must be the other manufacturer's product that is causing the problem. It's an industry wide problem with a lack of standardized communication protocols. Unfortunately the AV industry is very small by computer or automotive industry standards, so there is inadequate market volume to push for any functional industry standards that aren't safety issues.

Because the AV products are now so closely tied to software and software developers, it's difficult to achieve an overall system reliability any higher than a PC computer. A well implemented AV system might be as reliable as Windows XP and a system with lower quality implementation might be at a Windows 98 levels of reliability. The AV contractor's programming skills are now more critical than their wiring skills for system reliability.

11.0 Room Layout and Environment Issues

The room layout presents several issues that affect both the AV system use and TV coverage. The desk layout is also awkward for interaction between the council and staff, and for staff with the council and gallery.

Seating Layout

The deep gallery seating section is better suited to a room with a taller ceiling that would support adequately size projected images. The deep seating area also reduces the connection between the gallery and the council, as people near the back can't see council's faces clearly.

Staff seating behind council complicates the communication between the council and staff, and sets an apparent hierarchy to the members of the gallery. We have seen many variations of council layouts over the years, with a common layout being an extended horseshoe having the staff to inline with the council desks rather than behind them. Often the location behind council is the only space left for that many seats. The least effective location we've seen for staff is in the front row of the gallery as it puts them in a position to have their back to the public. It also puts them out within the coverage of the sound system for the gallery which compromises the ability to amplify the staff microphones adequately. Several chamber layouts are shown in Appendix A.

Lighting

The room lighting is not well suited for TV coverage; there are too many light types with different colour temperatures; the accent cove lighting creates an excessively bright light source for any camera wide shot; the balance of front light and down-lighting is not well suited to TV coverage; the bulkhead above the council desks are the most brightly lit area in the room which would skew the camera iris settings.

Proper lighting for this type of facility would have a balance of lighting from the front to get rid of raccoon eyes and shadows under the nose/chin, and from the top to provide task lighting and a general illumination level of the people to a level of 65-75 foot candles. Most lay people find proper TV lighting very uncomfortable and bright to sit in front of, but if the image quality for TV is important there is no alternative than to have about 70% of the light come from the front at a 45 degree angle above the line of sight. That usually leaves fairly bright lighting in the upper range of the council members field of view.

Vertical surfaces should not be brightly lit, but they should be uniformly lit, ideally using a tube type bulb cyclorama light or wall-washer.

Quartz spotlights are a very poor choice for use with a video camera as they have hot spots that are very visible in the video images. The lights that are best suited to lighting the foreground and background for video use are a true colour daylight or video optimized tubular fluorescent fixture.

12.0 A/V Upgrade Options

We'll outline the possible upgrade options along with budget estimates for each one. The estimates do not include the associated conduit or other architectural renovations to support these systems, those costs would need to be developed by other professionals. These estimates are GST extra.

AV Upgrade Level 1

The minimum upgrade would include replacing the IRP automixer with a newer analog automixer with better NOM management, and less draconian gating of the microphone signals. The current clip-on microphones could be re-used, but the staff microphones would be replaced with a better suited microphone. Ceiling speakers would be upgraded, and the speaker density increased for better coverage. No video display or control upgrade would be included. This is more in the scale of a system repair than upgrade as no additional conduit should be required.

2x 8 channel analog automixers (linked)	$ 3,300
5x staff and presenter microphones	$ 2,500
1x signal processor/EQ	$ 2,000
1x amplifier	$ 1,200
24x ceiling loudspeakers	$ 5,000
labour and installation	$ 6,000
AV upgrade Level 1 estimate total	$20,000 +GST

AV Upgrade Level 2

The next level of AV upgrade would incorporate a DSP based audio mixing and processing device and new short shotgun type microphones mounted in the staff and council millwork. The system would still continue to use ceiling speakers, but would split them into zones, so new home run speaker cable would be required. A small control system would be included for remote microphone control and some basic AV controls, but the control functions would be kept fairly basic (no request-to-speak microphone management). The existing video projectors could be upgraded to newer and brighter projectors. It is likely that additional conduit would be required.

1x DSP audio processor	$ 8,000
16x shotgun gooseneck microphones with plates and connectors	$12,000
1x multi-channel amplifier for ceiling speakers	$ 2,000
24x ceiling loudspeakers	$ 5,000
2x video projectors	$16,000
1x touch panel based control system	$10,000
misc cable and materials	$ 7,000
labour and installation	$20,000
AV upgrade Level 2 estimate total	$82,000 +GST

AV Upgrade Level 3

AV upgrade level 3 would involve most of the same upgrades as Level 2, but more sophisticated microphone control could be added, such as request to speak queue. The video and control hardware would remain the same, with the exception of more elaborate microphone control button plates for the council and staff.

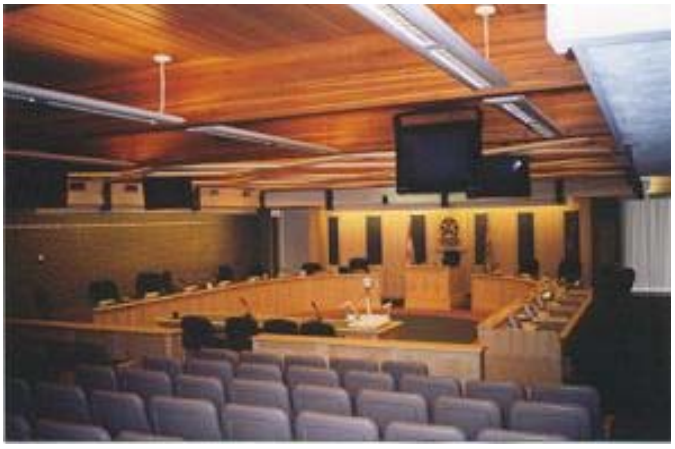
Additional control system hardware to Level 2	$ 5,000
Additional control system programming to Level 2	$15,000
Labour and installation	$ 8,000
AV upgrade Level 3 estimate total (including Level 2 total)	$110,000 +GST

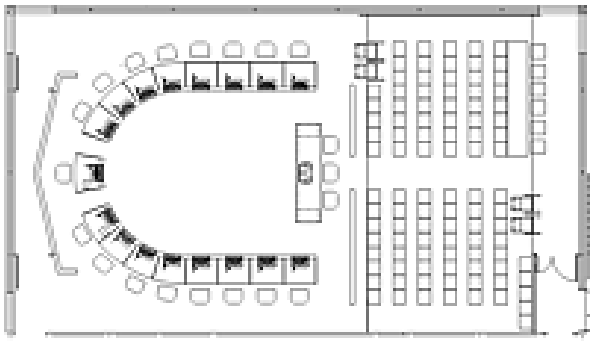
AV Upgrade Level 4

AV upgrade level 4 would include the audio upgrades as described in level 2, with one significant change, the council desks would have small loudspeakers incorporated into the millwork to provide better controlled voice and AV coverage for the council and staff. Gallery coverage would continue to be from ceiling speakers. In addition to the audio upgrades, local computer monitors would be provided for the council positions to provide more convenient displays for the council. Staff desks would have local computer display inputs so they can make presentations from the staff desks rather than having to move to a single presentation position. The video displays could be changed to ceiling mounted flat panel displays to optimize image size and viewing capability in place of the video projectors. The control system would be expanded to handle the additional items and would include the items in Level 3. The estimates are the additional cost over the total Level 3 estimate, taking into account deletions or reductions in items. This would require a sizable expansion to the AV related conduit system, likely in excess of $20,000 in conduit.

Millwork mounted speakers and amplifiers	$ 4,500
Desk LCD monitors, distribution and switching	$14,000
Additional computer inputs, switching and cabling	$ 8,000
Ceiling mounted flat panel displays, brackets and cabling	$20,000
Labour and installation	$16,000
AV upgrade Level 4 estimate total (including Level 2+3 total)	$170,500 +GST
Plus conduit and millwork modifications	$ 30,000-$40,000 (est)

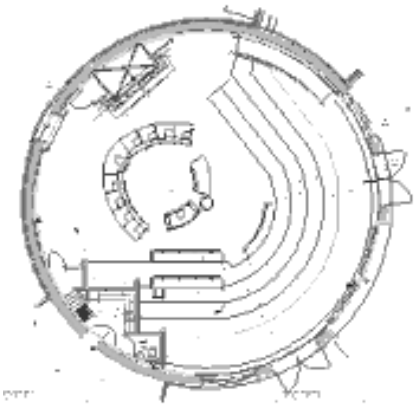
Appendix A
Examples of other chamber layouts



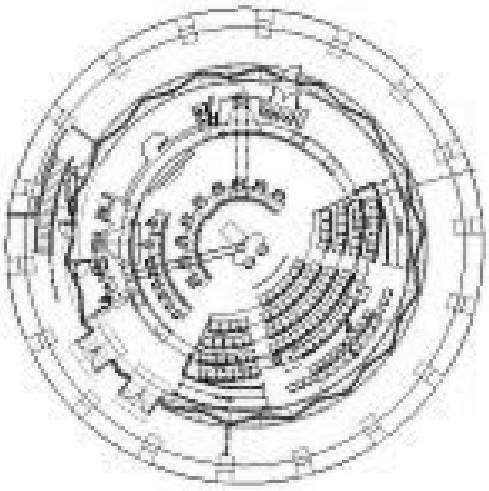


Prince George has staff in the seating horseshoe closest to the gallery, with ceiling mounted video displays

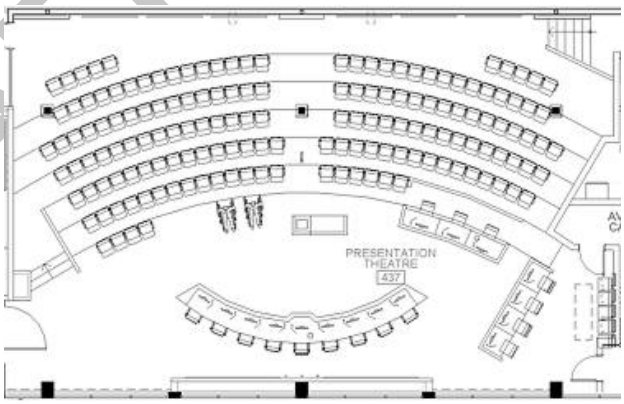
Burnaby has 2 additional staff desks behind the mayor/clerk/manager positions for the deputy clerk, secretary and staff seats. Burnaby has adequate ceiling height for a large projection screen above and behind the mayor.



Coquitlam is round room with the clerk/manager facing council, and balanced by the presenter's desk. Staff desks are in the front rows of the gallery seating and press front and centre.



Richmond is also a round room with staff behind council on one side, and the clerk/recording secretary on the other side Press are located in the very back for minimum distraction when they come and go. Presenter's desk in the middle. Round is not an optimum shape for any sort of meeting room, despite the trends in recent chambers.



Township of Langley has a rectangular layout with the front of the room being the long side. Staff desks face the council and the director's desks are on the council's right hand side. Presenter's desk is in the centre, press either in the front or back of the gallery, depending on the event.