



WYOMING STATE CAPITOL ACOUSTIC DESIGN REPORT

4/24/2024

TREANOR^{HL}



CCS

AVANTACOUSTICS

 HENDERSON
ENGINEERS



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1. INTRODUCTION

In response to the evolving needs and challenges faced within legislative and executive spaces, this report outlines a comprehensive approach to enhancing acoustic quality while balancing historical preservation considerations and budget constraints. The discussions held by the Capitol Exhibit and Wayfinding subcommittee have shed light on the complexities involved in identifying priorities, implementing effective solutions, and allocating resources. This report serves as a culmination of those discussions, providing a detailed analysis of proposed interventions, cost estimates, and recommendations for optimizing acoustic environments within the Wyoming State Capitol building.

The committee's deliberations have underscored the importance of addressing higher-priority spaces, where immediate improvements are warranted, and lower-priority areas, which require strategic planning for future enhancements. Recognizing the unique acoustic challenges posed by the historic nature of the building, this report recommends solutions that offer maximum efficacy with minimal visual impact, thereby preserving the architectural integrity of the Capitol while meeting contemporary needs. Furthermore, this report thoroughly considers cost implications by examining detailed preliminary cost estimates to inform decision-making and ensure responsible allocation of resources. By prioritizing solutions that balance effectiveness, historical sensitivity, and cost efficiency, the recommendations aim to create spaces that not only facilitate legislative and executive functions but also uphold the legacy and grandeur of the Capitol building for generations to come.

Through a complete overview of the proposed solutions, this report and the attached appendices provide the necessary acoustic treatments, mechanical adjustments, and sound reinforcement, along with associated cost estimates and recommendations for implementation. This collaborative effort and its informed decision-making endeavors to create an acoustic environment that fosters productivity, enhances communication, and preserves the architectural heritage of this beautiful Capitol building.

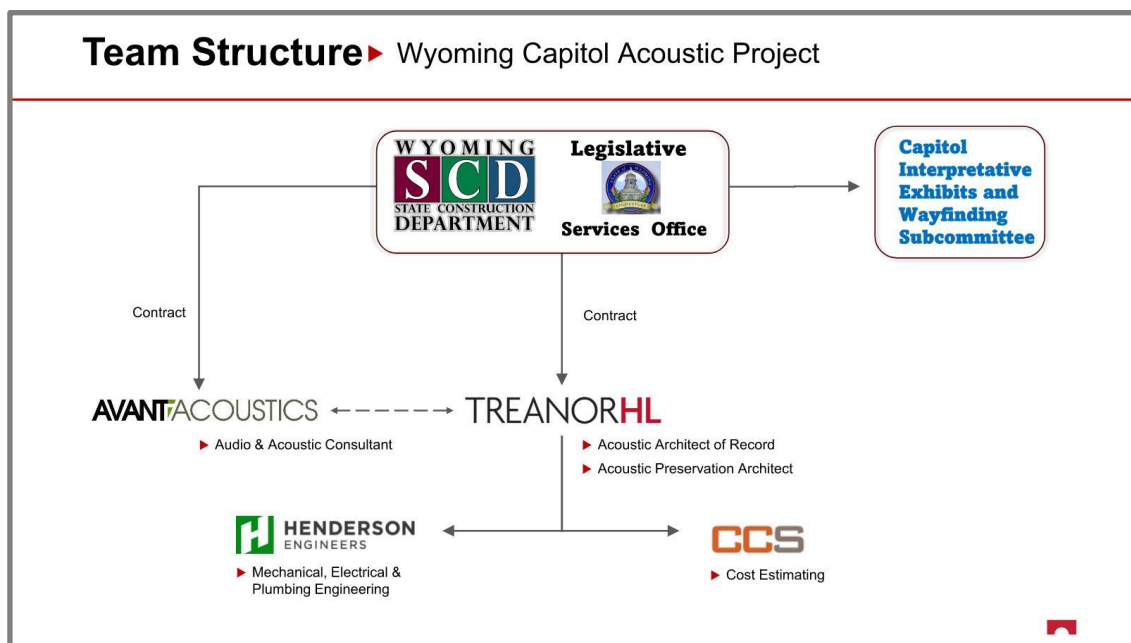


Figure 1 - Graphic illustrating team structure.



PROJECT CHARTER

During the assessment of the acoustic conditions of the Capitol complex, a project charter has been maintained. Within this matrix, locations and treatments have been identified and considered by this report. This Project Charter has been modified continually to reflect the ongoing discussion revolving around improving the acoustic performance of various capitol spaces. On the left, the locations within the Capitol are listed in order of higher priority to lower priority. At the bottom are treatments listed in order of invasiveness, from the least invasive solutions to the more costly ones. Within the matrix, the darker color signifies the corresponding priority to perform a given solution in the space. The Project Charter was our basis for the following evaluation and subsequent recommendations.

ACOUSTICAL PRIORITIZATION							
Location							
House & Senate Chambers							
Joint Appropriations Committee							
PMRs W110 and W113							
Ceremonial Conference Room							
Individual Offices							
Historic Supreme Court							
Rotunda							
Extension Corridor							
Capitol Monumental Corridors							
House and Senate Lobbies							
Treatment							
	Audio Programming & Training	Sound Reinforcement	Rugs/Draperies & Accessories	Mechanical Improvements	Acoustic Wall Treatment	Acoustic Ceiling Treatment	

← HIGHEST PRIORITY
↑ LOWEST PRIORITY

← LEAST INVASIVE → MOST INVASIVE

Figure 2 - Project Charter matrix developed by this team in cooperation with Sub-Committee. Darker cells represent greater inclination to the treatment option.

GOALS

1. First, do no harm. Do not negatively impact the investment made to restore the capitol.
2. Balance the need to improve acoustics without sacrificing the building's historic nature. There may be instances where a room's architectural integrity is more important than its acoustical performance (e.g., Historic Supreme Court).
3. Acoustical remedies employed should conform to historic building preservation standards whenever possible.
4. Spaces should be prioritized based on their use if there are insufficient funds to complete the full scope for all spaces. Rooms where good acoustics are critical to conducting public business should be prioritized over other spaces in the building (e.g., chambers are a higher priority than lobbies), as well as rooms used most frequently for public business vs. less frequently (chambers and JAC vs. W110, W113, and Supreme Court).
5. The scope of work should take a balanced approach regarding project quality, budget, scope, and schedule.

2. BENCHMARKING

LEARNING FROM OTHERS

The State of Wyoming benefits from other state capitol buildings having undergone similar renovations and shown different methods for improving the acoustics within a space. By looking at these examples, a benchmark for success is provided. Different spatial geometry, existing materials, and intended functions beckon unique solutions – a single room may employ various solutions – which is why it is crucial to consider multiple options. The following is a series of photos demonstrating similar improvement efforts in spaces that are comparable to this project's recommendations.



Figure 3.a – Kansas State Capitol – Acoustic



Figure 3.b – California State Capitol – Acoustic drapery



Figure 3.c – Colorado State Capitol – Acoustic ceiling



Figure 3.d – Kansas State Capitol – Furniture-mounted drapery



Figure 3.e – Kansas State Capitol – Acoustic ceiling



Figure 3.f – Kansas State Capitol – Acoustic ceiling, furniture-mounted drapery.



Figure 3.g – Kansas State Capitol – Acoustic ceiling, drapery, and area rug.



Figure 3.h – Idaho State Capitol – Area Rugs

HISTORICAL PRECEDENT

Although the study of acoustics began in the late nineteenth century, acoustic design is inherent in a building, regardless of whether it is intended. Over time, building designers have learned to control this phenomenon to create spaces that do not inhibit their audial functions. In this investigation, it was discovered that from the time this Capitol was constructed, there have been issues concerning the acoustics of the building. Within a short time, the acoustic problems created by the building's geometry and materials necessitated intervention. Acoustic treatment was consequently installed in the building.

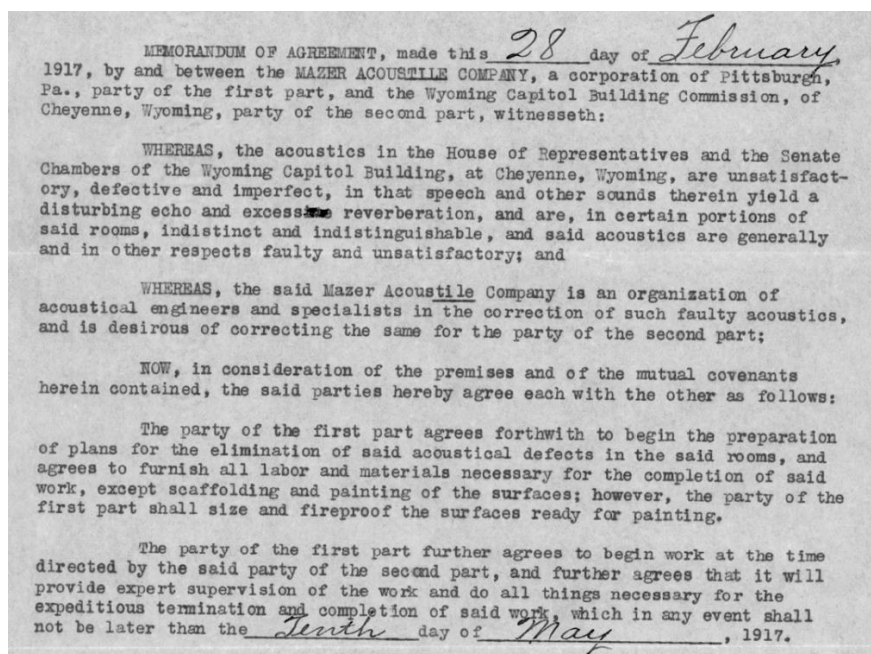


Figure 4 - Above is a portion of the contract showing the Mazer Acoustile Company having installed their acoustic treatment due to the "unsatisfactory, defective and imperfect" acoustics.

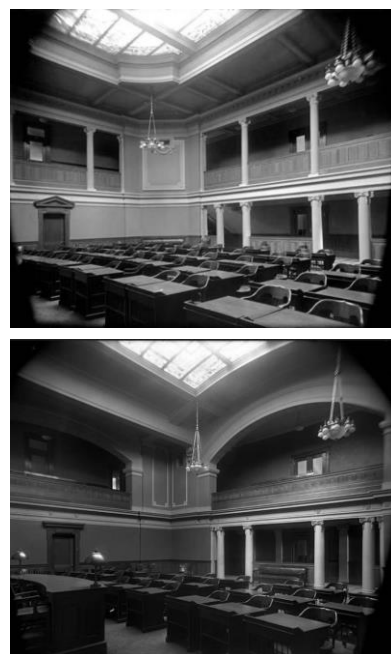


Figure 5 – Top: House Chamber circa. 1916.
Bottom: Senate Chamber circa. 1916.

RELEVANCE

Although the extent to which this treatment was installed is unknown, the fact that it was installed should be remembered as it provides relevant context, which this report intends to address.

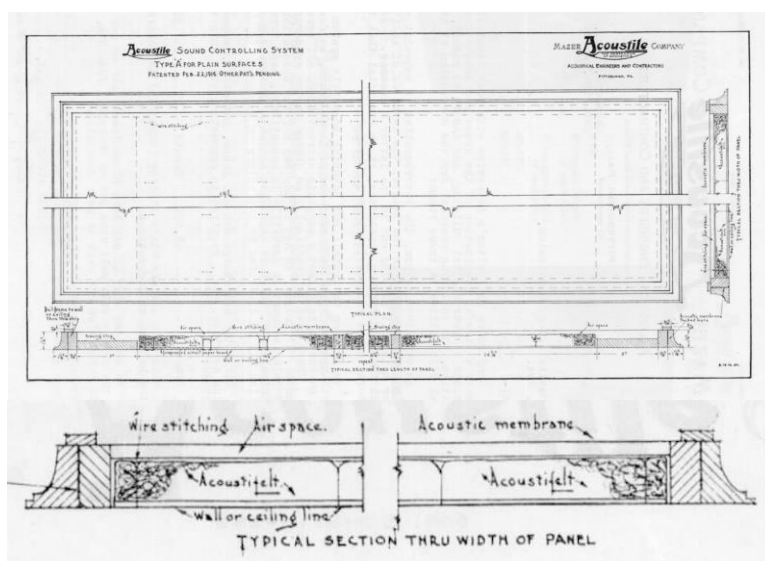


Figure 6 - Details showing an Acoustile Installation

3. FINDINGS

The approach to this study involves assessing each space individually and analyzing potential solutions tailored to its unique requirements. As addressed in the Project Charter, some spaces and treatments have greater priority, which has been used to organize this section. These priorities result from coordination with the State and intend to address deficiencies that impact the effectiveness of the public business done in this Capitol building. Avant Acoustics and Henderson Engineers have individually and extensively investigated each of these spaces. Their reports are attached as appendixes and should be referenced for additional information regarding their expertise and recommendations.

Priorities			
	Legislative	Executive	Common
High Priority	Joint Appropriations Committee (E301) Public Meeting Rooms (W110 & W113) Senate Chamber & Gallery (W212/312) House Chamber & Gallery (E214/314)	Ceremonial Conference Room (E107) Executive Conference Room (E142) Policy Conference Room (EG36) Policy Group Reception (EG14) Governor's Formal Office (E129) Individual Offices (E121 & E128)	Rotunda (C202) Capitol Extension Corridor Broadcast Studio (E027)
Lower Priority	Historic Supreme Court Meeting Room (E202) Data Closet (E202.1) Senate & House Lobbies (W206/C305 & E208/C303) Senate Break Room (W205) IT Work Room (WG11) Identified Replicable Solution Senate President (W213) House Speaker (E227) House Conference Room (E313) Individual Offices (EG02 & WG02)	Shared Conference Room (W107 & W107A) Individual Offices (EG25, EG30, W105)	Rotunda (C202) Capitol Extension Corridor Capitol Monumental Corridors Media Work Room (Sound Rooms) (E024C/D)

Connecting past to future.

As a part of the investigation, various graphic representations of the conceptual solutions have been developed and presented herein. These graphics include floor plans, reflected ceiling plans, elevations, and renderings of the acoustic treatment being considered in each room. Adjacent is a legend that will help define the symbolic illustrations. This legend should be used as a reference for the line drawings. Each material remains conceptual at this point but is elaborated within the description for each room.

LEGEND	
	Wall
	Drapery
	Ceiling
	Floor
	Speaker

This section solely compromises the architectural considerations of this report. For more information on the mechanical, electrical, plumbing, and acoustic investigation, attached are appendixes expanding on the associated conclusions. They have been referenced throughout these findings as a basis for our recommendation and further considerations for each room.

HIGHER PRIORITY LEGISLATIVE SPACES

The following section discusses the higher-priority legislative spaces determined to have acoustical needs. These spaces are expected to perform to the highest standard as they are the primary spaces where public business occurs for the legislature.

E301 - JOINT APPROPRIATIONS COMMITTEE ROOM

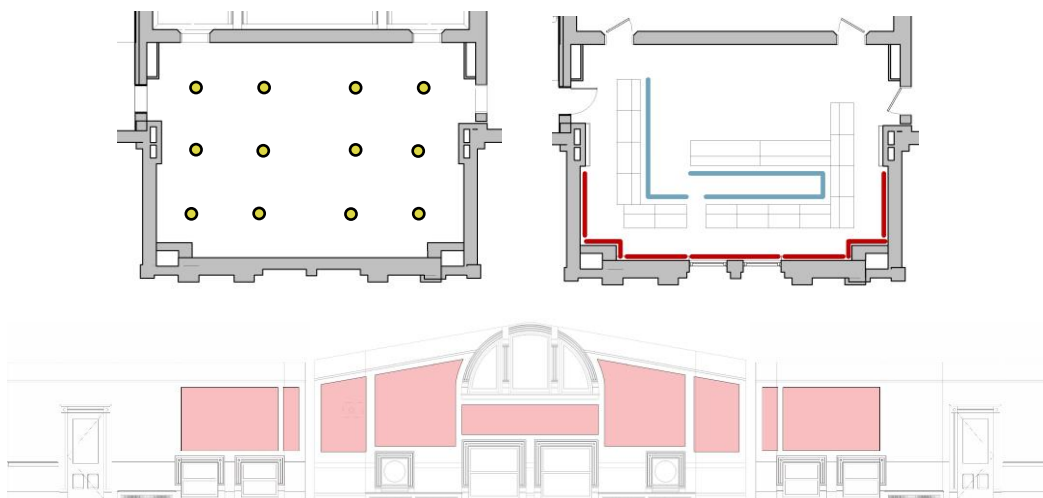


Figure 7.a - Floor Plan, Reflected Ceiling Plan, and Elevations of JAC

One of the highest priority spaces, the Joint Appropriations Committee Room (JAC), is frequently used by legislative committees. Due to the importance of public business in this room, it is essential that speaking is clear and intelligible. To add to the complexity, the room features a highly decorative ceiling and a large mural, which cannot be considered for applying acoustic treatment. What remains are limited areas to consider: the floors, walls, and furniture. Because the floors already have carpet installed, replacing it with a more absorptive carpet falls flat when considering the cost of replacement versus the benefit of the solution. The walls become the largest area of improvement where installing an acoustic wall treatment can impact the space. The wall panels may also better unify the decorative ceiling with the contrastingly bare walls, balancing the visual effect of the decorative elements within the space. Additionally, decorative stenciling may be appropriate on the panels to connect the walls to the ceiling visually. To install the acoustic wall treatment, wall-mounted cameras will be required to be removed and reinstalled as necessary. As featured in the benchmarking section, some of the existing furniture in this room grants an opportunity to install more absorptive material discreetly. Drapery should be installed from a mounted rail that blends into the existing woodwork at the face of the committee desks and the open shelving that faces them. These curtains would be unimposing but would further enhance the room



Figure 7.b – Existing JAC room.



Figure 7.c – JAC room with wall treatment and drapery installed.

acoustically. In addition to the acoustical improvements, upgrading to a new, overhead loudspeaker distribution would enhance the intelligibility of the system.

W110 & W113 - PUBLIC MEETING ROOMS

These public meeting rooms within the historic capitol buildings were newly constructed as a part of the previous renovation project. At the same time, public meeting rooms were built in the lower extension corridor and were coincidentally detailed differently. This difference in construction created rooms that are anecdotally more desirable to those scheduling meetings. The Public Meeting Rooms in the Capitol building, W110 and W113, while not genuinely historic, retain the character of the surrounding building. Consequently, to match this character, the exposed hard surfaces have left the spaces more reverberant than their counterparts in the extension corridor. Fortunately, these rooms provide ample surface area that can be considered for acoustic treatment because of the lack of historic elements and decoration. As a result of the reverberation calculations completed in Avant's report, they determined that either the ceilings or the walls should be considered for treatment, but not both. The wall treatment would be the acoustic plaster product used elsewhere in this project framed on the walls within the open surfaces above the chair rail, below the picture rail, and between the windows and protruding wall elements. Despite this, the recommendation is to install acoustic treatment only on the ceiling. The ceiling treatment should also be acoustic plaster applied in the spaces within the coffered ceiling. Molded trim may gradually transition from the existing ceiling to the new, absorptive acoustic plaster ceiling offset in specific dimensions to provide a complimentary border between the existing coffer beams and the new ceiling. The final decision must consider existing speakers, lights, fire sprinklers, *et cetera*, as the new acoustic plaster system will require removal and reinstallation of the elements as outlined in Henderson's report.

W212/312 – SENATE CHAMBER & GALLERY

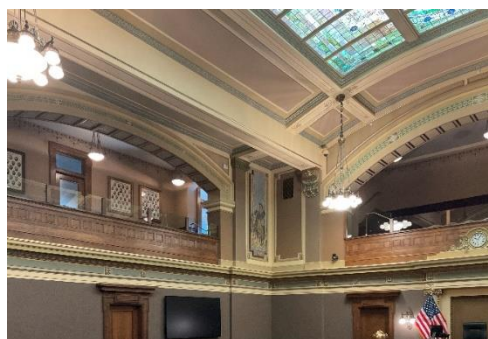


Figure 8.a - Existing Senate Chamber

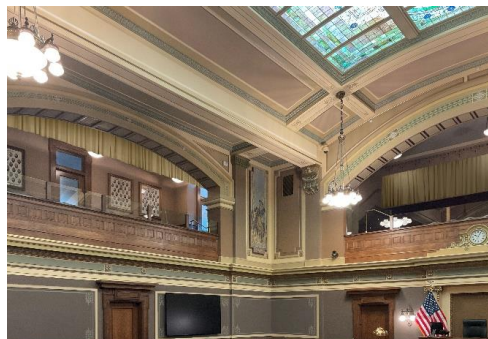


Figure 8.b- Senate Chamber with acoustic wall treatment and drapery.

The Senate Chamber presents a challenge in maintaining the preservation of the historic character undertaken by the last renovation. Whatever is modified in this space should not divert attention from the beautiful work already completed. However, due to modern expectations and the need for the Legislators and public to hear clearly what is being discussed, modifications must be made to enhance the room's acoustic performance.

Throughout the chamber's history, the room has been host to various acoustic treatments, with the first improvement effort being taken shortly after the capitol building's completion in 1917. At the time, acoustic treatment featured fire retardant-treated animal wool, likely containing asbestos, covered by canvas with a profiled wood frame. Research has shown that a similar product called *Acoustile* was installed in this chamber on the walls. Sometime later, 12"x12" acoustic tile was installed as wall treatment in this room. However, it was a noticeable eyesore that resulted in its inevitable removal. Acoustic wall treatment does not have to look like an afterthought and should not, especially in a grand space such as this legislative chamber. Instead, following the historical precedent of the early twentieth century, acoustic wall treatment may be in the form of acoustic plaster framed by profiled molding. The acoustic wall plaster can be painted to match the wall color, or it can be painted a soft accent color. Likewise, the frame around the plaster can be seamlessly integrated into the color of the wall or painted like the adjacent moldings and decorative



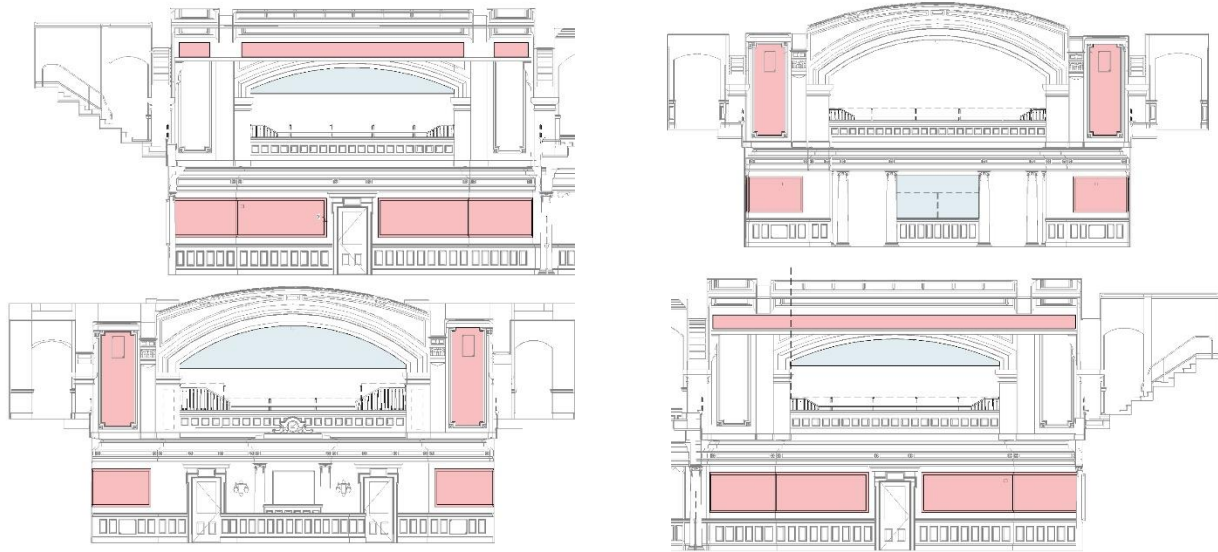


Figure 8.c - Senate Chamber Elevations

elements. In Figure 8.b, the panel is the same color as the existing wall, and the frame is painted to match the other molding in the room. Additionally, the drapery at the gallery serves to block the excess sound from the ceiling-mounted speakers and absorb reverberant sound at the upper level. In this case, the drapery would resemble heavy valance curtains fit within the arches on the north and south sides of the room. On the east wall, behind the riser seating, a curtain should be installed to increase the absorption within the space. At the ceiling, to achieve the desired performance based on Avant's calculations, acoustic plaster should be installed in the space behind the bar on the lower level and the gallery near the entrance from the lobby. All wall and ceiling treatments outlined will require modifications to wall-mounted cameras, grilles, displays, and ceiling-mounted lights, speakers, sensors, and fire protection devices. Furthermore, if curtains are not installed, the gallery's ceiling treatment should extend throughout to replace the effect of the acoustic drapery, as recommended in the House Chamber. It is also recommended that the glass railings be replaced with an open brass railing system akin to those currently installed throughout the building. As it exists, the glass is a highly reflective surface, reflecting sound and light that distracts from the room both aurally and visually. Also, the glass partition, which separates the chamber floor and the area behind the bar, should be removed and replaced with drapery, which can be opened or closed to accommodate visibility while providing absorption when necessary. In addition to the acoustical treatments to the room, the Senate gallery would benefit from additional loudspeakers, evenly spaced, to provide adequate sound system coverage to the public seating areas.

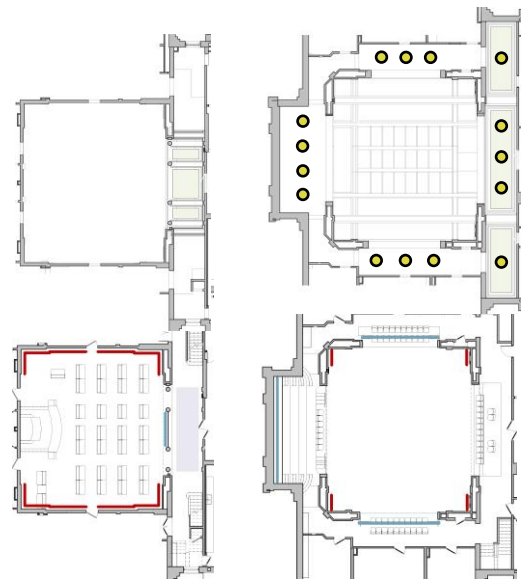


Figure 8.d - Senate Chamber Floor Plans and Reflected Ceiling Plans

E214/314 – HOUSE CHAMBER & GALLERY

Using an approach like the one taken in the Senate Chamber, it is possible to address the acoustic needs of the space with several different acoustic treatments. As noted regarding the Senate chamber, shortly after the capitol building's completion, acoustic treatment was installed across the building in various spaces to improve the acoustics. As a result of the room's design, the acoustics from the beginning were inadequate, and necessary measures were taken to improve the reverberation time. As recommended in the Senate chamber, wall treatment should be installed along the lower portion of the wall and in select areas on the upper portion. In this case, as seen in Figure 9.b, the acoustic plaster wall material is painted a soft accent color: one taken from the color palette of the existing room. While the Senate Chamber had arches to mount drapery behind, the House gallery instead features columns supporting the room's decorative cornice. Because of obstructions to installation, it would not be appropriate to utilize drapery. Acoustic plaster is recommended to be installed on the ceilings throughout the gallery. There are ceiling coffers above the dais, which, unlike the other coffers above the assembly space surrounding the laylight, did not have acoustic plaster installed as part of the previous project. These additional coffers should be utilized to increase the absorptive surface area by installing acoustic plaster similar to the adjacent coffers. The ceiling spaces behind the bar on the lower level and the gallery ceiling on the upper level near the lobby should also receive acoustic plaster treatment to achieve the desired reverberation time in the room. Like the Senate chamber, any wall and ceiling treatment would require various room fixtures to be removed and reinstalled as necessary. Finally, as recommended in the Senate Chamber, the glass railing at the gallery and the glass partition between the chamber floor and behind the bar should be removed. The railing in the gallery should be replaced with a historically appropriate brass railing system, and the glass partition should be replaced with drapery. In addition to the acoustical treatments to the room, the House gallery would benefit from additional loudspeakers, evenly spaced, to provide adequate sound system coverage to the public seating areas.



Figure 9.a – Existing House Chamber



Figure 9.b - House Chamber with wall and ceiling treatment installed.

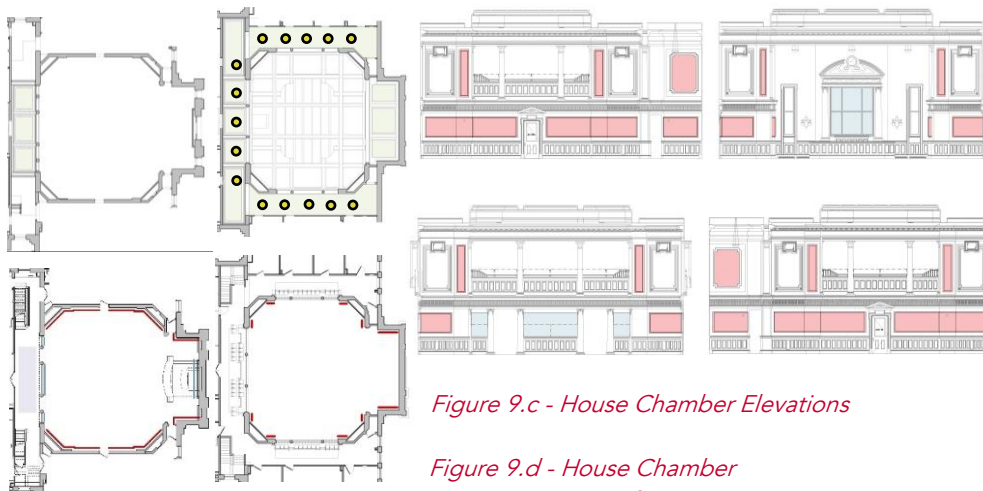


Figure 9.c - House Chamber Elevations

Figure 9.d - House Chamber Floor Plans and Reflected

HIGHER PRIORITY EXECUTIVE SPACES

Because of their smaller spatial volume, the higher-priority executive spaces require less intervention for acoustic improvement. It is critical to have acoustic treatment in executive spaces, which involves additional considerations not present in legislative spaces. The spaces included are used by the Governor's office and other staff in the executive branch of the state. They are often used for meetings, both in person and virtual, where the inadequate quality of the room acoustics and excessive noise have a negative impact.

E107 – CEREMONIAL CONFERENCE ROOM

Sitting just south of the entrance to the Governor's office, the Ceremonial Conference Room serves the executive branch in various functions. Many of these functions require an acoustically high-performing room because they involve broadcasting – whether in critical meetings led by the Governor or public addresses that may be recorded in this room. While this room benefits significantly from the beautifully upholstered chairs and elegant carpet, the remainder of the room's surface area is reflective, leading to a somewhat reverberant space. Avant has shown that acoustic treatment should be installed in the room to provide the utmost sound intelligibility. This room is another space where the treatment should only be considered in select areas and would not benefit from excessive absorptive material. While wall treatment could complement the existing east and west walls above the wainscot, the recommendation is to install acoustic plaster solely on the ceiling. This acoustic plaster should

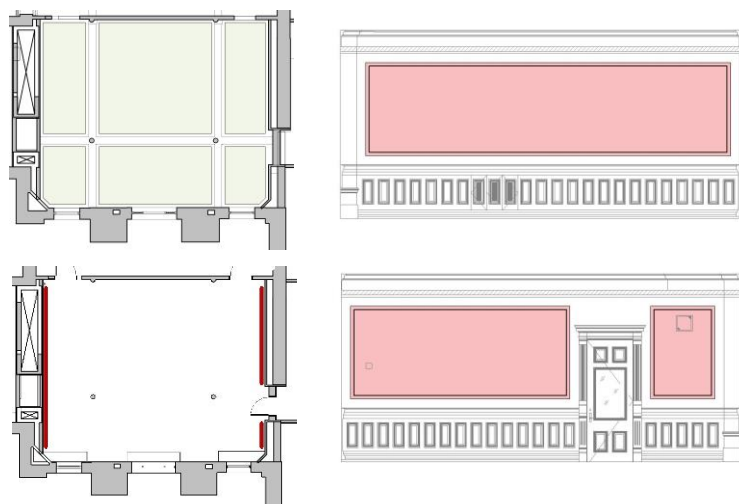


Figure 10.c - Ceremonial Conference Room Floor Plans, Reflected Ceiling Plans, and Elevations



Figure 10.a - Existing Ceremonial Conference Room



Figure 10.b - Ceremonial Conference Room with both wall and ceiling options shown installed.

be offset from the coffered ceiling beams at a set dimension to encapsulate what currently exists on the ceiling. Installing the treatment on the ceiling in this manner will significantly impact the existing elements, requiring them to be modified to install the plaster. However, the ceiling would be the most discreet visually and provide the most flexibility moving forward. Additionally, in the attached appendix, Henderson Engineers has included a solution for the mechanical unit within the space that causes excessive noise.

E142 – EXECUTIVE CONFERENCE ROOM

The Executive Conference Room has historically been the office of the Governor but is currently serving the Governor as a private conference room. Being a smaller space, the room performs only moderately well, but can be improved with the addition of acoustic treatment to fine-tune the reverberation to perform better for in-person and online meetings. Wall treatment could be installed on three of the room's four walls, blending into the environment. Still, to provide the most flexibility for hanging pictures, *et cetera*, ceiling treatment is our recommendation to improve the space. As with other coffered ceilings, the treatment should be offset from the coffer beams with a subtle molded trim that transitions to the existing ceiling over which it is being applied. As with the Ceremonial Conference room, Henderson has recommended a solution to improving the mechanical units within the space.

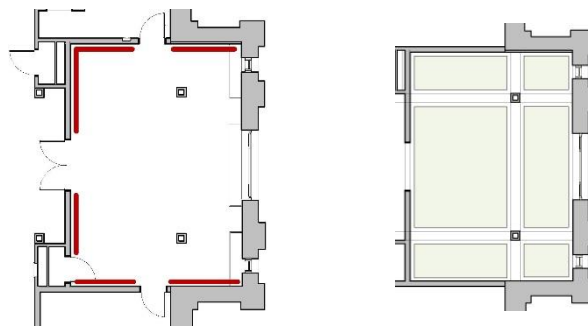


Figure 11 - Executive Conference Room Floor Plan and Reflected Ceiling Plan

EG36 – POLICY CONFERENCE ROOM

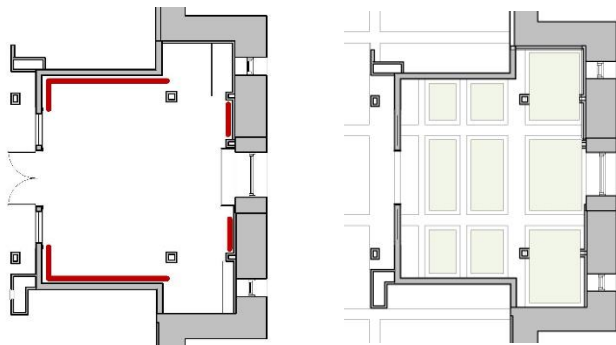


Figure 12 - Policy Conference Room Floor Plan and Reflected Ceiling Plan

Directly beneath the Executive Conference room, the Policy Conference room also suffers from poor acoustics and excessive noise caused by the mechanical units. Although State staff have installed some acoustic wall treatment within the room to improve the reverberation, the recommendation is that this treatment be removed and that acoustic plaster be installed on the ceiling, within the coffers. Acoustic wall treatment may be considered here, but only as a substitution for ceiling treatment. Utilizing the ceiling to keep the acoustic treatment out of sight is preferred over acoustic wall treatments for this room.

EG14 – POLICY GROUP RECEPTION

The Policy Group Reception area is served by two existing blower coil units that produce excessive noise and vibration to the adjacent space and structure. To mitigate the noise and vibration transfer into the space, some selective demolition shall be required. Each unit shall have their shipping and hold down bolts removed from their hangers. The unit's supply and return ductwork connections shall be replaced with flexible fabric connections. Each existing branch ductwork shall be demolished to provide new high efficiency taps as well as 45-degree transitions from the branch ductwork to grille connections. All new ductwork shall have 2" thick fiberglass duct liner. Additionally, neoprene waffle pads shall be added at each beam clamp to mitigate vibration transfer to structure. This area, while primarily impacted by mechanical issues addressed in Appendix 4, should have acoustic insulation and a layer of Type X gypsum board installed on the inside of the mechanical spaces to mitigate unwanted sound transmission.



E129 – GOVERNOR’S FORMAL OFFICE

The room currently functioning as the Governor’s office, which has historically been the Executive Conference room and is connected by a doorway to its current location, likely performs only moderately well, but can be improved with the addition of acoustic treatment. While the acoustic concerns in this room may be primarily related to the mechanical issues outlined in Henderson’s report, acoustic treatment should be installed. In this case, we suggest that treatment be installed on the walls as acoustic plaster rather than on the ceiling. This acoustic plaster should have a profiled trim installed around the edge of the plaster and should be painted to match either the color of the wall or an accent within the room.

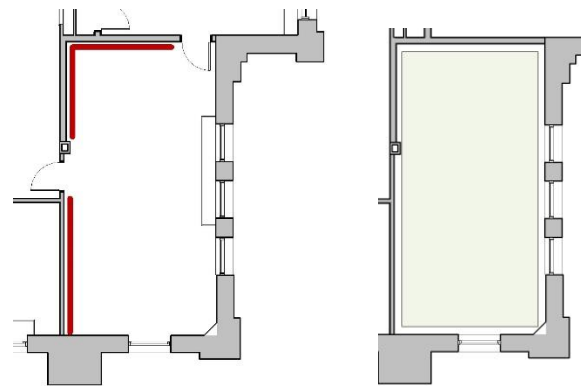


Figure 13 - Governor's Formal Office Floor Plan and Reflected Ceiling Plan

HIGHER PRIORITY COMMON SPACES

The higher priority common spaces are areas within the Capitol building and extension shared between the people of the State of Wyoming and their government, and they are primarily concerned with the deliberate connection between the two. Each of these spaces addresses how to improve the acoustics of the building to better communicate with the public.

C202 - ROTUNDA

The Rotunda has not been considered for architectural acoustic treatment as a part of the higher-priority common spaces, but a high-performance portable audio system has been recommended for use in the Rotunda during special events. Refer to Avant’s report in Appendix 1a for more information.

CAPITOL EXTENSION CORRIDOR

The Capitol Extension Corridor has not been considered for architectural acoustic treatment as part of the higher-priority common spaces, but a high-performance portable audio system (the same as recommended for the Rotunda) has been recommended for use in the corridor during special events. For more information, refer to Avant’s report in Appendix 1a.

E027 – BROADCAST STUDIO

The Broadcast Studio renovation is included in this project. The current space lacks the acoustic infrastructure to accommodate the broadcasting team and their significant role in communicating to the public. To elevate the broadcasting capabilities of the state, this investigation intends to serve as a basis of design for the State of Wyoming to create a space that fulfills modern expectations. Part of this report, along with Avant and Henderson’s reports, is a conceptual design of what that space may be.

Architecturally, the existing space in the Hershler building should be expanded to create more area for the production equipment and a proper

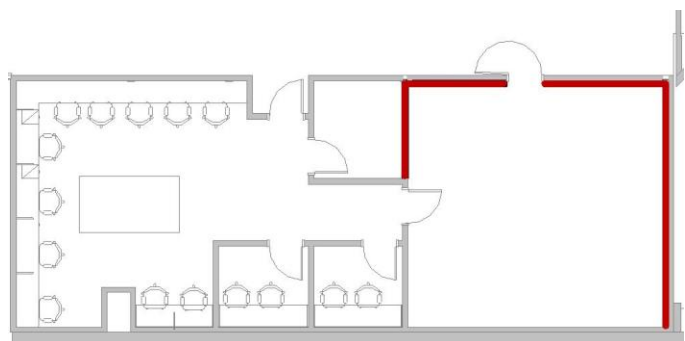


Figure 14 - Broadcast Studio Floor Plan

backdrop and recording space for the type of addresses and interviews that take place here. The room will be acoustically separated from the adjacent rooms with insulated walls, limiting the amount of sound transmitted into the room. Overhead, a noise control and acoustic panel ceiling should be installed as an absorptive barrier between the broadcast space and any equipment associated with the operation of the room. To accommodate the acoustic panel ceiling installation, the space's existing terminal unit will be removed and reinstalled in the corner of the space at a higher elevation. Ductwork and air terminals will be provided to distribute the conditioned air throughout the space. Additionally, new light fixtures, fire alarm devices and fire sprinkler heads will be provided to complete the fit out of the space.

LOWER PRIORITY LEGISLATIVE SPACES

Although most of the lower priority legislative spaces do not have the prominence of the higher priority rooms, they remain a pivotal step to improve the acoustic needs of the building's occupants. Most acoustic concerns in these spaces are related to mechanical issues and are detailed in Henderson's report.

E202 – HISTORIC SUPREME COURT MEETING ROOM

As a part of the previous renovation project, the Historic Supreme Court was beautifully restored to its historic grandeur. Although it no longer serves its original function as the Supreme Court, it will always be revered as such. Instead, this grand space has become a meeting room for the Legislature – reserving it for the most important occasions. As Avant has shown in their report, the room performs surprisingly well. In the renovation, acoustic plaster was used on the ceiling, greatly benefiting the room. Any additional improvements in the space should be considered in select locations. To further increase the room's acoustic performance, we recommend installing drapery on the east and west windows, fitting within the alcove and not interfering with the historic finishes. Additionally, as was done in the ceiling above, acoustic plaster should be installed at the underside of the balcony overhang on the barrel vault extending over the room's width. These minor improvements would achieve the recommended reverberation time detailed in Avant's report.

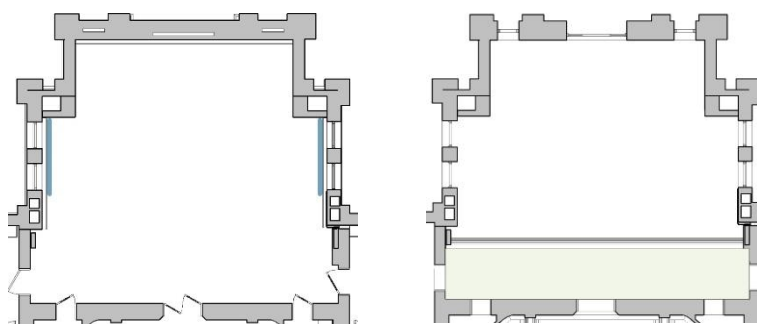


Figure 15 - Historic Supreme Court Meeting Room Floor Plan and Reflected Ceiling Plan

E202.1 – DATA CLOSET

The Data Closet near the Historic Supreme Court is currently conditioned by a plug-in style box fan. This fan produces excessive noise and is often unplugged by the adjacent space's occupants effectively preventing any heat from being dissipated from the space's AV rack. Henderson recommends that the plug-in fan be replaced by an in-line transfer fan. The fan will have an EC motor and be provided with a factory vibration isolation kit to mitigate noise to the adjacent spaces. The fan shall be controlled by a new space mounted temperature sensor so that the fan only operates when required.



W206/C305 & E208/C303 – SENATE & HOUSE LOBBIES

Although the official legislative process occurs in the chambers these lobbies serve, the conversations in these spaces are undoubtedly critical to what is accomplished within the chambers. The importance of an improved acoustic environment for these spaces is twofold. First, reducing the room's reverberation time will improve the speech intelligibility between conversing parties, which may prevent the exponential growth of loudness that results from individuals being unable to hear clearly. By reducing the potential loudness of the lobbies, acoustic improvement of this space can also mitigate any excessive noise that could spill into the chambers and other adjacent rooms. To provide the required absorption here, the floors should be utilized with the installation of an area rug. This solution will provide the necessary square footage of absorption without disturbing the walls or ceiling.

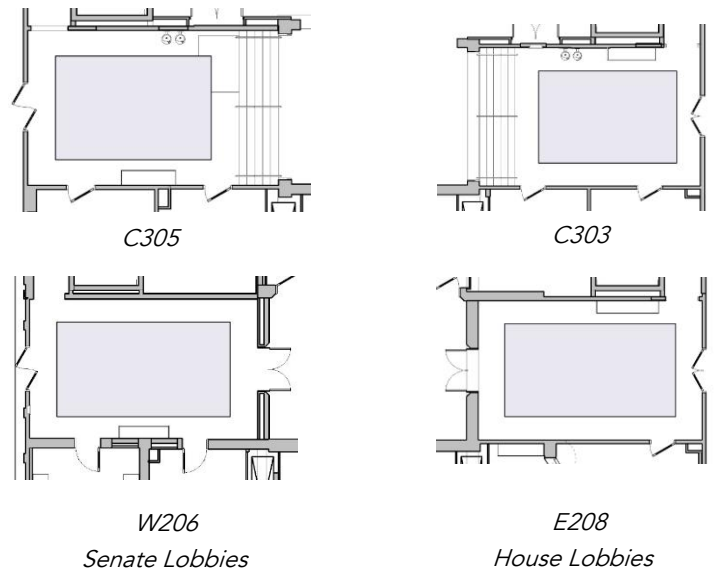


Figure 16 - Senate and House Lobbies Floor Plans

W205 – SENATE BREAK ROOM

The existing mechanical layout to the space is oversized and letting in too much airflow. To reduce the noise generated by the air distribution, Henderson recommends demolishing the existing supply/exhaust grilles and replacing with new smaller grilles. These grilles will be provided with cable-operated dampers to ensure proper airflow to the space. New ductwork serving the grilles shall be lined and at least one 90-degree elbow shall be added to mitigate noise transfer to the space. The Senate Break Room has not been considered for architectural acoustic treatment.

WG11 – IT WORK ROOM

Excessive noise is generated from the space's wall mounted supply grille due to the proximity of the grille relative to the adjacent space's mechanical room. Henderson recommends demolishing the existing branch duct and supply grille and replacing it with a new lined duct. The new branch ductwork shall have two new elbows to mitigate noise transfer into the space. The new supply grille shall be controlled by a cable-operated damper to ensure the room does not receive excess airflow. Apart from detailing a soffit to conceal the mechanical adjustments, the IT Work Room has not been considered for architectural acoustic treatment.

LOWER PRIORITY EXECUTIVE SPACES

As with other office areas mentioned in this report, issues with the mechanical system are hindering work in the surrounding area. While not included as higher priority items, this section contains rooms that do not need to be altered architecturally but as detailed in Henderson's report, have mechanical issues that need to be addressed.

W107 & W107A – SHARED CONFERENCE ROOM

The existing air distribution serving these spaces generates excessive noise. Henderson recommends demolishing the existing supply grilles and their associated branch ductwork. New ducts shall be provided

with a 1" thick acoustic fiberglass liner and new supply grilles. The supply grilles shall be controlled by a cable-operated damper to ensure they do not receive excessive airflow.

LOWER PRIORITY COMMON SPACES

Whereas the higher priority common space acoustic design addressed specific functions needing attention, the lower priority items focus on improvements that can be made to the existing spaces.

C202 - ROTUNDA

Considering the iconic elegance of the Capitol's rotunda, the historic character of the space is vitally important to the building. As a higher priority, Avant has recommended a specific sound reinforcement system to allow the space to perform better when functions are held there. When this is complete, the sound intelligibility will be improved, but some excess reverberation that could be reduced sensitively will remain. When looking at areas where acoustic treatment can be installed, the available surfaces are limited due to the historic decorative painting and other architectural elements. However, on Level 2, there are four open wall surfaces. We recommend installing an appropriately detailed acoustic wall treatment.

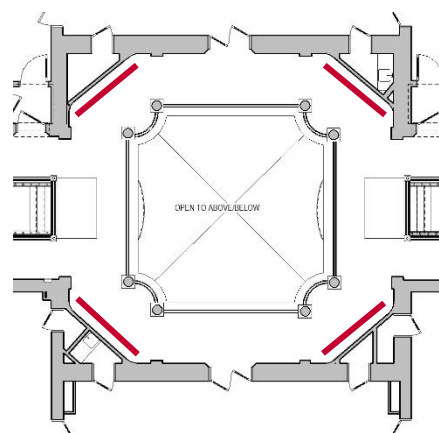


Figure 17 - Rotunda Floor Plan

CAPITOL EXTENSION CORRIDOR

In the underground extension corridor, the acoustics can be improved with a relatively small amount of wall treatment installed on the vertical surface of the skylight wells. This treatment would be unnoticeable but would further enhance the acoustics in the space, according to Avant's calculations.

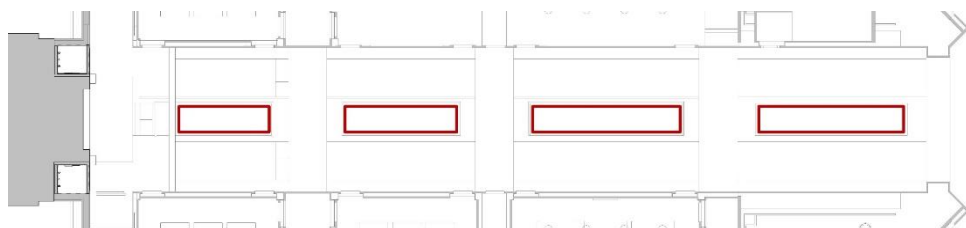


Figure 18 - Capitol Extension Corridor Reflected Ceiling Plan

CAPITOL MONUMENTAL CORRIDORS

Like the Rotunda, the Monumental Corridors are an essential character-defining feature of this Capitol building. This volume is expected to be acoustically warm, psychologically conveying the grandeur of the space. However, with minor improvements, conversations had by staff and visitors in the corridors would be better had if some absorption were introduced. We recommend installing area rugs underneath existing furniture clusters around the atrium spaces. These would not only benefit the acoustics of the corridors but also help further define the sitting areas apart from the circulation paths.

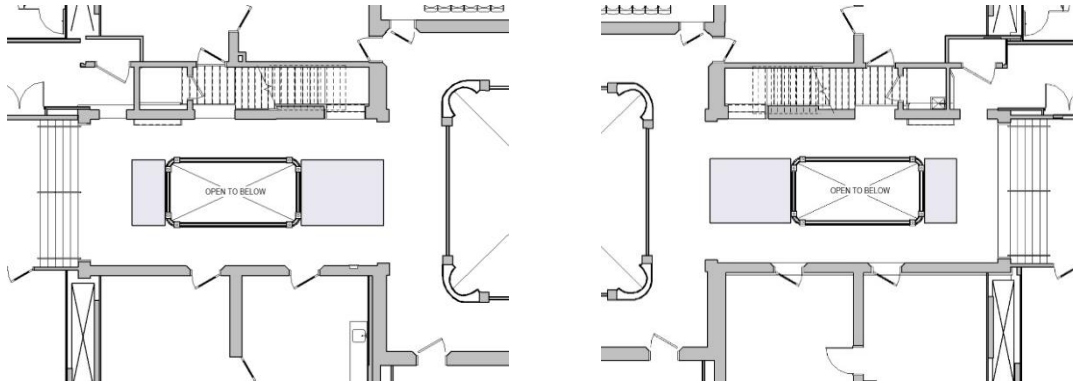


Figure 20 - Capitol Monumental Corridor Floor Plans

E024C/D – MEDIA WORK ROOMS (SOUND ROOMS)

The Media Work Rooms, or Sound Rooms, associated with the Broadcast Studio mentioned in the higher priority common spaces, need acoustical wall treatment due to the recording in these rooms. Fabric acoustic wall panels should be installed on two of the walls in each room to reduce the reverberation and the sound reflections that diminish the quality of the work in the rooms.

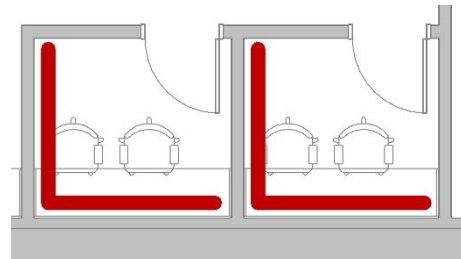


Figure 19 - Media Work Room Floor Plans

IDENTIFIED REPLICABLE SOLUTION

Henderson Engineers has identified a replicable solution that retrofits the existing fan coil units to reduce the excessive noise the units create. Every fan coil unit in the spaces outlined below shall have a 1" thick acoustic duct liner added to the unit's discharge, as well as a 1" thick baffle installed on the inside of the unit's intake. Additionally, alterations to the unit's control sequences shall be made to prevent the fans from operating at max speed when not required. Below are rooms that have been brought to our attention as needing improvement. Treatment shall be applied to these rooms as well as any others identified:

E107 – Ceremonial Conference Room

E142 – Executive Conference Room

EG36 – Policy Conference Room

E129 – Governor's Formal Office

E121 & E128 – Individual Offices

W213 – Senate President

E227 – House Speaker

E313 – House Conference Room

EG02 & WG02 – Individual Offices

EG25, EG30, W105 – Individual Offices

4. TREATMENT DESCRIPTIONS

This section may serve as a basis of design moving forward with the recommendations outlined in this report. According to the Secretary of the Interior’s Standards for the Treatment of Historic Properties, it is critical that the treatments be undertaken using the gentlest means possible. Anything that could damage historic materials in the installation process or hypothetical removal in the future should be avoided as best as possible. Each manufacturer has been thoughtfully evaluated for suitability in this landmark building, but an equivalent product may also be acceptable.

WALL

The primary wall treatment for this project should be an acoustic plaster product. Acoustic plasters are effective absorptive surfaces that can best match historic plaster finishes. Selecting an acoustic plaster that is durable enough to be used in places within reach is crucial. Therefore, the recommended product is **STARsILENT BY PYROCK**.

This product consists of a system built out of a 25mm recycled crushed glass board, a base coat plaster, and a top coat plaster with a smooth finish. Generally, this product will be mounted to a thin hat channel attached to the wall by either mechanically fastening or adhering to the existing plaster with glass or mineral fiber insulation in the cavity. The thickness of the system is about 1 1/2”.

Test Method/Authority	Property	Value
ASTM E605	Density	1.8 Lbs./Sq.Ft.
ASTM E84	Surface Burning Characteristics	15, 15
ASTM C423-84	Sound Absorption	NRC = 0.85 – 0.95
ASTM E761	Compression Strength	125 PSI

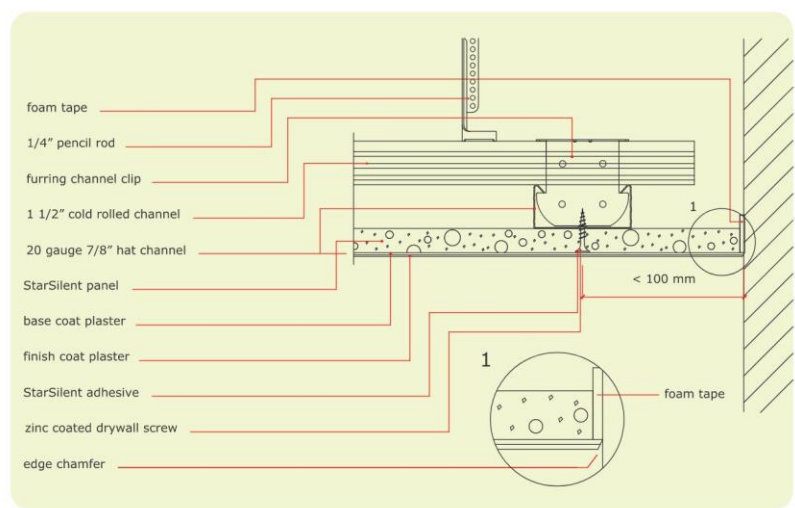


Figure 21 - Example detail provided by Pyrock.



DRAPERY

Fabric curtains such as those from **ROSEBRAND CRESCENT VELOUR** should be used where the use of drapery has been identified.

Material Composition	100% Polyester		
Width	54 in.	4.5 ft.	137 cm
Weight	13 oz/sq.yd.	1.48 oz/sq.ft.	452 gr/sq.mtr.
Weight	20 oz/l.yd.	6.67 oz/l.ft.	495 gr/l.mtr.
Construction	Napped	Woven	
Acoustical Performance	NRC = 0.95	SAA = 0.96	

CEILING

Like the wall treatment, the recommended ceiling treatment is **STARSILENT BY PYROCK**. This acoustic plaster could be installed on the ceiling by a similar contractor, thus negating the need for separate contractors if a different product were used.

FLOOR

Area rugs that comply with ADA and have sound absorption of around 0.95 should be used.

These treatments are subject to change during the design phase following this report.



5. COST ESTIMATE OF RECOMMENDATIONS

To provide the State of Wyoming with an accurate cost estimate of the recommended work, this report has been evaluated by the construction advisory firm, CCS. Their comprehensive report has been included as Appendix 5. By engaging with the cost estimator throughout the process, they became familiar with our approach and have been able to produce the following data. Each priority has been broken apart and shown as separate costs, assuming the work may be done independently. Furthermore, within each priority level, the cost has also been divided into the cost associated with each space.

SUMMARY

HIGH-PRIORITY ACOUSTIC RECOMMENDATIONS

Joint Appropriations Committee Room.....	\$57,471	Walls + Drapery
Public Meeting Rooms.....	\$302,064	Ceilings
Ceremonial Conference Room.....	\$168,627	Ceilings
Executive Conference Room.....	\$124,690	Ceilings
Policy Conference Room.....	\$88,428	Ceilings
Governor's Formal Office.....	\$69,889	Walls
Senate Chamber.....	\$360,627	Walls + Ceilings + Drapery
House Chamber	\$347,001	Walls + Ceilings + Drapery

HIGH-PRIORITY MECHANICAL RECOMMENDATIONS

E202.1 Data Closet.....	\$40,698	Mechanical
Executive Shared Conference Room	\$40,691	Mechanical
Executive Individual Offices	\$77,530	Mechanical

HIGH-PRIORITY SOUND REINFORCEMENT RECOMMENDATIONS

Joint Appropriations Committee Room.....	Included in Acoustic Recommendation Value
Senate Chamber.....	Included in Acoustic Recommendation Value
House Chamber	Included in Acoustic Recommendation Value
Mobile Sound System.....	\$15,000-\$18,000 Rotunda and Capitol Extension Corridor

LOWER PRIORITY HVAC & MISCELLANEOUS RECOMMENDATIONS

An incremental approach as funding allows	Potential for an alternate funding source.
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6. CONCLUSION

In conclusion, the committee deliberations have resulted in a comprehensive strategy for enhancing acoustic quality within legislative and executive spaces while navigating the complexities of historical preservation and budgetary constraints. Through rigorous analysis and collaborative discussions, the committee has identified high-priority areas requiring immediate attention and developed targeted interventions to address acoustic challenges effectively.

The proposed solutions, encompassing acoustic treatments, mechanical adjustments, and sound reinforcement systems, have been carefully selected to optimize acoustic environments while minimizing visual impact and preserving the architectural integrity of the Capitol building. By prioritizing solutions that offer maximum efficacy and cost efficiency, the committee aims to create spaces that promote productivity, facilitate communication, and uphold the grandeur of the Capitol for future generations. The recommendations discussed in this report identify the ideal acoustic performance of the spaces considered.

Furthermore, the detailed cost estimates provided in this report offer valuable insights into the financial implications of the proposed interventions, enabling informed decision-making and responsible resource allocation. While recognizing the need for prudent budget management, the committee remains committed to implementing solutions that prioritize acoustic quality without compromising the Capitol building's historical significance.

Ultimately, this report serves as a roadmap for enhancing acoustic environments within the Capitol, reflecting the sub-committee's dedication to creating spaces that inspire collaboration, foster innovation, and honor the rich legacy of Wyoming's state governing body. Through concerted efforts and continued collaboration, this report intends to assist the State in its commitment to ensuring the Capitol building remains a beacon of democracy and excellence for future generations. Following this report, the next steps towards this goal include holding a workshop in which decisions should be made that balance the ideal acoustical performance, budget, and impact on the historic Capitol building.



May 2, 2023

Ms. Gillian Welch
Dimensional Innovations
3421 Merriam Drive
Overland Park, KS 66203

Re: Wyoming State Capitol Acoustics
Cheyenne, Wyoming
AVANT File: C1117

Dear Gillian:

We visited the Wyoming State Capitol over three days, January 23-25, 2023, to observe site conditions and perform subjective and objective acoustical tests in various locations throughout the facility. The following report presents our observations, collected data, and recommendations regarding improvements to the existing conditions regarding room acoustics, mechanical noise control, and sound system intelligibility.

EXECUTIVE SUMMARY

In some of the most important spaces in the building such as the House and Senate Chambers, and Public Meeting Rooms within the Capitol, the intelligibility of the sound reinforcement system has been reported as poor. The addition of sound absorbing materials to these rooms could greatly improve the room acoustics, and the configuration of the sound systems could be improved for better performance, both of which would have a positive impact on the speech intelligibility in these critical spaces.

The loud and reverberant nature of the corridors and rotunda have made public communication before and after sessions very difficult. While these areas are not as critical as others, the addition of sound absorbing materials to these spaces would create a more comfortable environment for the public to communicate.

In private offices and conference rooms, mechanical noise has made it difficult for occupants to work and have conference calls. Due to the nature of the existing mechanical systems in many of the areas, reduction in background noise may be difficult. However, the strategic addition of acoustically lined ductwork and properly installed vibration isolation may help.

While we have provided recommendations for all spaces, a delicate balance of acoustical performance and architectural aesthetic must always be considered, and any modifications must be carefully approached. The prioritization of acoustical performance may ultimately vary space-by-space as determined by architectural and historical impact.

Room/Topic	Acoustical Issues Addressed		
	Sound System Intelligibility	Room Acoustics	Background Noise
House Chamber E212	X	X	
Senate Chamber W214	X	X	
Historical Supreme Court Meeting Room E202	X	X	
Join Appropriations Committee Meeting Room E301	X	X	
Public Meeting Room W110	X	X	
Public Meeting Room W113	X	X	
Governor's Ceremonial Conference Room E107		X	X
Capitol Rotunda		X	
Capitol Public Corridors		X	
House and Senate Lobbies E208/W206		X	
Capitol Extension Public Corridors		X	

Conference Rooms E102, E142, E313, EG36			X
Offices E121, E128, E129, E227, EG02, EG25, EG30, WG02, W213			X
Offices W105, W107, WG11			X
Open Office EG14			X
Studio E027 and Media Rooms		X	X

Table 1. List of spaces and associated acoustical issues in the scope of this report.

DEFINITIONS

Important terminology used throughout the report is defined below for reference.

1. Acoustic Echo Cancelling (AEC): Audio signal processing that automatically cancels out audio echo for the far-end of a tele- or video-conference call by detecting far-end audio being picked up by microphones in the room.
2. Automatic Gain Control (AGC): Audio signal processing that automatically adjusts the gain of an audio signal to match a preset level. Level adjustment can be up or down based on the detected signal level and the target level.
3. Automatic Mixer: Audio signal processing that automatically mixes the audio signals of a group of microphones based on signal level, number of microphones in simultaneous use, and other factors.
4. Equalization: Audio signal processing that is manually configured to adjust the tonality of an audio signal. The intent of equalization is to compensate for variations in audio response due to elements in the system such as the microphones and speakers.
5. Narrowband Equalization: Audio signal processing that is manually configured to reduce feedback in an audio system. Very narrow equalizer filters are applied to specific frequencies where the audio system is prone to feedback. Proper application of narrowband filters can increase the available gain-before-feedback in a system.
6. Noise Criteria (NC): A standard single number rating to describe the ambient noise levels in a particular space, typically used for background mechanical noise. This rating includes frequency weighting approximate to the human ear's sensitivity to various sound pressure levels at octave band center frequencies ranging from 63 to 8000 Hertz (Hz). Field measurements were performed with a calibrated Type 1 handheld real-time analyzer (NTI Audio XL2).
7. Noise Suppression: Audio signal processing that automatically detects background noise in a room that is picked up by microphones, and applies processing to cancel it out. Intended only for use on audio being sent to the far-end of a tele- or video-conference call. Algorithms work best with low frequencies and constant background noise sources such as mechanical fan noise.



8. Reverberation: A function of a room's volume and the quantity of sound absorbing materials present in it. Reverberation can be described as the persistence of sound in a room due to multiple reflections.
9. Reverberation Time (RT): The time required for the reverberant energy to decay by 60 decibels defines the reverberation time. Depending on the desired function of the space, the appropriate reverberation time might be short (for speech intelligibility and/or a quieter environment) or longer (for a "livelier" or louder environment). Once the recommended reverberation time for the function has been determined, the amount and type of sound absorption needed to achieve that reverberation time can be calculated. Field measurements were performed with a calibrated Type 1 handheld real-time analyzer (NTI Audio XL2) and an impulsive noise source (popped balloons).
10. A-Weighted Sound Pressure Level (SPL dBA): A measure of the level of sound at a location and reported with a frequency weighting approximate to the human ear's sensitivity to various sound pressure levels and as defined by ANSI/ASA S1.4 standard. For this report, this metric will be used to describe the overall level of sound experienced in a given location due to the sound reinforcement system or occupant generated background noise.
11. Sound Absorbing Materials (also referred to as Acoustical Treatments): An architectural material that absorbs sound energy instead of reflecting it. Generally includes a finish face material and an acoustical "core" such as fiberglass or mineral fiber that provides the absorption properties. Refer to the Acoustical Products Reference at the end of this report for detailed information about recommended products.
12. Speech Transmission Index for PA Systems (STIPA): An objective field measurement of the speech intelligibility of a sound reinforcement system, as defined by American National Standards Institute (ANSI) Standard 3.5-1999 (R2017) and International Electrotechnical Commission (IEC) 60268-16. A table describing the rating system is listed below. A rating of 0.60 should be considered an absolute minimum for meeting rooms and government chambers within the Wyoming State Capitol, with a goal of 0.68 or higher. Intelligibility of a sound system is dependent on several factors, including frequency response of the system at the listener, reverberation time of the room, and signal-to-noise ratio (relative level of the reproduced speech to ambient noise). Field measurements were performed with a calibrated Type 2 handheld real-time analyzer (NTI Audio XL2) and a calibrated noise source (NTI Audio TalkBox).

Rating	STI Range	Examples of Typical Uses	Perceived Speech Intelligibility
A+	> 0.76	Recording studios	Excellent
A	0.72-0.76	Theatres, speech auditoria, parliaments, courts	Excellent
B	0.68-0.72	Theatres, speech auditoria, parliaments, courts	Good
C	0.64-0.68	Teleconference, theatres	Good
D	0.60-0.64	Classrooms, concert halls	Good
E	0.56-0.60	Concert halls, modern churches	Fair
F	0.52-0.56	PA in shopping malls, public offices, cathedrals	Fair
G	0.48-0.52	PA in shopping malls, public offices	Fair
H	0.44-0.48	PA in difficult acoustic environments	Poor
I	0.40-0.44	PA in very difficult spaces	Poor
J	0.36-0.40	Not suitable for PA systems	Bad
U	< 0.36	Not suitable for PA systems	Bad

Table 2. STI Rating System

SOUND SYSTEM INTELLIGIBILITY

One of the primary issues that has been reported is poor intelligibility of the sound reinforcement systems in the House and Senate Chambers and Public Meeting Rooms. While initial accounts point to poor room acoustics as the cause for this, there are many factors that affect intelligibility.

The acoustical characteristics of a room that can be detrimental to intelligibility are reverberation time and ambient noise level. Long reverberation time directly lowers intelligibility due to late sound reflections arriving at the listeners. Long reverberation time also indirectly lowers intelligibility by increasing ambient noise levels and reducing the maximum gain-before-feedback of the sound system. Mechanical and electrical system noise can also be detrimental to sound system intelligibility if it is loud enough, although we did not detect any of these noise issues in the Chambers and Public Meeting Rooms.

The sound system is also a major factor in intelligibility. The system should reproduce speech naturally without altering the tonal sound of the speaker's voice and without introducing any sound artifacts. The system also needs to do so with adequate signal-to-noise, which is the level of the reinforced sound relative to ambient noise, equally at every seat. In these types of systems, audio signal processing is used to obtain flat tonal response and maximum gain, while loudspeaker coverage is responsible for adequately delivering the reinforced sound to room occupants.

While there are definitely issues with room acoustics in each of the spaces, we also detected several common issues with the sound reinforcement systems that could be improved. Specific recommendations for each space are listed in the sections below, but common recommendations are described in detail as follows:

1. Train users on the proper operation of microphone, loudspeakers, and the system controls, which can be immediately performed and should include periodic reminders.
 - a. Users should speak directly into the end of a gooseneck microphone from ideally 1-foot, and not more than 2-feet, away assuming a typical seated (or standing) position.
 - b. The moveable desk loudspeakers should be positioned on the desktop directly facing the seated user, without obstruction.
 - c. Improper setting of levels using the touchpanel can reduce signal-to-noise ratio and intelligibility. While increasing the overall system level might be deemed appropriate to overcome user error with microphones, a common issue noted during testing was that the systems exhibited feedback when turning up the user accessible volume controls much beyond the default settings.



Figure 1. Improper uses of Desktop Loudspeaker.

2. Equalize the system to have a flat response for natural and accurate speech reinforcement. As part of this process, investigate system feedback frequencies and insert narrowband filters to improve system gain-before-feedback.
 - a.

3. Adjust some of the audio signal processing within the system to improve gain-before-feedback.
 - a. Automatic Gain Control (AGC) should be used prior to Automatic Mixing processing (or preferable is to use light compression and avoid AGC entirely for in-room reinforcement).
 - b. Use direct input audio feeds for in room sound reinforcement paths, avoiding audio artifacts from Acoustic Echo Cancellation (AEC) and Noise Suppression (NS) processing that can reduce system intelligibility and is only intended for the audio paths feeding the far-end of video and teleconferencing.
4. Permanently install desktop loudspeakers at the top ledge of individual desks and facing horizontally (not at an upward angle). This will provide consistent audio coverage at each desk and prevent the users from improperly adjusting their local loudspeakers. By raising them to the top ledge, instead of on the desktop, obstruction from user items such as laptops can also be avoided.
5. Replace any gooseneck microphones that have a broken rubber section which causes the element to sag. As part of this process, we recommend installing all new gooseneck microphones that do not have this rubber section and include a metal windscreen for better "pop" filtering. The existing gooseneck microphone model is only available with a foam windscreen.
 - a. Shure MX418D/C with A412MWS metal windscreen for desktop use.
 - b. Shure MX412D/C with A412MWS metal windscreen for lectern use (shorter length for more consistent operation).
 - c. Microphone model would need to be fully vetted for compatibility with existing system.
6. Install additional loudspeakers where system coverage is lacking.

Note: The processes described for items 2 and 3 above can be performed on the system by any experienced sound system professional and can be done before installation of any acoustical treatments. However, if acoustical treatments are subsequently installed in the room, or changes to microphones or loudspeakers are made, these processes will need to occur again and may result in increased overall project costs. In our experience, a holistic approach in which room acoustics and sound system modifications are addressed at the same time has greater perceived benefits by users, as opposed to incremental improvements.

SOUND SYSTEM OPERATIONS AND MAINTENANCE

During our site visit we observed typical operation of various systems and had some comments to share regarding operations and maintenance of the systems.

1. QSC Q-SYS System.
 - a. The central "brain" of each system is the QSC Q-sys Audio Processor, which provides audio signal processing and overall control of each system. This is a robust and highly flexible system and is an appropriate platform for these types of systems. However, due to its flexible nature, it can be prone to software and firmware bugs that threaten the stability of the system. It was reported to us that the current firmware on the processors at the facility is a custom version written by the manufacturer to solve a USB issue. While it is great that support was given to resolve the issue, we highly encourage the facility to upgrade the processor firmware to the next public firmware release for long term system stability.
 - b. When undertaking firmware upgrades for a Q-sys system, we highly recommend that this be done rarely and only if needed to solve a functionality problem of system bug. Firmware updates should also only occur with ample time before the system will need to be used (at least one full day). While the upgrade process can be relatively quick, there is always a chance for peripheral devices to not update properly, or user interfaces do not properly function. In fact, while we were on-site a firmware upgrade was initiated by Capitol staff to get the House and Senate chamber processors onto the same version as other processors in the facility. This was done a couple hours before the sessions began and still resulted in a loss of user interface control in the Senate and non-working microphones for the first few hours of both the House and Senate sessions.



2. Public Meeting Room Video

- a. Public Meeting sessions include online Zoom calls to allow remote members of the public to call in to the room. This call video is on-screen in the room and provides some useful functionality for the public to get a better view of who's talking. Recently closed-captioning service was added to the Zoom call as well, and was on-screen during some of the meetings. We highly recommend making it standard practice to turn on closed captioning on the in-room displays, as it provides great visual assistance if anyone is hearing impaired and can also make up for the poor audio system intelligibility in some of the meeting rooms.
- b. The one drawback to viewing the Zoom calls in the room is that the on-screen camera video is delayed and not lip-synced to the audio in the room. It is reported that there are two different government computer systems engaged in the Zoom call, one that hosts the call and the camera inputs, and an in-room computer that calls into the Zoom meeting and displays its video on the in-room displays. It should be possible to improve lip-sync by simply altering this process or possibly reconfiguring some parts of the video system.

HISTORICAL EXHIBITS

1. There is currently an ongoing project to add historical exhibits throughout the Capitol and Capitol Extension. The acoustical impact of these exhibits should be very minimal. Audio playback content is only included in a select few locations: the Visitor's Center and a "Vault".
2. Visitor's Center:
 - a. This room already has an acoustic tile ceiling and carpeting, and has doors between the center and the public corridor. Acoustically the space will be fairly pleasant, and we have no recommendations for architectural modification.
 - b. For the exhibits themselves, the current design incorporates highly directional museum quality loudspeakers to be installed in the ceiling above each exhibit. These loudspeakers are specially made to limit audio coverage to a very small area directly below the loudspeaker.



Figure 2. Visitor's Center.

3. Vault Room:

- a. This room consists of hard walls and ceiling and is very reverberant. We recommend installing sound absorbing materials on the ceiling and/or walls for the best performance of the exhibit and

occupant comfort. We recommend approximately 50-80 square feet of material. Refer to the section at the end of the report for various options.

- b. The current design of the exhibit incorporates highly directional museum quality loudspeakers to be installed on the wall or ceiling above. These loudspeakers are specially made to limit audio coverage to a very small area directly below the loudspeaker.



Figure 3. Vault Room. Exact location of additional absorption to be coordinated with final exhibit design.

HOUSE CHAMBER (E212)

1. Room Acoustics

The House Chamber is a very large volume with many hard surfaces such as plaster walls and ceiling, and stained-glass skylight. There are some sound absorbing materials in the space in the form of carpeting and 1-inch-thick acoustical plaster on some of the ceiling.

The reverberation time measured in the room at various locations and as a function of frequency is shown on Figure 4 below. The recommended reverberation time for a space of this type and volume is shown in a green line on the figure, as well as some commentary on the results.

In addition to the reverberation time being longer than desirable, the parallel side walls on the House floor, and at the dais, create undesirable reflections which can be particularly annoying and was specifically observed at the dais during our testing.

We recommend the installation of sound absorbing materials in the room to reduce reverberation time and undesirable reflections. Our recommendations are listed below in order of importance:

- a. Install a 2-inch-thick acoustical product in a continuous band on both the north and south side lower walls, and select areas of the upper walls, as much as will fit architecturally and aesthetically. If installed in a continuous manner in the available space, we approximate around 1,000 square feet of product can be installed, and we recommend a minimum of 650 square feet of material be considered. Some potential products with similar acoustical performance are noted below, which could be mixed into different locations as desired for aesthetics:
 - 1) Stretched Fabric Acoustical System.
 - 2) Fabric Curtains over Panels.
 - 3) Screen Printed Acoustical Panels.
 - 4) Painted Wall Panels (note the potential durability concerns of this product).
 - 5) Acoustical Plaster.
 - 6) Oil Paintings with acoustical media in-fill.
- b. Install acoustical plaster in the ceiling above the dais, in a similar fashion to the ceiling in the rest of the room. We approximate around 280 square feet of product can be installed, which we assume to be a 1-inch-thick installation similar to the existing ceiling.
 - 1) Existing Acoustical Plaster.

2-inch-thick acoustical products are recommended because they have better broadband frequency performance. For cost and aesthetic reasons, 1-inch thick products or fabric with 100% fullness and no fiberglass panels behind, could be considered but may leave the room “boomy” sounding since low frequencies will not be equally absorbed. Refer to Figure 4 below.

While the Gallery would benefit from some acoustical treatment on the walls or ceiling, given the existing conditions there is no logical place to install absorption. The walls are covered with framed, glass covered images of former House members that cannot be removed, and the plaster ceiling is full of building systems (lighting, sprinklers, speakers) that would make installation difficult and costly. We do not think the benefits would justify the cost.

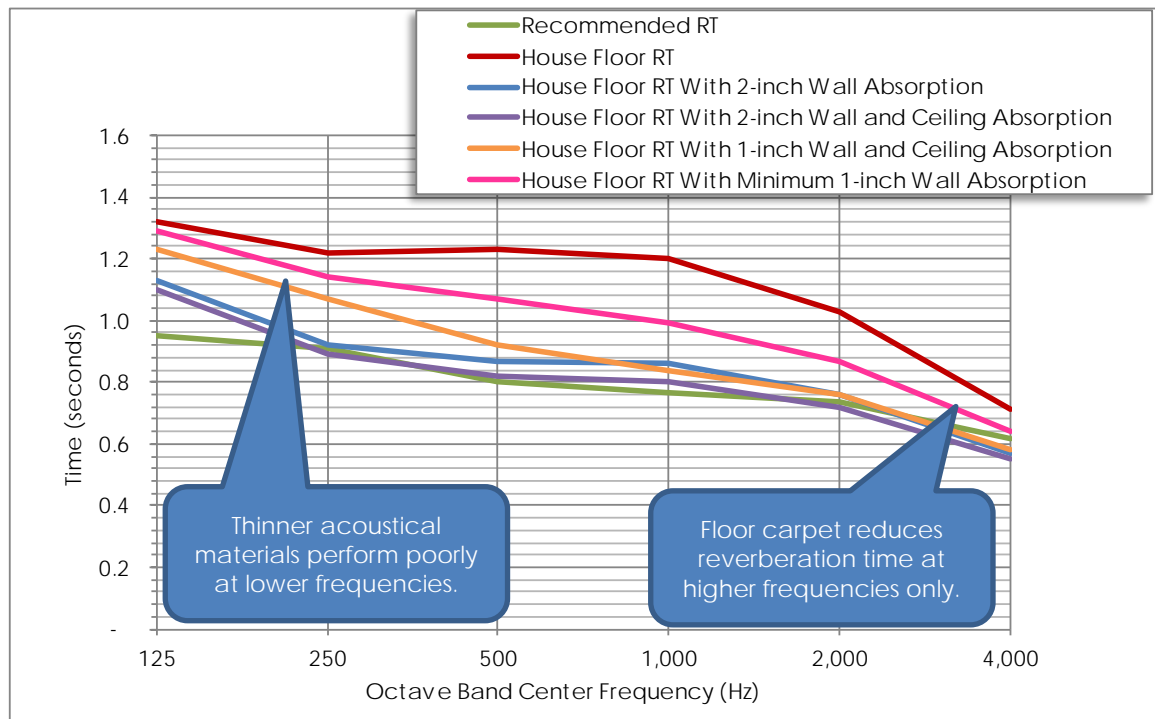


Figure 4. Measured and Estimated House Chamber Reverberation Times.



Figure 5. Recommended locations for wall mounted sound absorption. Layout would be similar on other walls not shown.



Figure 6. Recommended location for additional ceiling mounted sound absorption.

2. Sound System

The sound system consists of gooseneck microphones located at the dais and four podiums located around the room. Each desk and dais position has a single full-range loudspeaker in an angled enclosure that can be moved around the desktop. Subjectively, speech reinforcement sounded muddy and unintelligible throughout the room unless the listener is positioned closely and directly in front of a desktop loudspeaker.

The measured STIPA rating of the system is shown below on Table 3. As defined previously in the report, the minimum desirable STIPA rating is 0.60, with a goal of 0.68. A graph of the measured frequency response at each location is shown on Figure 7.

Locations with poor loudspeaker coverage exhibited lower high frequency response, which corresponded with lower intelligibility. Of note is the variation in intelligibility based on the loudspeaker positioning (Desks) or coverage (Gallery) and the effect of ambient noise (and therefore a low signal-to-noise ratio). Testing was performed with the sound system at “default” levels and test loudspeaker placed in an ideal location.

Location	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
Desk with Good Speaker	0.66	0.55
Desk with Sideways Speaker	0.59	0.49
Desk with Obstructed Speaker	0.56	0.46
Gallery below Speaker	0.62	0.49
Gallery between Speakers	0.54	0.42
Floor Aisle North	0.58	0.49
Floor Aisle South	0.61	0.50
Speaker of the House Desk	0.50	0.38

Table 3. STIPA Measured at Various Positions in the House.

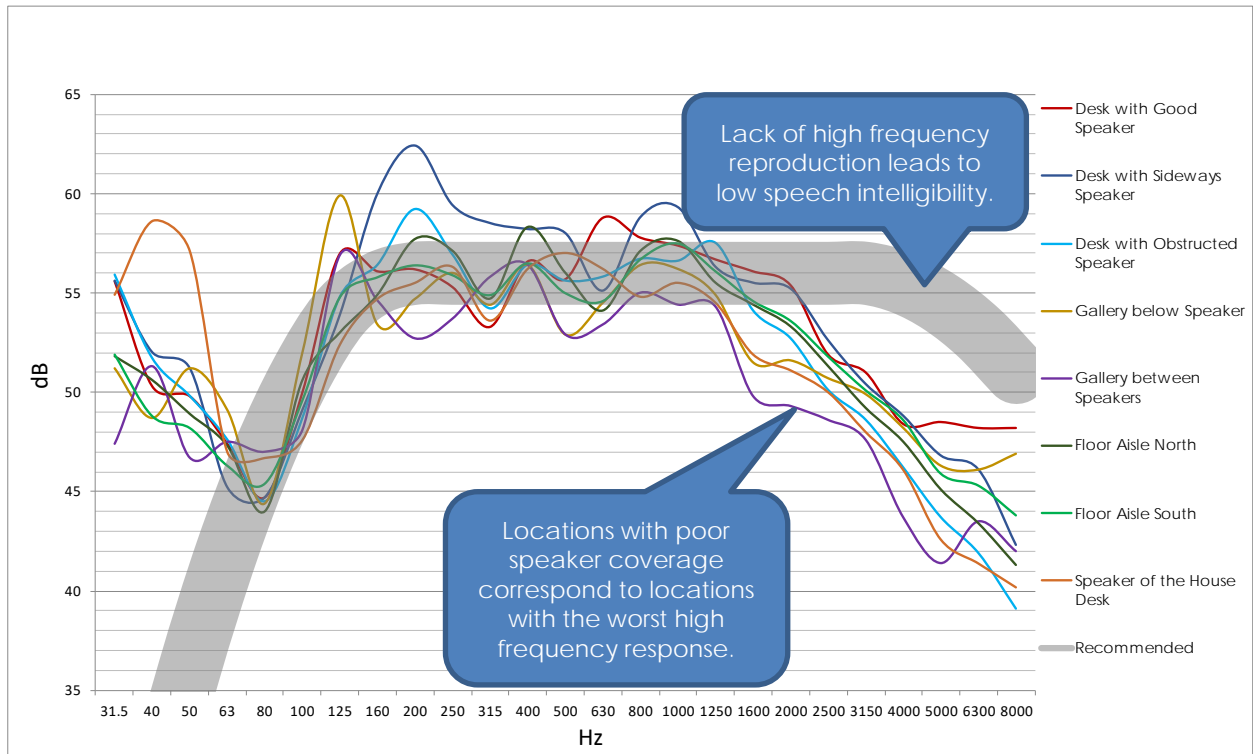


Figure 7. System Frequency Response at Various Positions in the House.

We recommend the following adjustments to the sound reinforcement system to improve intelligibility. Refer to the introductory section above for detailed discussion on each item. Our recommendations are listed below in order of importance:

- Train users.
- Equalize system frequency response.
- Adjust audio signal processing to improve gain-before-feedback.

- d. Permanently install the desktop loudspeakers.
- e. Replace damaged gooseneck microphones and consider upgrading all of them.
- f. Install additional flush mounted ceiling loudspeakers in the Gallery to fill gaps between loudspeakers that are spaced too far apart.

SENATE CHAMBER (W214)

1. Room Acoustics

The Senate Chamber is a very large volume, albeit smaller than the house, but with many hard surfaces such as plaster walls and ceiling, and a large stained-glass skylight. Sound absorbing materials in the space consist of carpeting and 1-inch-thick acoustical plaster on some of the ceiling.

The reverberation time measured in the room at various locations and as a function of frequency is shown on Figure 8 below. The recommended reverberation time for a space of this type and volume is shown in a green line on the figure, as well as some commentary on the results.

In addition to the reverberation time being longer than desirable, the barrel shaping of the skylight creates very undesirable focused reflections in the center of the room which can be particularly annoying and was specifically observed at the dais during our testing.

We recommend the installation of sound absorbing materials in the room to reduce reverberation time and undesirable reflections. Our recommendations are listed below in order of importance:

- a. Install a 2-inch-thick acoustical product in a continuous band on all the lower walls, and select areas of the upper walls, as much as will fit architecturally and aesthetically. If installed in a continuous manner in the available space, we approximate around 800 square feet of product can be installed, and we recommend a minimum of 400 square feet be considered. Some potential products with similar acoustical performance are noted below, which could be mixed into different locations as desired for aesthetics:
 - 1) Stretched Fabric Acoustical System.
 - 2) Fabric Curtains over Panels.
 - 3) Screen Printed Acoustical Panels.
 - 4) Painted Wall Panels (note the potential durability concerns of this product).
 - 5) Acoustical Plaster.
 - 6) Oil Paintings with acoustical media in-fill.
- b. Install a 2-inch-thick acoustical product in a continuous band on the rear wall of the west Gallery as much as will fit architecturally and aesthetically. If installed in a continuous manner in the available space, we approximate around 150 square feet of product can be installed, and we recommend a minimum of 75 square feet be considered. It would be ideal if more walls of the Gallery could be treated with absorption, but this was the only logical location due to existing conditions. Given this location directly behind public seating steps, we recommend only the most durable or maintenance-friendly products in this location. Some potential products with similar acoustical performance are noted below:
 - 1) Stretched Fabric Acoustical System.
 - 2) Fabric Curtains over Panels.

2-inch-thick acoustical products are recommended because they have better broadband frequency performance. For cost and aesthetic reasons, 1-inch-thick products or fabric with 100% fullness and no fiberglass panels behind, could be considered but may leave the room "boomy" sounding since low frequencies will not be equally absorbed. Refer to Figure 8 below.

While it would be ideal to provide some sort of treatment for the curved stained-glass ceiling, the transparent acoustical film product that could be applicable was evaluated and ultimately would not satisfy aesthetic requirements since it would obscure visibility of the stained-glass details.

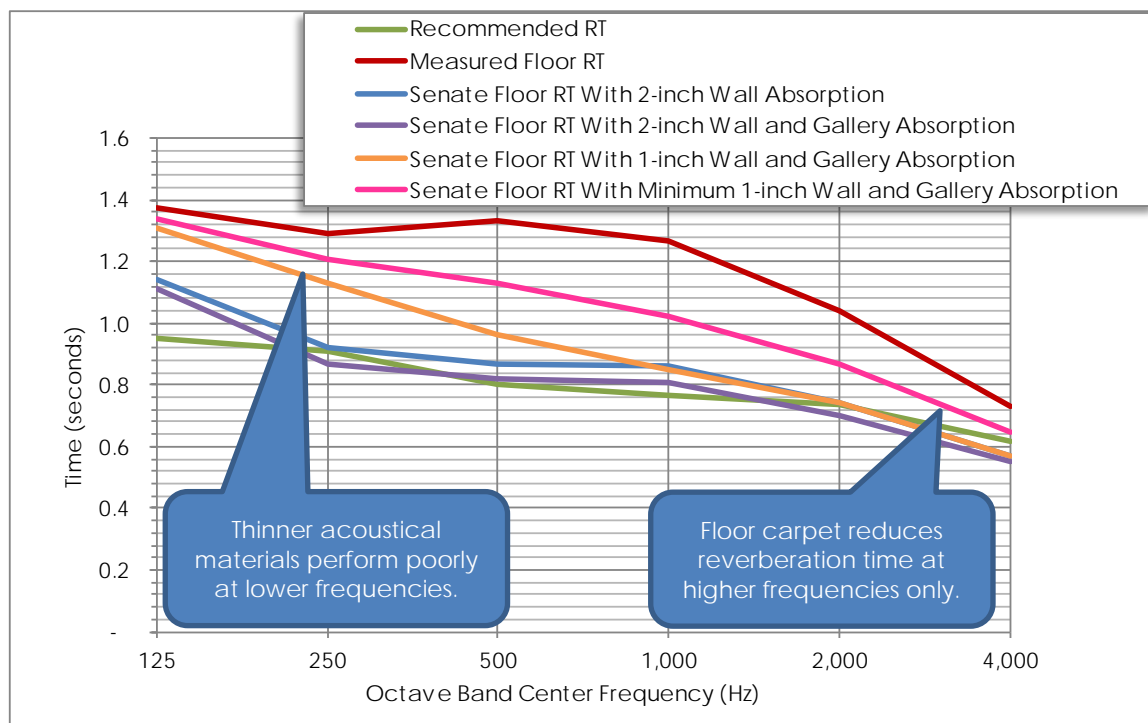


Figure 8. Measured and Estimated Senate Chamber Reverberation Times.



Figure 9. Recommended locations for wall mounted sound absorption. Layout would be similar on other walls not shown.

2. Sound System

The sound system consists of gooseneck microphones located at the dais and each Senator's desk located around the room. Each desk and dais position has a single full-range loudspeaker in an angled enclosure that can be moved around the desktop. Subjectively, speech reinforcement sounded more natural than in the House, but was still somewhat unintelligible throughout the room unless the listener is positioned closely and directly in front of a desktop loudspeaker. Similar to the

House, the reinforcement of speech is lacking high frequency. Besides not accurately reproducing the presenter's voice, this results in lower speech intelligibility.

The measured STIPA rating of the system is shown below on Table 4. As defined previously in the report, the minimum desirable STIPA rating is 0.60, with a goal of 0.68. A graph of the measured frequency response at each location is shown on Figure 10.

Our comments for the Senate Chamber are similar to those from the House; desks where loudspeakers are obstructed by computer monitors or simply laid on their face, and areas in the gallery between the loudspeakers that are very far apart, have poor intelligibility. Testing was performed with the sound system at "default" levels and test loudspeaker placed in an ideal location.

Location	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
Desk with Good Speaker	0.70	0.65
Desk with Sideways Speaker	0.61	0.56
Desk with Obstructed Speaker	0.59	0.55
Gallery below Speaker	0.62	0.52
Gallery between Speakers	0.55	0.49
Floor Aisle North	0.53	0.54
Floor Aisle South	0.57	0.51
President Desk	0.64	0.58

Table 4. STIPA Measured at Various Positions in the Senate.

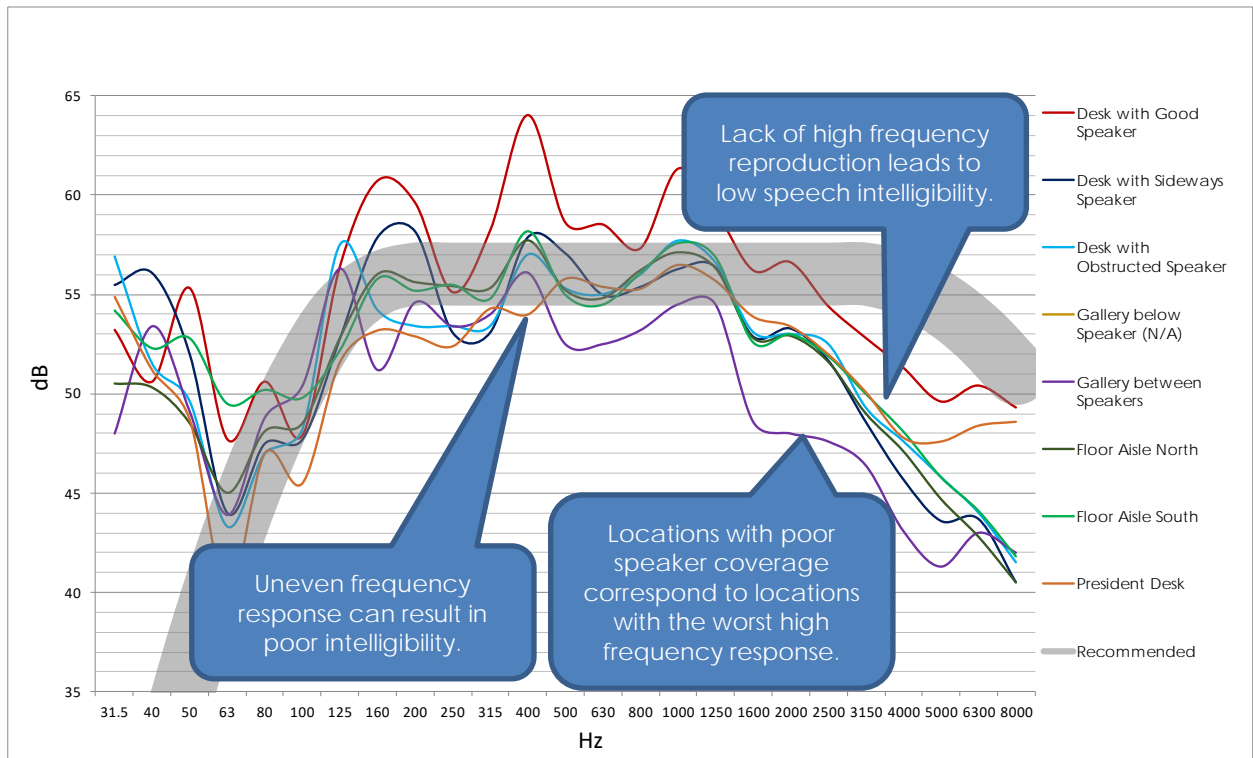


Figure 10. System Frequency Response at Various Positions in the Senate.

We recommend the following adjustments to the sound reinforcement system to improve intelligibility. Refer to the introductory section above for detailed discussion on each item. Our recommendations are listed below in order of importance:

- a. Train users.

- b. Equalize system frequency response.
- c. Adjust audio signal processing to improve gain-before-feedback.
- d. Permanently install the desktop loudspeakers.
- e. Replace damaged gooseneck microphones and consider upgrading all of them.
- f. Install additional flush mounted ceiling loudspeakers in the Gallery to fill gaps between loudspeakers that are spaced too far apart.

HISTORICAL SUPREME COURT MEETING ROOM (E202)

1. Room Acoustics

The Historical Supreme Court meeting room has a mixture of hard surfaces and sound absorbing materials, including plaster walls and glass windows with wood shutters, carpeting, and 1-inch-thick acoustical plaster ceiling.

The reverberation time measured in the room at various locations and as a function of frequency is shown on Figure 11 below. The recommended reverberation time for a space of this type and volume is shown in a green line on the figure, as well as some commentary on the results.

In addition to the reverberation time being longer than desirable, the dimensions of the room and its parallel side walls create a condition call flutter echo, which is caused by rapid high frequency reflections and is evident in a reverberation time graph by a noticeable peak at a particular frequency.

We recommend the installation of sound absorbing materials in the room to reduce reverberation time and undesirable reflections. Unfortunately, this will be no easy task in this room, as nearly every surface includes various historic ornamentation that cannot be removed or altered. The improvements offered by the addition of room absorption may be limited. Our recommendation is listed below:

- a. Install a fabric curtain product with 100% fullness in various locations around the perimeter of the room and with pullbacks to allow the reveal of existing wall elements, as much as will fit architecturally and aesthetically. We approximate around 500 square feet of product can be potentially installed, and recommend this be considered a minimum amount to achieve a notable benefit.
 - 1) Fabric Curtains with 100% Fullness.

It is possible that flutter echo will remain in the space, since many portions of the walls need to remain uncovered, but we think that if some absorption can be added this effect will be reduced and overall room acoustics improved. However, we understand that in this particular space, the application of sound absorption materials might not be possible.



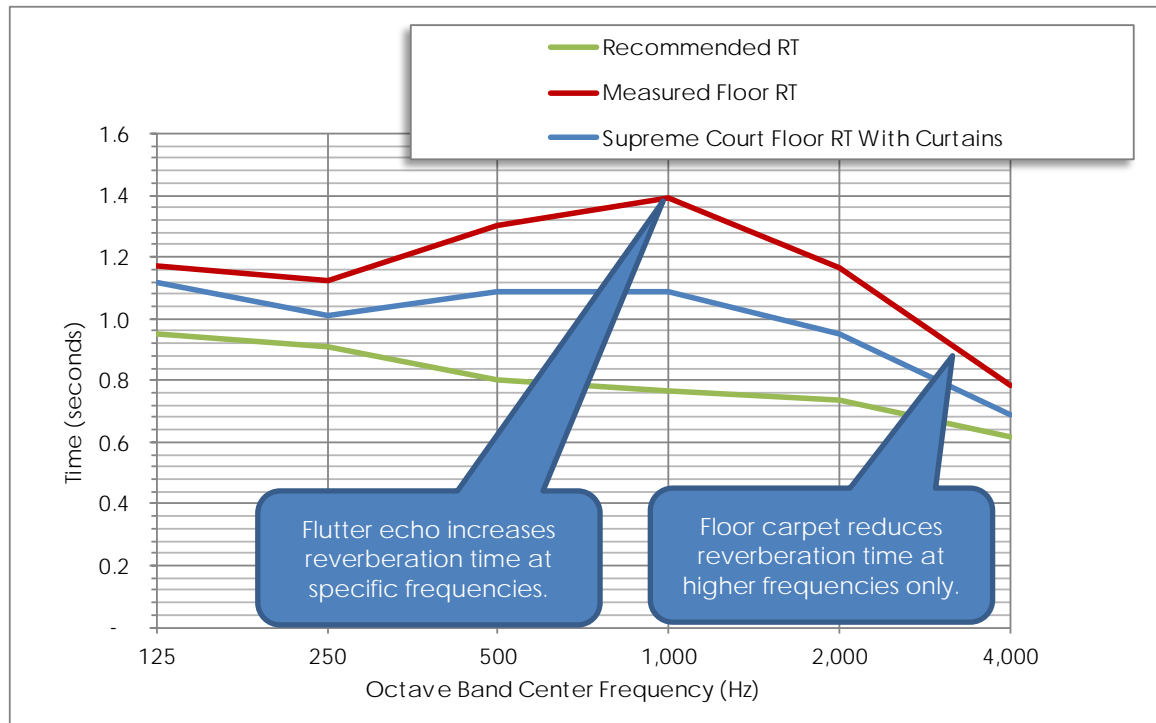


Figure 11. Measured and Estimated Historical Supreme Court Reverberation Times.



Figure 12. Locations for wall mounted curtains to be determined.



Figure 13. Locations for wall mounted curtains to be determined.

2. Sound System

The sound system consists of gooseneck microphones located at the dais and public testimony tables. Each table and dais position has a single full-range loudspeaker in an angled enclosure that can be moved around the desktop. Subjectively, speech reinforcement sounded more natural but was still somewhat unintelligible throughout the room unless the listener is positioned closely and directly in front of a desktop loudspeaker.

The measured STIPA rating of the system is shown below on Table 5. As defined previously in the report, the minimum desirable STIPA rating is 0.60, with a goal of 0.68. A graph of the measured frequency response at each location is shown on Figure 14.

In this room, loudspeakers were not obstructed and were positioned well. Testing was performed with the sound system at “default” levels and test loudspeaker placed in an ideal location.

Location	STIPA with no ambient noise (not in session)	STIPA with ambient noise (from typical meeting session)
Dais Seat	0.59	0.54
Testimony Table Seat	0.62	0.58
Lower Gallery Edge	0.51	0.45
Lower Gallery Center	0.55	0.50
Upper Gallery	0.52	0.46

Table 5. STIPA Measured at Various Positions in the Historical Supreme Court.



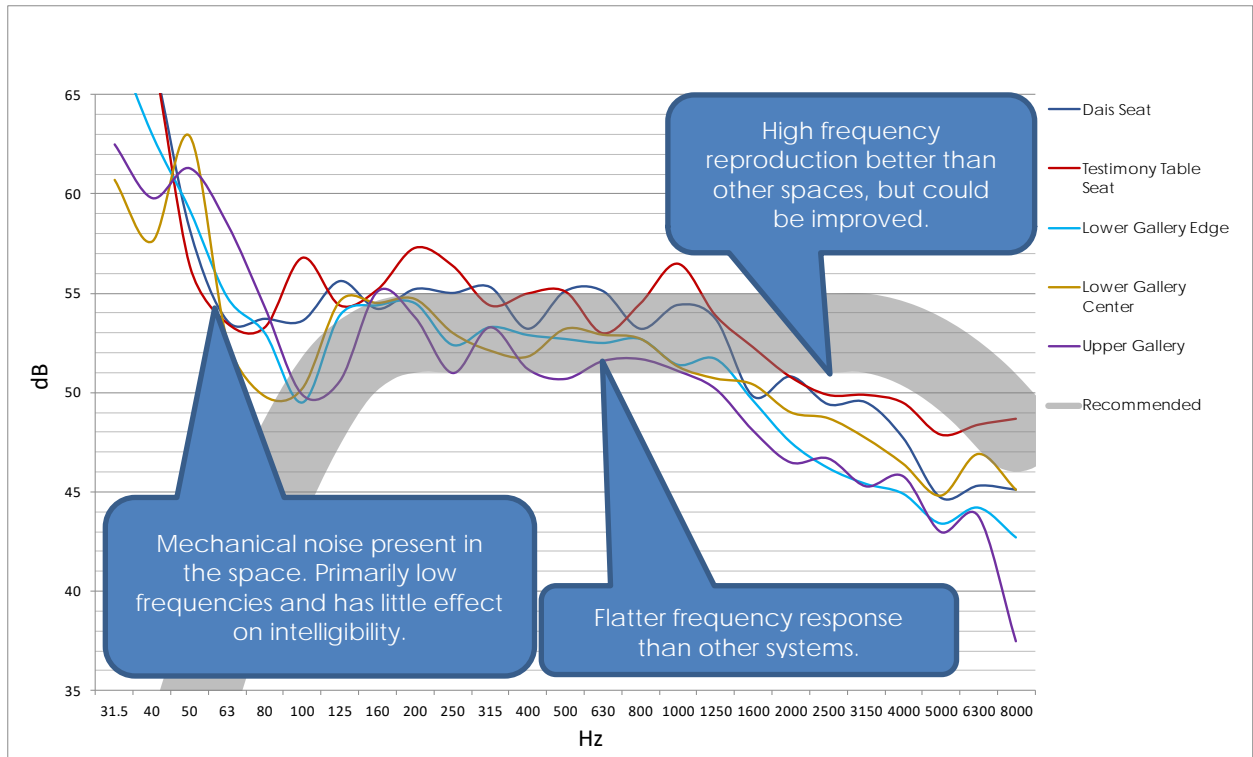


Figure 14. System Frequency Response at Various Positions in the Historical Supreme Court.

We recommend the following adjustments to the sound reinforcement system to improve intelligibility. Refer to the introductory section above for detailed discussion on each item. Our recommendations are listed below in order of importance:

- Train users.
- Equalize system frequency response.
- Adjust audio signal processing to improve gain-before-feedback.
- Replace damaged gooseneck microphones and consider upgrading all of them.
- Install additional surface mounted loudspeakers in the Lower Gallery, increased to two loudspeakers per column played apart instead of just one.
- Install additional flush mounted ceiling loudspeakers in the Upper Gallery, to fill the gaps in coverage between loudspeakers that are spaced too far apart.

JOINT APPROPRIATIONS COMMITTEE (JAC) MEETING ROOM (E301)

1. Room Acoustics

The JAC meeting room has mostly hard surfaces , including plaster walls and ceiling, glass windows with wood shutters, and a very large canvas painting on one wall. The floor is carpeted, which is the only sound absorbing material in the space.

The reverberation time measured in the room at various locations and as a function of frequency is shown on Figure 15 below. The recommended reverberation time for a space of this type and volume is shown in a green line on the figure, as well as some commentary on the results.

In addition to the reverberation time being longer than desirable, the dimensions of the room and its parallel side walls create flutter echo.

We recommend the installation of sound absorbing materials in the room to reduce reverberation time and undesirable reflections. Unfortunately, modification of the ceiling is off-limits and there are

few open wall surfaces available for the installation of sound absorption. The improvements offered by the addition of room absorption may be limited. Our recommendation is listed below:

- a. Install a 2-inch-thick acoustical product on the walls, as much as will fit architecturally and aesthetically. If installed in a continuous manner in the available space, we approximate around 420 square feet of product can be installed, and we recommend a minimum of 200 square feet be considered. Some potential products with similar acoustical performance are noted below, which could be mixed into different locations as desired for aesthetics:
 - 1) Stretched Fabric Acoustical System.
 - 2) Fabric Curtains over Panels.
 - 3) Screen Printed Acoustical Panels.
 - 4) Painted Wall Panels (note the potential durability concerns of this product).
 - 5) Acoustical Plaster.

2-inch-thick acoustical products are recommended because they have better broadband frequency performance. For cost and aesthetic reasons, 1-inch-thick products or fabric with 100% fullness and no fiberglass panels behind, could be considered but may leave the room “boomy” sounding since low frequencies will not be equally absorbed. Refer to Figure 15 below.

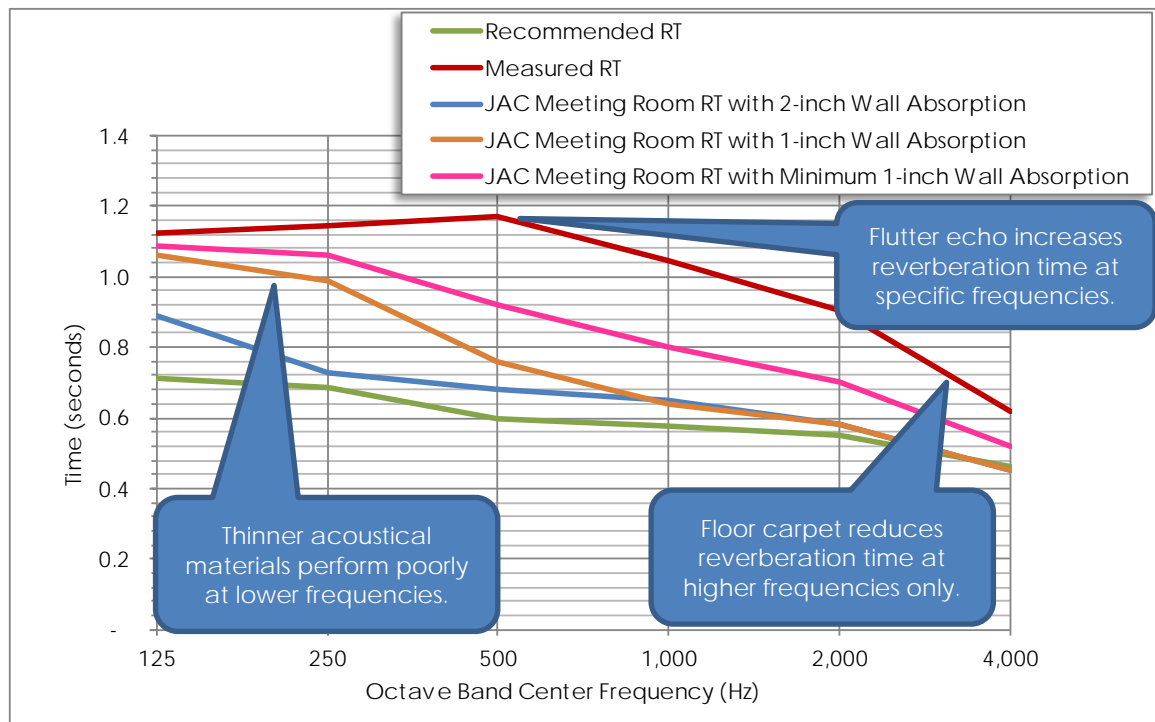


Figure 15. Measured and Estimated JAC Meeting Room Reverberation Times.



Figure 16. Recommended locations for wall mounted sound absorption. Layout would be similar on other walls not shown.

2. Sound System

The sound system consists of gooseneck microphones located at the desks and public testimony tables. Each table and desk position has a single full-range loudspeaker in an angled enclosure that can be moved around the desktop. Subjectively, speech reinforcement sounded muddy and is unintelligible throughout the room unless the listener is positioned closely and directly in front of a desktop loudspeaker.

The measured STIPA rating of the system is shown below on Table 6. As defined previously in the report, the minimum desirable STIPA rating is 0.60, with a goal of 0.68. A graph of the measured frequency response at each location is shown on Figure 17.

In this room, some desk loudspeakers were obstructed while table loudspeakers were positioned well. Testing was performed with the sound system at “default” levels and test loudspeaker placed in an ideal location.

Location	STIPA with no ambient noise (not in session)	STIPA with ambient noise (from typical meeting session)
Desk Seat	0.62	0.58
Testimony Table Seat	0.54	0.51
Gallery Edge	0.58	0.54
Gallery Center	0.60	0.56

Table 6. STIPA Measured at Various Positions in the JAC Meeting Room.

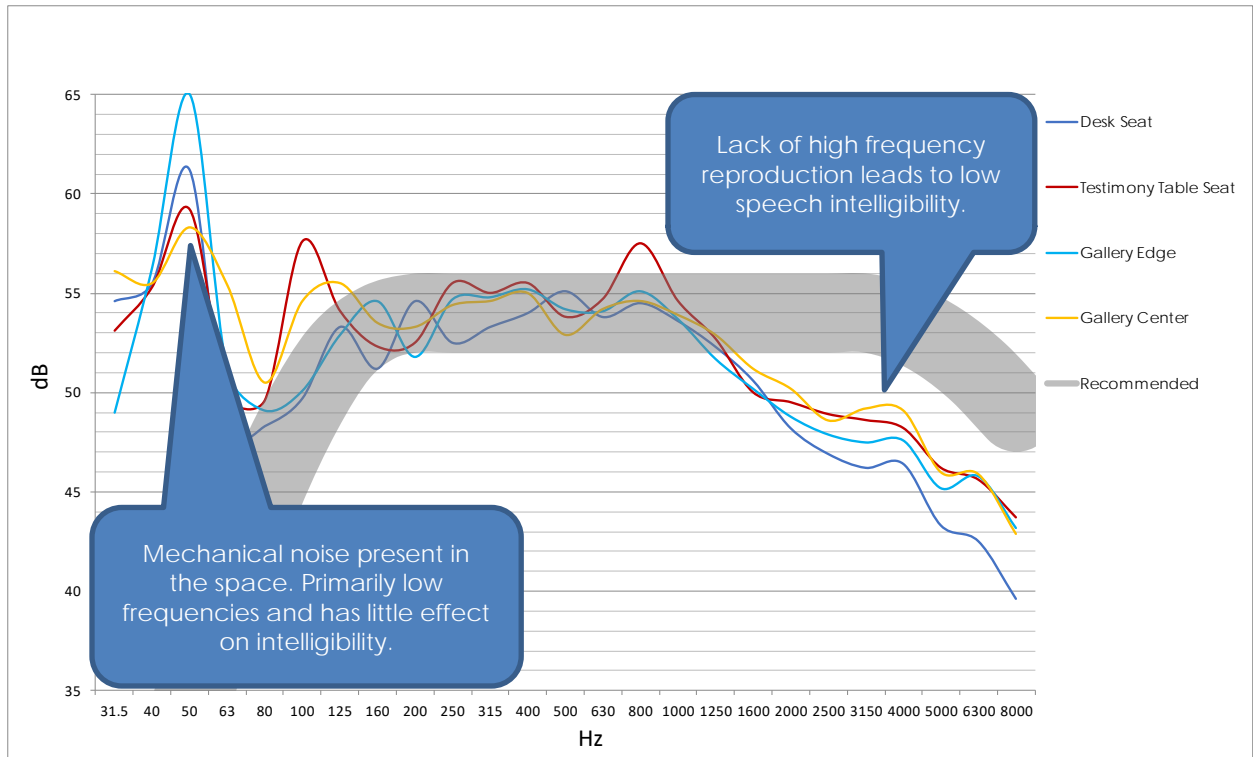


Figure 17. System Frequency Response at Various Positions in the JAC Meeting Room.

We recommend the following adjustments to the sound reinforcement system to improve intelligibility. Refer to the introductory section above for detailed discussion on each item. Our recommendations are listed below in order of importance:

- a. Train users.
- b. Equalize system frequency response.
- c. Adjust audio signal processing to improve gain-before-feedback.
- d. Replace damaged gooseneck microphones and consider upgrading all of them.
- e. Move Gallery loudspeakers to ceiling or back wall directly above the seats and pointing down. Add a third loudspeaker in the center of the ceiling/backwall.

PUBLIC MEETING ROOMS (PMR) W110 AND W113

1. Room Acoustics

These two meeting rooms have mostly hard surfaces, including plaster walls and ceiling, glass windows with roller shades, and large paintings on several walls. The floor carpet and the double layer manual roller shades do provide some sound absorption in the spaces.

The reverberation time measured in the room at various locations and as a function of frequency is shown on Figure 18 below. The recommended reverberation time for a space of this type and volume is shown in a green line on the figure, as well as some commentary on the results. The reverberation time measured in a new meeting room, PMR-006, is also included for comparison. The new meeting rooms in the Capitol Extension include a more traditional sound absorbing ceiling, and the intelligibility in these rooms is reportedly better.

We recommend the installation of sound absorbing materials in the room to reduce reverberation time and undesirable reflections. Our recommendations are listed below in order of importance:

- a. Install a 2-inch-thick acoustical product on the walls, as much as will fit architecturally and aesthetically. If installed in a continuous manner in all the available space, we approximate around 330 square feet of product can be installed in each room, and we recommend considering this to be the minimum amount of absorption added to the room. Some potential products with similar acoustical performance are noted below, which could be mixed into different locations as desired for aesthetics:
 - 1) Stretched Fabric Acoustical System.
 - 2) Fabric Curtains over Panels.
 - 3) Screen Printed Acoustical Panels.
 - 4) Painted Wall Panels (note the potential durability concerns of this product).
 - 5) Acoustical Plaster.
- b. Install sound absorption on the ceiling in each coffer. Careful coordination with existing architectural elements will be required. If this recommendation is followed, only install approximately 100 square feet of wall absorption on the rear and one side walls. Some potential products with similar acoustical performance are noted below:
 - 1) Acoustical Plaster.
 - 2) Stretched Membrane Acoustical System.

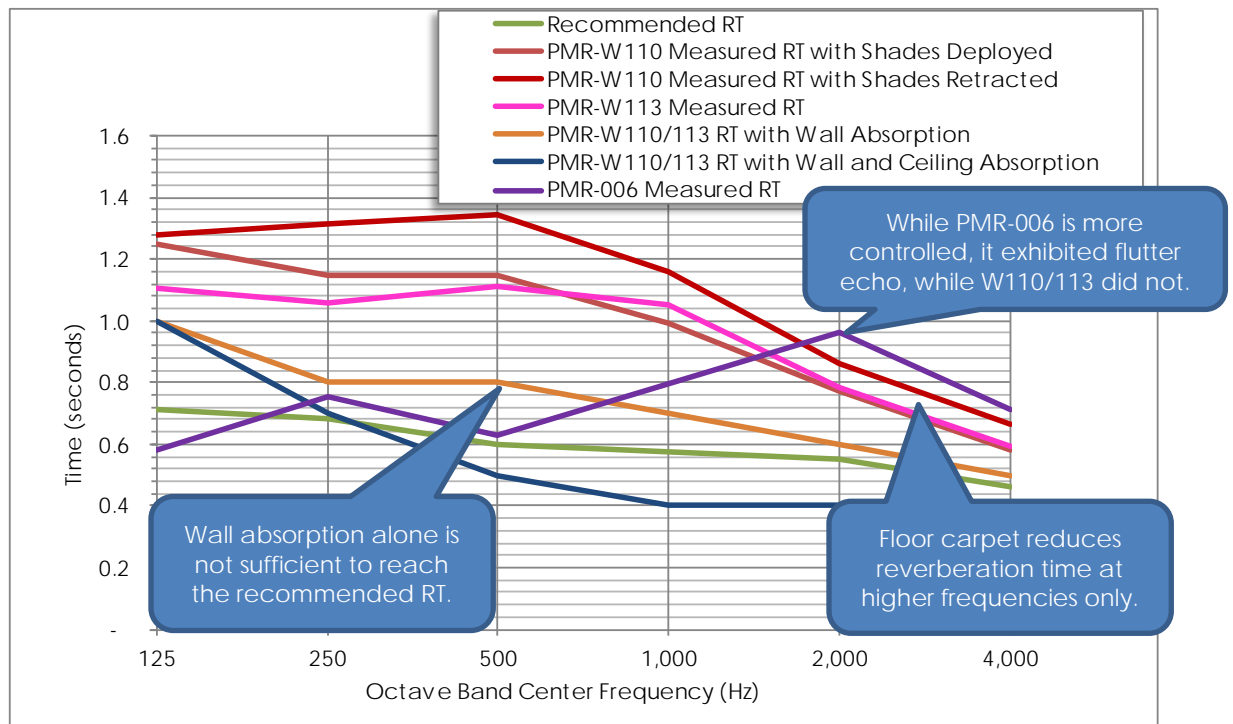


Figure 18. Measured and Estimated Public Meeting Room Reverberation Times.



Figure 19. Recommended locations for wall and ceiling mounted sound absorption. Layout would be similar on other walls not shown. Coordination with existing architectural elements would be necessary.

2. Sound System

The sound system consists of gooseneck microphones located at the dais and public testimony table. Loudspeaker coverage is provided by nine (9) flush mounted ceiling loudspeakers. Subjectively, speech reinforcement sounded natural but unintelligible throughout the room unless the listener is positioned directly under a ceiling loudspeaker. Some obstruction of loudspeaker coverage was noted where pendant lighting blocked line of sight between a listener seat and a loudspeaker.

The measured STIPA rating of the systems in each room are shown below on Table 7. As defined previously in the report, the minimum desirable STIPA rating is 0.60, with a goal of 0.68. A graph of the measured frequency response at each location is shown on Figure 20. Testing was performed with the sound system at "default" levels and test loudspeaker placed in an ideal location.

Location	STIPA with no ambient noise (not in session)	STIPA with ambient noise (from typical meeting session)
PMR-W110 Dais Seat	0.56	0.51
PMR-W110 Testimony Table Seat	0.59	0.54
PMR-W113 Dais Seat	0.58	0.57
PMR-W113 Testimony Table Seat	0.52	0.51
PMR-006 Dais Seat	0.70	0.70
PMR-006 Testimony Table Seat	0.65	0.65

Table 7. STIPA Measured at Various Positions in the Various Meeting Rooms.

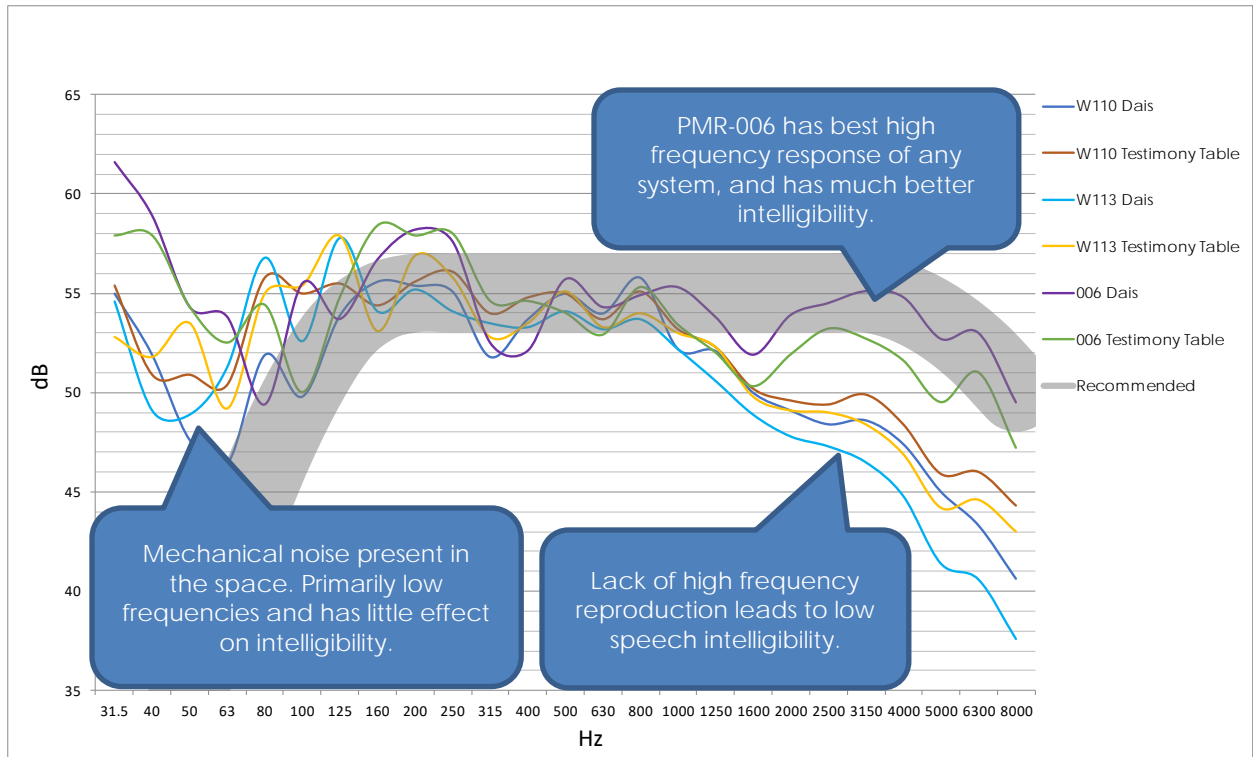


Figure 20. System Frequency Response at Various Positions in the JAC Meeting Room.

We recommend the following adjustments to the sound reinforcement system to improve intelligibility. Refer to the introductory section above for detailed discussion on each item. Our recommendations are listed below in order of importance:

- Train users.
- Equalize system frequency response.
- Adjust audio signal processing to improve gain-before-feedback.
- Replace damaged gooseneck microphones and consider upgrading all of them.

GOVERNOR'S CEREMONIAL CONFERENCE ROOM E107

1. Room Acoustics

During our site visit we examined the acoustical characteristics of the ceremonial conference room. The reverberation time measured in the room and as a function of frequency is shown on Figure 21 below. The recommended reverberation time for a space of this type and volume is shown in a green line on the figure, as well as some commentary on the results.

We recommend the installation of sound absorbing materials in the room to reduce reverberation time and undesirable reflections. Our recommendations are listed below in order of importance:

- Install a 2-inch-thick acoustical product on the ceiling. At a minimum we recommend 450 square feet, but it could also be installed continuously over the entire ceiling. Some potential products with similar acoustical performance are noted below, which should be chosen as desired for aesthetics:
 - Acoustical Plaster.
 - Stretched Membrane Acoustical System.
- If installing absorption on the ceiling is deemed undesirable or too costly, we recommend installing a 2-inch-thick acoustical product on the east and west walls, as much as will fit

architecturally and aesthetically. If installed in a continuous manner in all the available space, we approximate around 250 square feet of product can be installed. Some potential products with similar acoustical performance are noted below, which should be chosen as desired for aesthetics:

- 1) Stretched Fabric Acoustical System.
- 2) Fabric Curtains over Panels.
- 3) Screen Printed Acoustical Panels.
- 4) Painted Wall Panels (note the potential durability concerns of this product).
- 5) Acoustical Plaster.

2-inch-thick acoustical products are recommended because they have better broadband frequency performance. For cost and aesthetic reasons, 1-inch-thick products or fabric with 100% fullness and no fiberglass panels behind, could be considered but may leave the room “boomy” sounding since low frequencies will not be equally absorbed. Refer to the figure below.

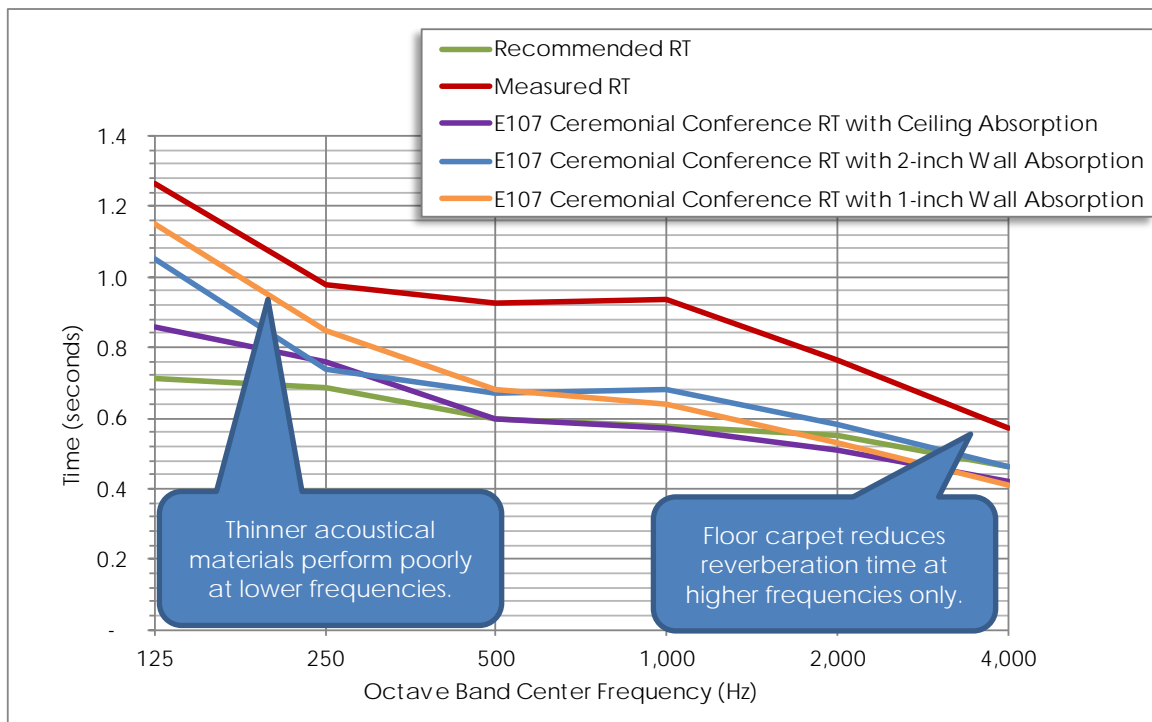


Figure 21. Measured and Estimated Ceremonial Conference Room Reverberation Times.



Figure 22. Recommended locations for wall or ceiling mounted sound absorption. Layout would be similar on other walls or ceiling areas not shown.

PUBLIC CORRIDORS/ROTUNDA

1. Room Acoustics

During our site visit we examined the acoustical characteristics of the various public corridors, including the rotunda. These spaces are used for special function events, as well as daily ad-hoc meetings and discussions between the press, members of the public, and Representatives and Senators. These spaces can get very loud from normal conversations, making them unpleasant and difficult to carry on multiple conversations from different groups of people. There is also a current plan to add technology kiosks to many of these public areas which may include loudspeakers for audio playback. We recommend that specific care be taken in the design of these kiosks to limit the coverage of any loudspeaker playback devices to a small area directly around each kiosk.

The reverberation times measured in the spaces and as a function of frequency are shown on the figures below.

The goal in each space is to reduce direct reflections from side walls and ceilings, and reduce overall reverberation time, to minimize overall noise levels. We recommend the installation of sound absorbing materials in each of the public corridors, lobbies, and rotunda. In most cases, the ceiling is still the logical place to install sound absorption due to obstructions and ornamentation on the walls. Our recommendations are listed below in order of importance:

Capitol Corridors/Rotunda

- a. Install a 2-inch-thick acoustical product on the ceiling, as much as will fit architecturally and aesthetically. This is approximately 2,700 square feet on Level 1, 1,100 square feet on Level 2, and 1,400 square feet on Level 3. We recommend considering half of these amounts as the minimum goal, if the ideal amount is not achievable. Some potential products with similar acoustical performance are noted below, which should be chosen as desired for aesthetics:
 - 1) Acoustical Plaster.
 - 2) Stretched Membrane Acoustical System.
- b. If installing absorption on the ceiling is deemed undesirable or too costly, we recommend installing a 2-inch-thick acoustical product on the side walls of the corridors in lieu of the ceiling, as much as will fit architecturally and aesthetically. While the goal would be to fit the same square footage of wall absorption as there is listed above for the ceiling, this may not be possible.

We recommend the minimum goals to be 1,350 square feet on Level 1, 550 square feet on Level 2, and 700 square feet on Level 3. Some potential products with similar acoustical performance are noted below, which should be chosen as desired for aesthetics:

- 1) Stretched Fabric Acoustical System.
 - 2) Fabric Curtains over Panels.
 - 3) Screen Printed Acoustical Panels.
 - 4) Painted Wall Panels (note the potential durability concerns of this product).
 - 5) Acoustical Plaster.
- c. In addition to the ceiling or wall absorption listed above, we recommend placing area rugs wherever low traffic and furniture make it possible.
- 1) Area rugs.
- d. In addition to the items listed above, sound absorption could be integrated into future technology kiosks, although the impact of this would be very minimal and might not be worth pursuing.

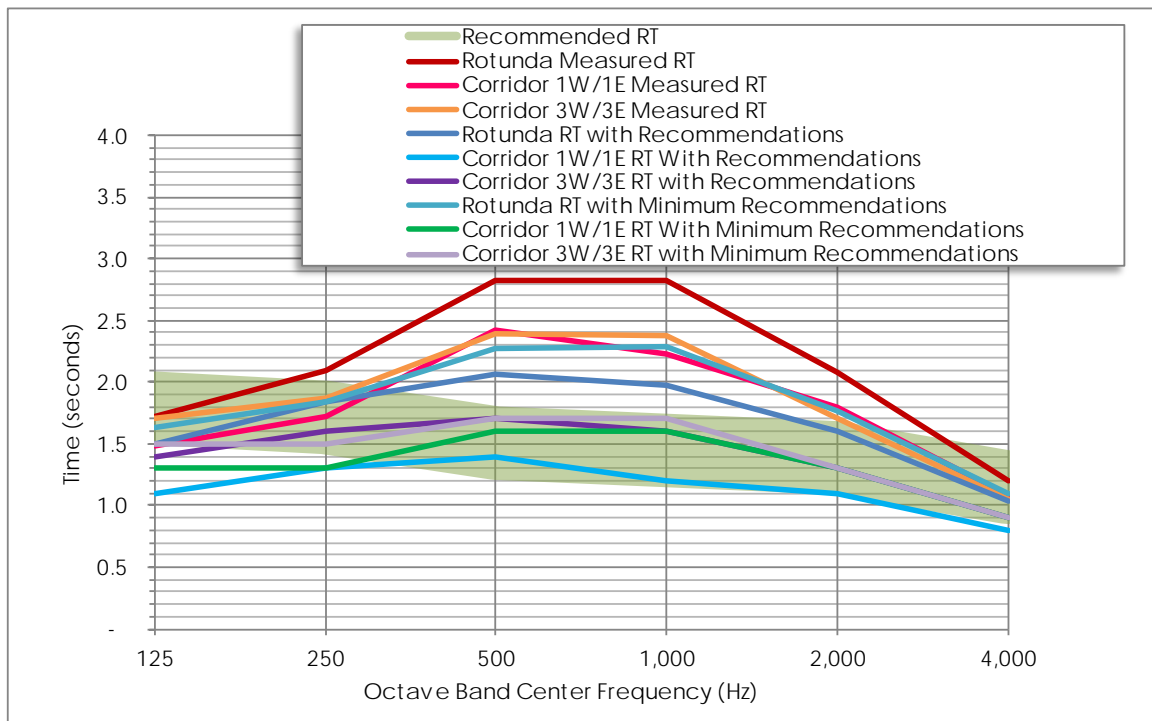


Figure 23. Measured and Estimated Rotunda and Corridor Reverberation Times.

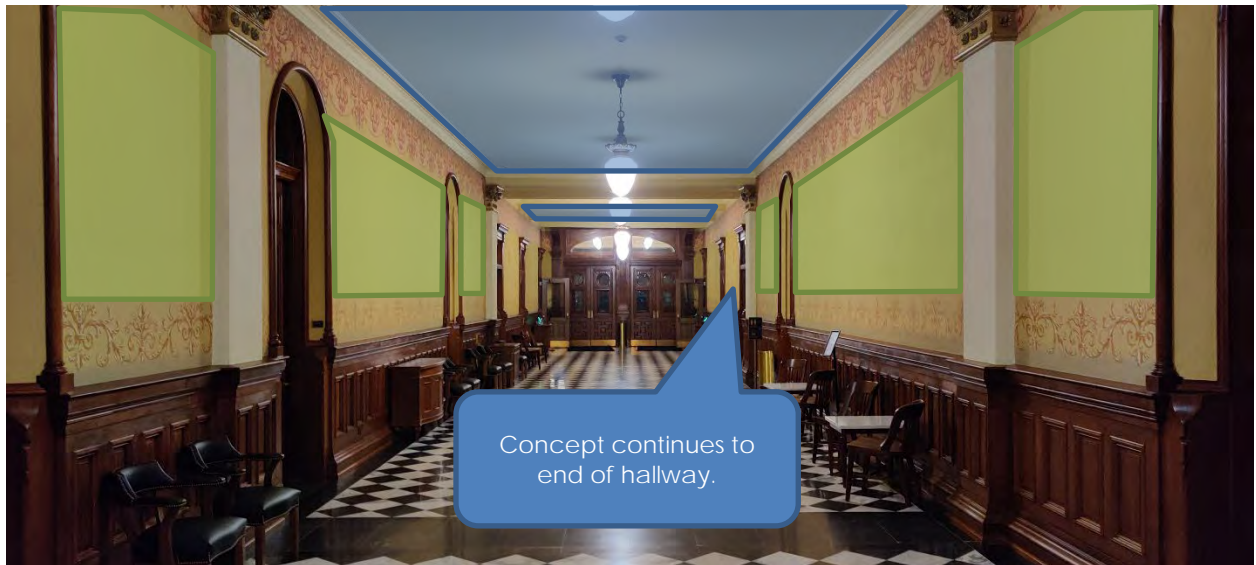


Figure 24. Recommended sound absorption installation locations. Typical for Level 1. Recommendation is for ceiling absorption or wall absorption.

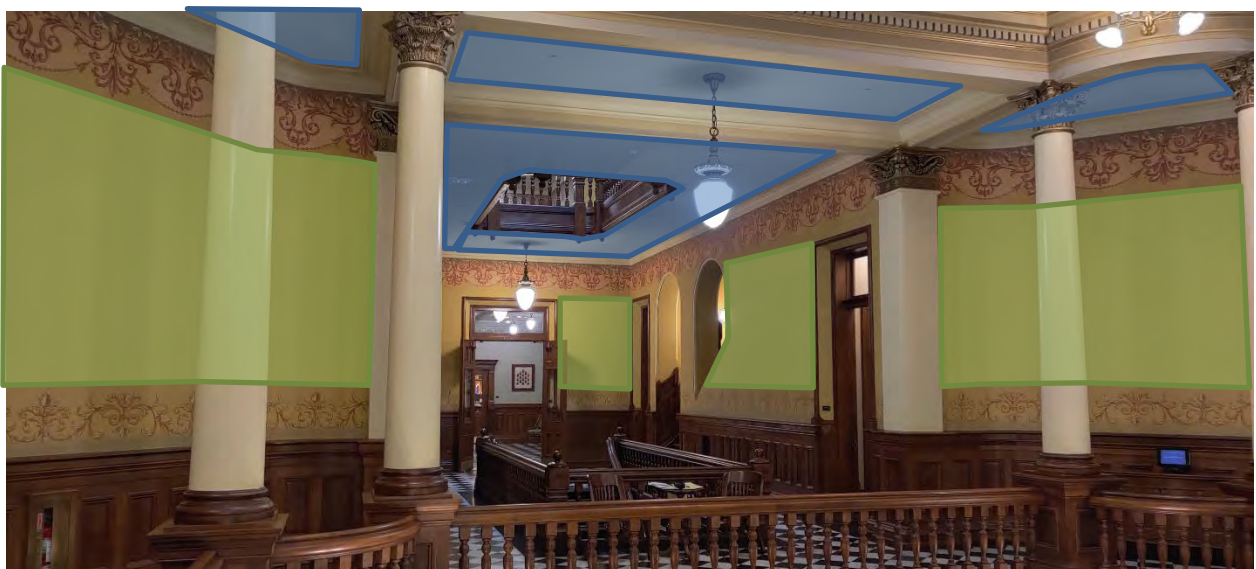


Figure 25. Recommended sound absorption installation locations. Typical for Level 2. Recommendation is for ceiling absorption or wall absorption.



Figure 26. Recommended sound absorption installation locations. Typical for Level 3. Recommendation is for ceiling absorption or wall absorption.

House and Senate Lobbies

- a. Install a 2-inch-thick acoustical product on the ceiling in each coffer. While complete ceiling coverage would be ideal, the minimum amount that should be considered is 100 square feet. Some potential products with similar acoustical performance are noted below, which should be chosen as desired for aesthetics:
 - 1) Acoustical Plaster.
 - 2) Stretched Membrane Acoustical System.
- b. In addition to the ceiling absorption listed above, we recommend placing area rugs wherever low traffic and furniture make it possible.
 - 1) Area rugs.
- c. In addition to the items listed above, sound absorption could be integrated into future technology kiosks, although the impact of this would be very minimal and might not be worth pursuing.



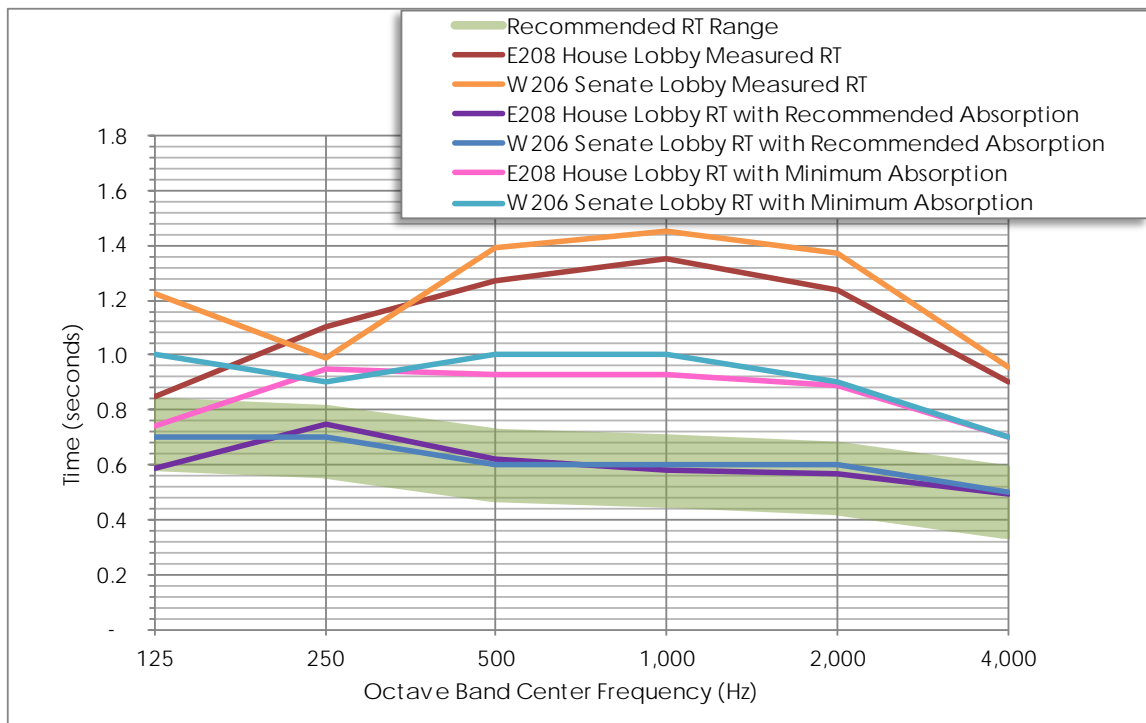


Figure 27. Measured and Estimated Lobby Reverberation Times.



Figure 28. Recommended locations for ceiling mounted sound absorption and rugs in Senate Lobby. Layout would be similar in the House Lobby.

Capitol Extension Corridor

- a. Install a 2-inch-thick acoustical product on the ceiling in the auditorium lobby and on the vertical walls of all the skylight wells. Some potential products with similar acoustical performance are noted below, which should be chosen as desired for aesthetics. Between 400 and 1000 square feet of total material is recommended.
 - 1) Acoustical Plaster.

- 2) Stretched Membrane Acoustical System.
 - 3) Stretched Fabric Acoustical System.
- b. In addition to the ceiling or wall absorption listed above, we recommend placing area rugs wherever low traffic and furniture make it possible, up to 300 square feet distributed throughout the corridor.
- 1) Area rugs.
- c. In addition to the items listed above, sound absorption could be integrated into future technology kiosks, although the impact of this would be very minimal and might not be worth pursuing.
- 1) Microperforated Wood Panels.
 - 2) Felt Panels.

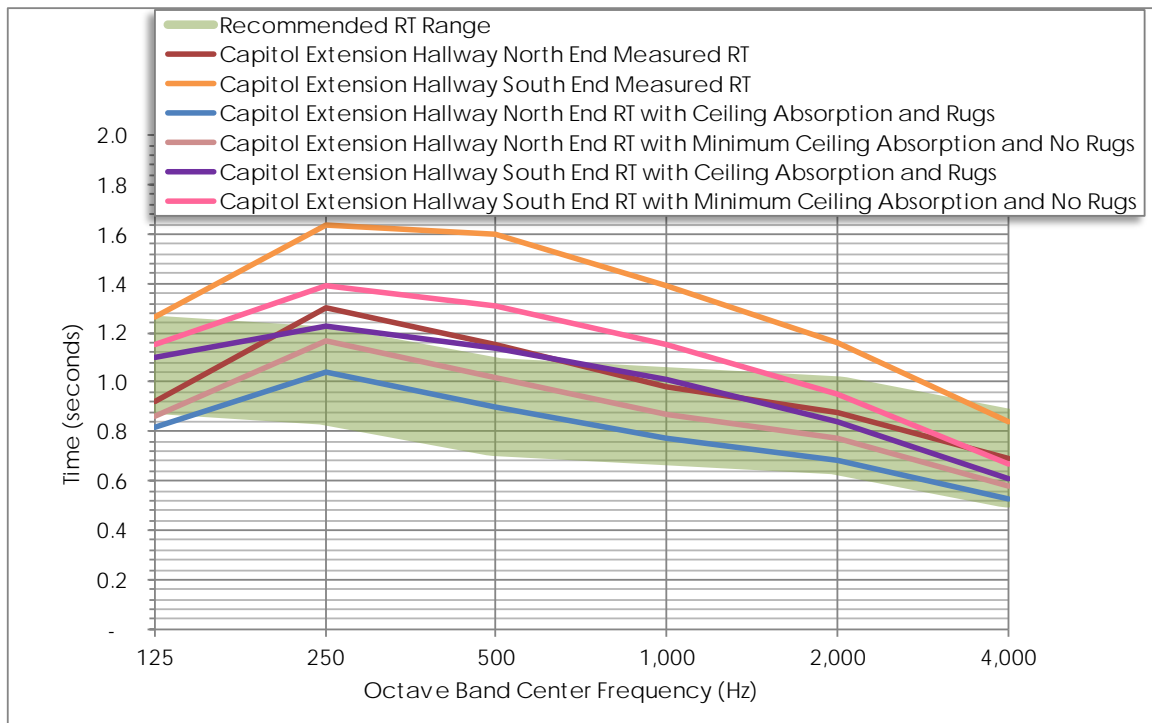


Figure 29. Measured and Estimated Capitol Extension Hallway Reverberation Times.





Figure 30. Typical recommended location for area rugs under existing and future furniture.

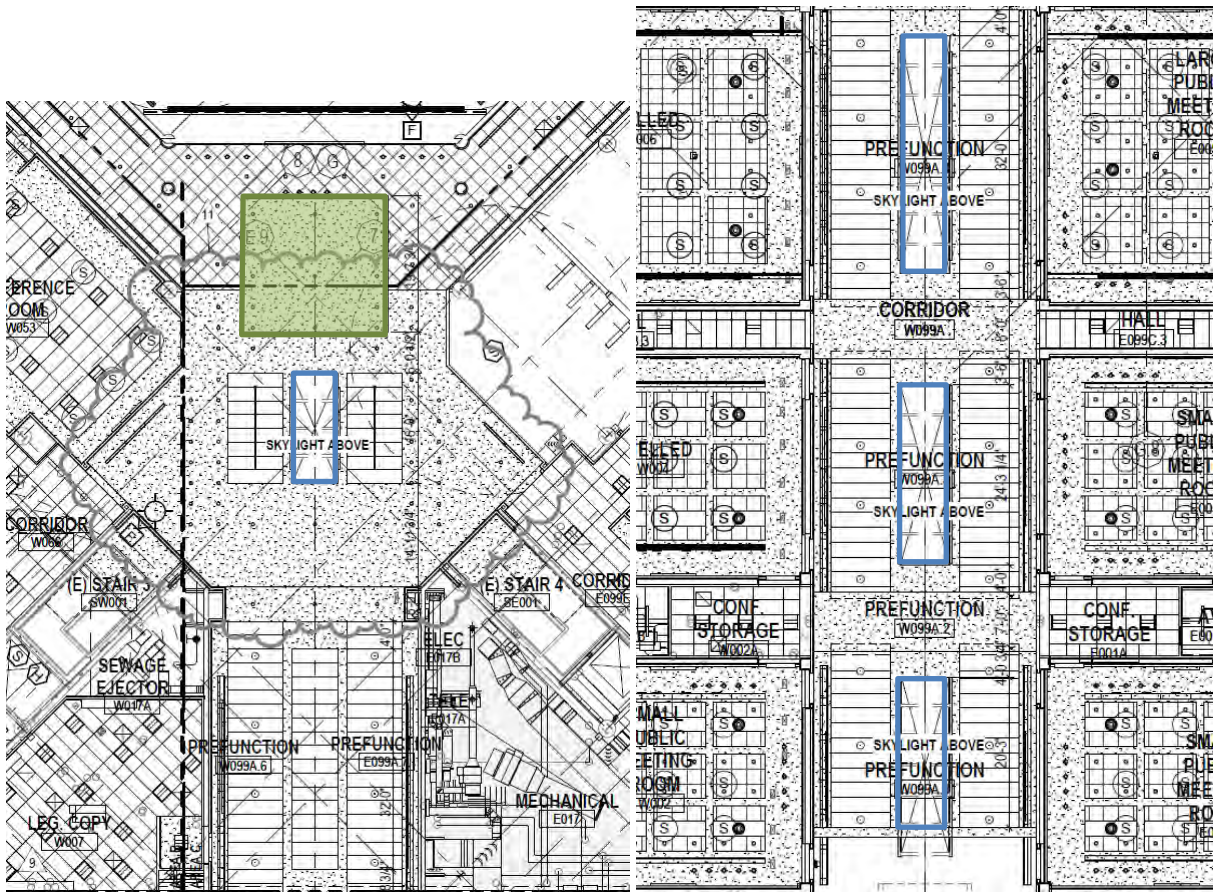


Figure 31. Recommended locations for sound absorption.

2. Temporary Sound Systems

- a. In the public corridors there are special events that sometimes require the use of a portable, temporary sound system. For these events we recommend the use of column-type, or line-array type loudspeaker systems. These loudspeaker systems are highly directional and will provide the

highest level of system intelligibility whether acoustical treatments have been installed or not. If these events occur regularly, it may be beneficial to purchase a specific system for use, rather than rely on the availability of rental systems that might not perform as well.

- b. If permanent acoustical treatments will not be installed in the public corridor areas, we recommend considering the temporary installation of rental curtains in front of the walls in select areas to provide some sound absorption and reduce reflections of audio reproduced by the loudspeaker system.

MECHANICAL NOISE CONTROL

1. Fan Coil Units – Offices and Conference Rooms

- a. During our site visit we measured the background noise level of several rooms which included local Fan Coil Units for heating and cooling. The recommended goal for offices and conference rooms that may be used for video and teleconferencing is NC 30-35. Each of the spaces in question were in excess of this, and some were much louder. For the majority of the spaces, given the mechanical systems present, the background noise levels are what we would expect; the fan coil units are operating normally. However, there are a few units exhibiting unusual whining or squealing sounds where we think that the units may require maintenance. See the Figure below for commentary.

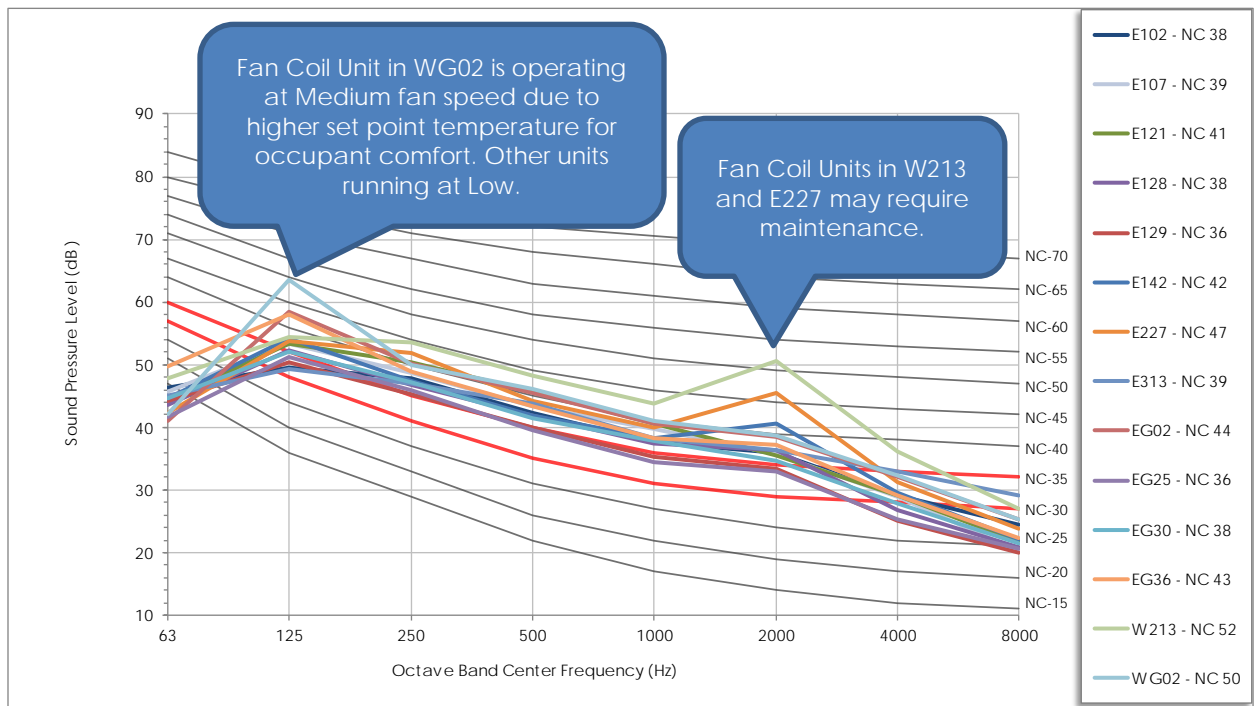


Figure 32. Fan Coil Unit Background Noise Levels.

- b. In order to reduce the noise level of the fan coil units, we recommend some specific modifications to the custom wood enclosures. Care must be taken to ensure that any modifications continue to allow proper operation and maintenance of the units. Any modifications should be evaluated by a mechanical engineer or the Fan Coil Unit manufacturer prior to implementation.
 - 1) Install a solid baffle over the return air inlet grille. This baffle could be made of wood to match the rest of the enclosure and should be larger than the dimensions of the grille and installed with a 1- or 2-inch gap between it and the inlet grille, allowing air to be pulled in from the sides. The inside face should consist of 1-inch-thick fiberglass duct lining.

- 2) Install 1-inch thick fiberglass duct lining on the perimeter of the supply air duct, and including some vertical baffles in the airstream itself, creating a mini duct silencer effect.
- 3) We expect these modifications to reduce fan coil unit noise by 3-6 dB in each location.



Figure 33. Fan Coil Unit inlet baffle diagram.

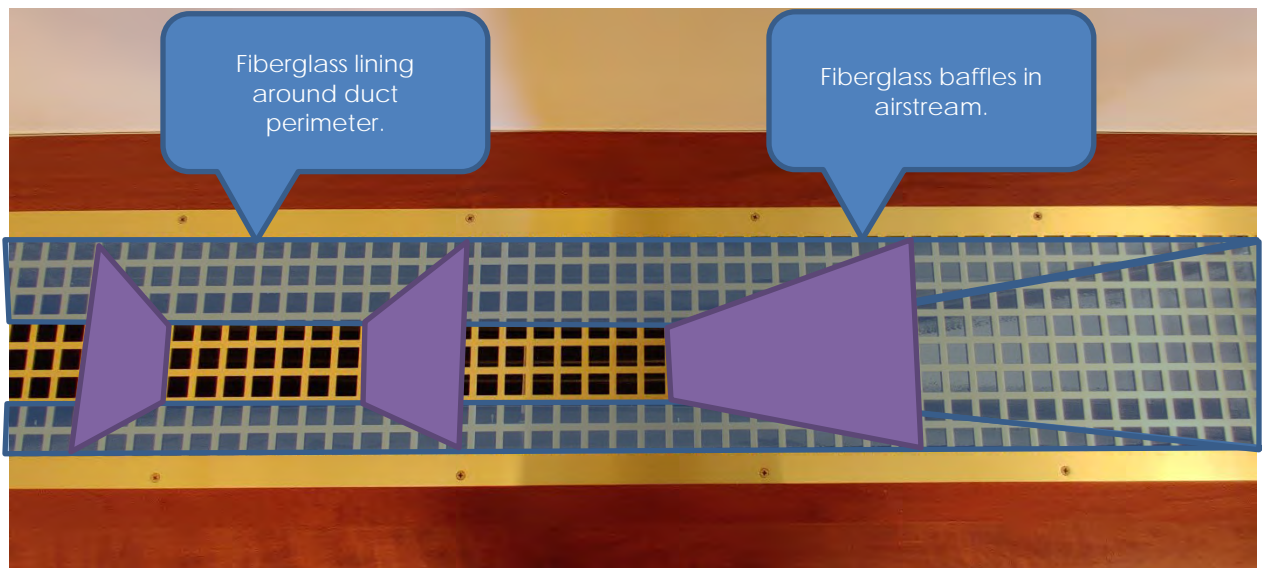


Figure 34. Fan Coil Unit supply duct lining diagram.

2. Air Handling Units – W105, W107, and WG11
 - a. There are three rooms we looked at that had outside air being served to the room from a nearby air handling unit which was causing the majority of noise in these rooms. Existing conditions prevent modification of the main supply duct, so we recommend installing new ductwork with internal 1-inch-thick duct lining to attenuate the noise.

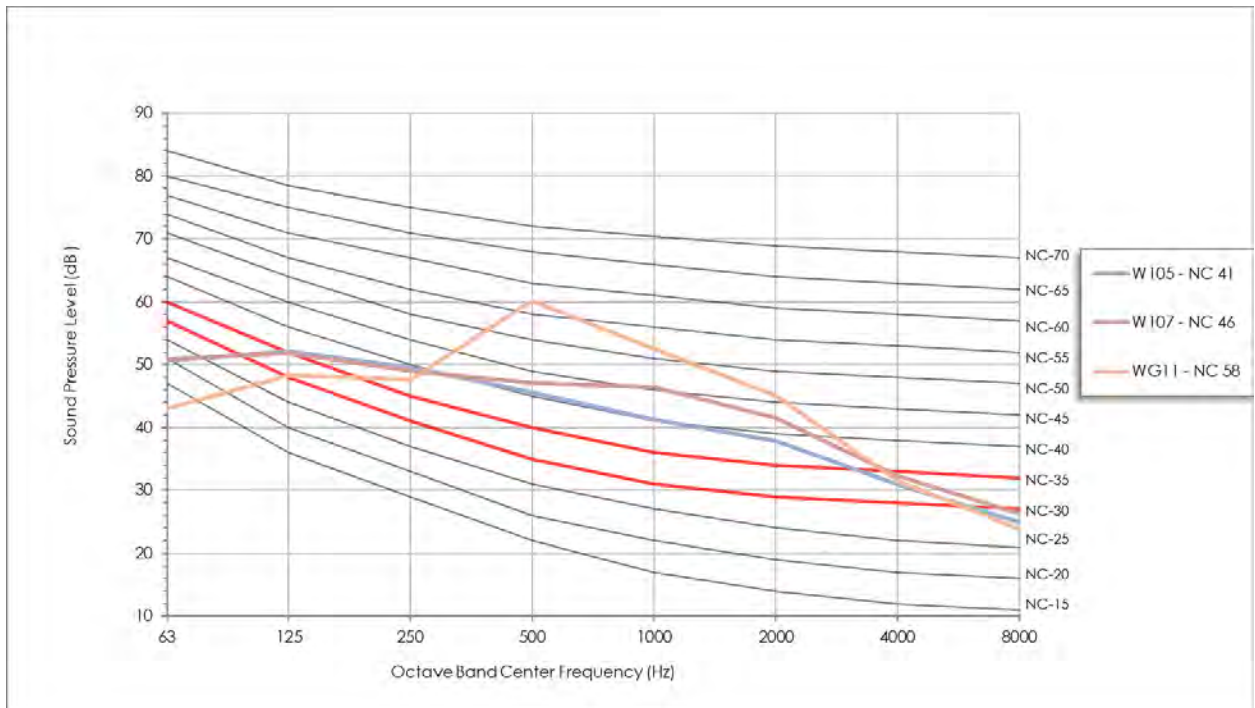


Figure 35. Air Handling Unit Background Noise Levels.

- b. We recommend installing at least 8-feet of new ductwork, post any volume damper, and including at least one elbow. New ductwork could be rerouted through adjacent closet space, or a new soffit created to hide it.

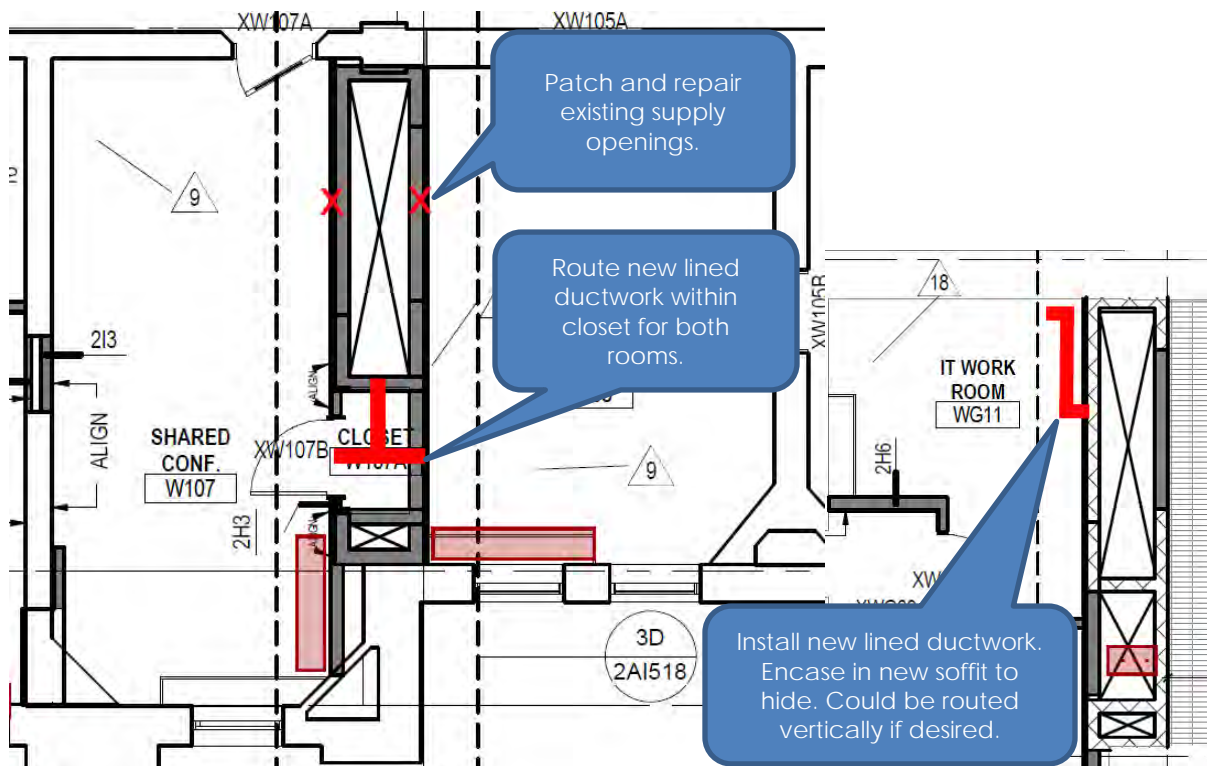


Figure 36. Recommended ductwork modifications.

3. Air Handling Units – Governor’s Open Office

- a. In the open office area EG14 there are two individual air handling units that control thermal comfort to this space. Unfortunately, these units are installed with very short duct runs and with only a single layer of gypsum board between the unit and occupied space which results in a background noise level of NC 61, much higher than the recommend NC-40 for open office areas. In order to control the low frequency noise from these units, significant construction may be required.

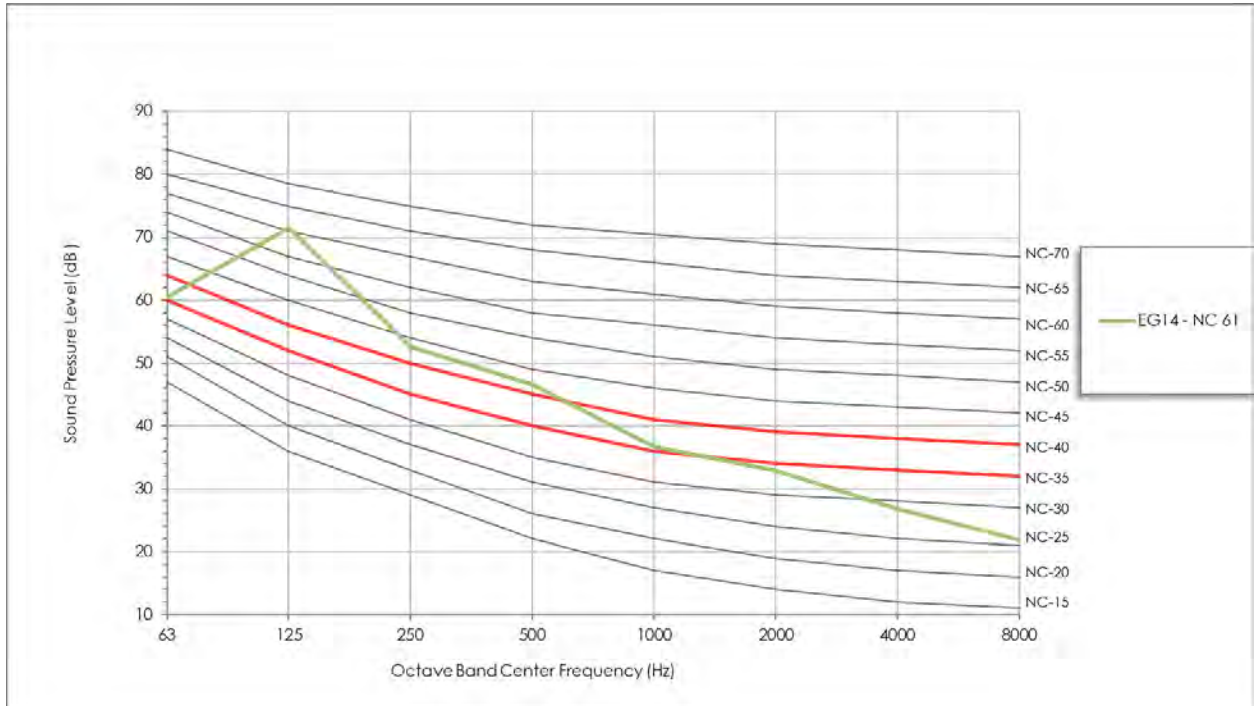


Figure 37. EG14 Background Noise Level.

- b. We recommend the following modifications to the construction, in order of importance:
- 1) Install proper vibration isolation for the units. Remove the shipping and installation hold-down bolts from all spring hangers. Install flexible duct connectors on supply ducts. Install proper isolators for all connected piping such as Mason Industries Vibraflex. <https://mason-ind.com/vibraflex/>
 - 2) Install 2-inch-thick fiberglass duct lining in all return and supply ducts.
 - 3) Install one layer of 5/8" Type X gypsum board on the inside of the mechanical chase, with lightweight fiberglass insulation in the stud cavity.



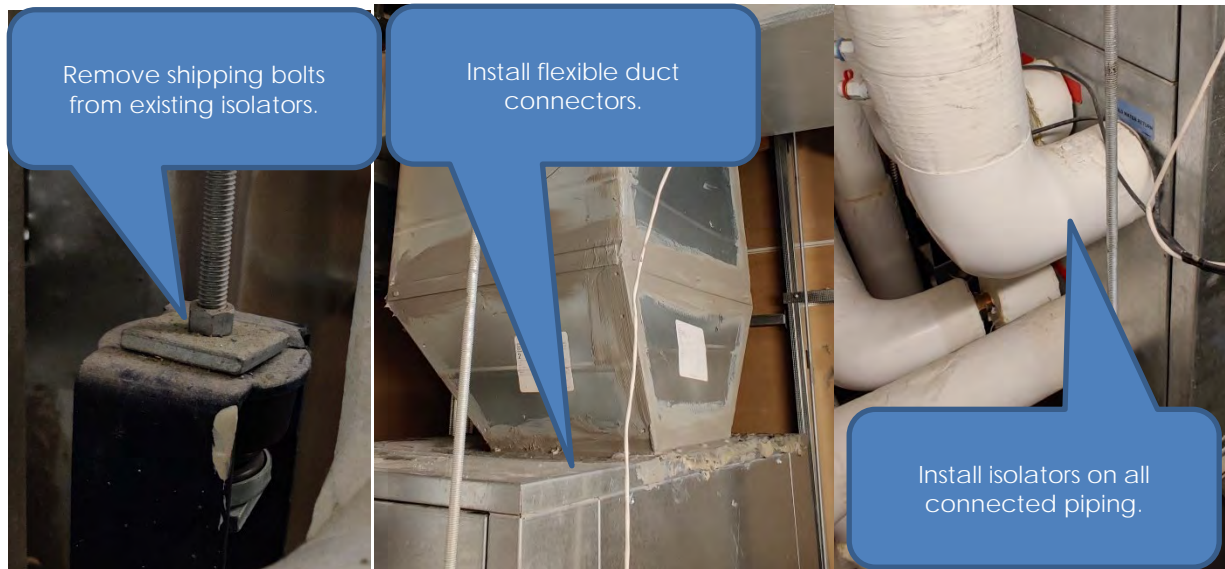


Figure 38. Recommended vibration isolation for air handling units.

STUDIO AND MEDIA ROOMS

We visited the two rooms currently used for broadcast video functions. It is intended to renovate room E027 to be a full-time professional broadcast studio. However, there are some acoustical issues that should be addressed during renovation in order to make this successful. AVANT ACOUSTICS can provide detailed design consultation if desired.

1. Room Acoustics
 - a. Broadcast studios work best when sound reflections are minimized and the room has a very low reverberation time. We recommend that when constructing this room, sound absorption be included on all walls but the green screen or virtual backdrop, and also on the entire ceiling.
2. Noise Control
 - a. It is very important to prevent infiltration of outside noise from entering the studio and possibly being picked up in the recording or live broadcast. There are three major adjacent noise sources to be concerned about in this location. The recommended background noise level for studios is NC 25 or less.
 - 1) Hallway. There is a frequently trafficked hallway right outside the studio door. Upgrades to the demising wall should be considered, and a sound retarding door and/or vestibule should be included.
 - 2) Elevator. The studio room is adjacent to an elevator shaft/machine room. In order to limit noise from this machinery, a new free-standing wall should be planned for the renovation. The room may need to be enlarged in order to function as a broadcast studio, as some existing square footage will be lost with the addition of walls for noise control.
 - 3) Mechanical Noise. Currently the studio room has no ceiling and is exposed to mechanical systems and piping. We recommend encasing any mechanical and plumbing systems in a hard soffit that is designed for noise control. Duct work will also need to be added to the local fan powered air terminal in the room and duct borne noise will need to be analyzed.

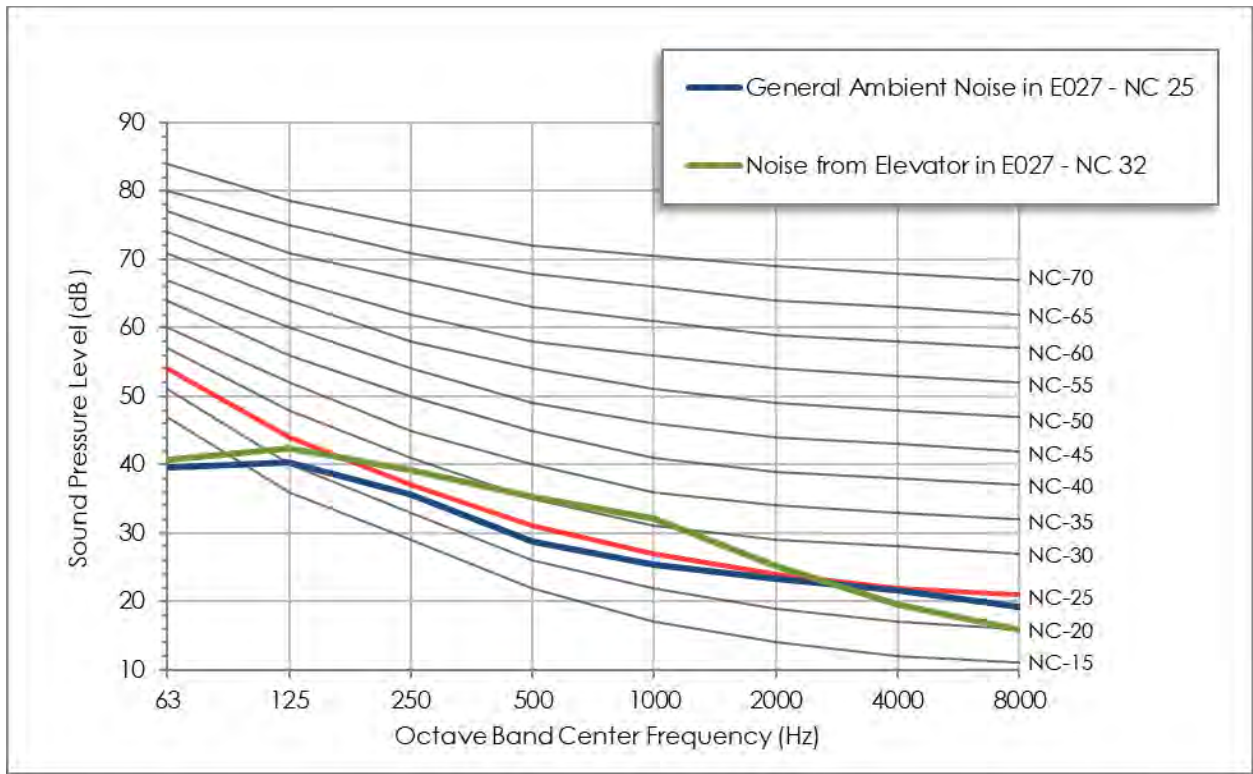


Figure 39. Studio E027 Background Noise Levels.

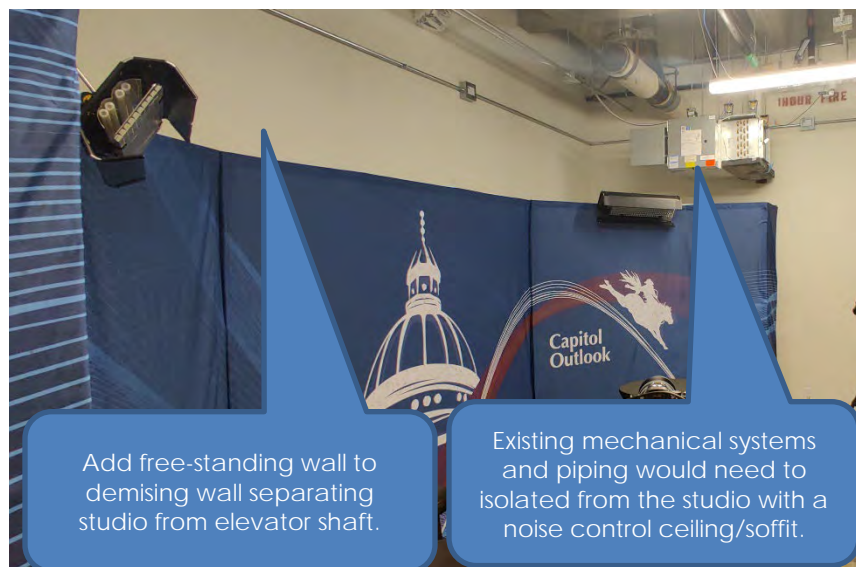


Figure 40. Studio E027 existing conditions and noise control recommendations.

3. Media Rooms

- a. The interior acoustics of the adjacent Media Rooms could be improved with the installation of 2-inch-thick acoustical wall panels installed on two adjacent walls.
 - 1) Stretched Fabric Acoustical System.
 - 2) Screen Printed Acoustical Panels.
 - 3) Painted Wall Panels (note the potential durability concerns of this product).

ACOUSTICAL PRODUCTS REFERENCE

Detailed information regarding acoustical products referred to in the report above are given below. Relative cost is indicated by \$ symbols. Exact costs to be determined as the design progresses. The \$ symbols represent ranges of budgetary costs:

\$ = \$15-25 per square foot.

\$\$ = \$25-35 per square foot.

\$\$\$ = \$35-? per square foot (depends on final finish selection).

1. Stretched Fabric Acoustical System (\$-\$). Consists of a sound absorbing core material, edge track, and fabric of the architect's choosing. Advantages of this system are a monolithic aesthetic with minimal seams, field installed/trimmed around existing architectural elements, field replaceable fabric if damage should occur, and can be very cost effective with large quantities and depending on fabric choices. Fabric can be screen printed to look like a mural or material texture for additional cost.
 - a. Extra-large spans, limited color options:
 - i. Clipso. <https://www.clipsocellingswall.com/>
 - b. Compatible with wide range of standard fabrics:
 - i. FabricWall. <https://fabric-wall.com/>
 - ii. FabriTRAK. <https://www.fabritrak.com/>
 - iii. Novawall. <https://novawall.com/>
 - iv. Snaptex. <http://www.snaptex.com/>

Some examples were provided by Capitol staff of things they have seen at other Statehouses that might provide precedence for the Wyoming Capitol. See below:



Figure 41. Example of stretched fabric acoustical system.

2. Fabric Curtains over Panels (\$-\$). Curtains hung as a finished material over a plain acoustical core such as fiberglass duct liner. Easy to retrofit into existing conditions and provides a more period-appropriate aesthetic that may be desirable and has precedence in many other statehouses.
 - a. 13 oz. (or heavier) Cotton or Synthetic Velour. <https://www.rosebrand.com/shop/product.aspx?id=1195>
 - b. Black fiberglass duct liner. G&S Acoustics Silent Night. <https://gsacoustics.com/product/silent-night-sn/>

Some examples were provided by Capitol staff of curtains they have seen at other Statehouses that might provide precedence for the Wyoming Capitol. See below:

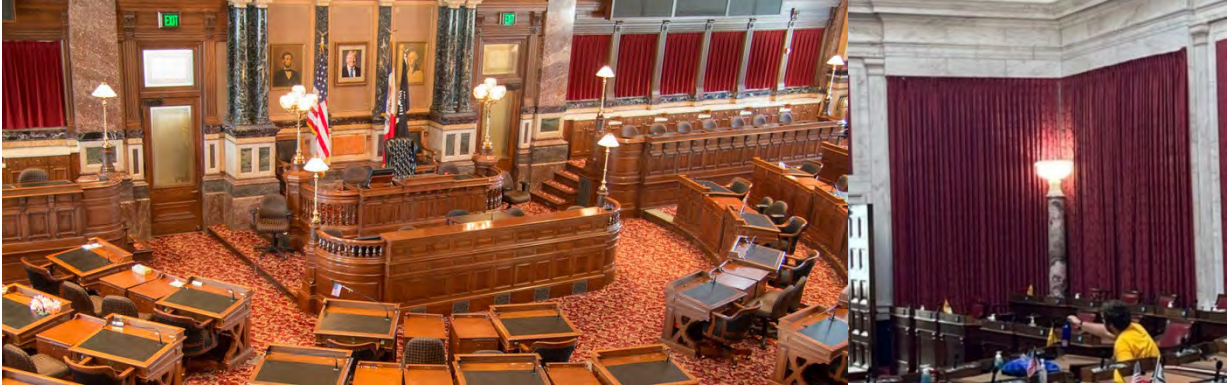


Figure 42. Example of fabric curtains installed on walls.

3. Fabric Curtains (\$-\$\$). Curtains hung with 100% fullness in a standalone fashion. Easy to retrofit into existing conditions and provides a more period-appropriate aesthetic that may be desirable and has precedence in many other statehouses.
 - a. 18 oz. (or heavier) Cotton or Synthetic Velour.
<https://www.rosebrand.com/shop/product.aspx?id=1472>

Some examples were provided by Capitol staff of curtains they have seen at other Statehouses that might provide precedence for the Wyoming Capitol. See below:



Figure 43. Examples of fabric curtains hung in stand-alone fashion with pullbacks.

4. Screen Printed Acoustical Panels (\$\$\$). Can mimic the look of wall mounted art prints, but includes specialized fabric suitable for acoustical applications, as well as sound absorbing core material. Can be a very expensive option, especially depending on the art print(s) used. Exact layout would need to be coordinated around existing architectural elements.
 - a. High-End Solution:
 - i. Meyer Sound Libra. <https://meyersound.com/product/libra/>
 - b. Middle-Grade Solution:

- i. G&S Acoustics Acousti-Image. <https://gsacoustics.com/product/acousti-image-panels-ai/>
5. Painted Acoustical Panels (\$\$). Consists of a sound absorbing core material with a scrim facing and factory painted to match a selected color. Can mimic the look of plaster or drywall from a distance but is surface mounted in panels with a limited maximum size. Usually recommended for high walls or ceilings that are out of reach since it is not the most durable (or cheapest) option. But, due to its panelized nature, it can be replaced if damaged. Exact layout would need to be coordinated around existing architectural elements.
 - a. G&S Acoustics Pinta Panels. <https://gsacoustics.com/product/pinta-panels-pp/>
6. Acoustical Plaster (\$\$\$). Consists of a sound absorbing core material with a specialized plaster surface that is field applied with a trowel. The product can be an expensive retrofit option, since its completely integrated aesthetic requires very detailed coordination with other building systems (lighting, fire sprinklers, etc.). For this application we recommend a specific version of this product that is durable enough to be installed on walls, is more easily repaired, and is field paintable.
 - a. StarSilent, by Pyrok. <https://www.starsilent.com/the-starsilent-system/#top>
7. Existing Acoustical Plaster (\$\$\$). Consists of a sound absorbing core material with a specialized plaster surface that is field applied with a trowel. Used where additional acoustical plaster is recommended to add to an existing ceiling that has acoustical plaster in some areas.
 - a. BaswaPHON. <https://www.baswana.com/baswa-products/baswa-phon>
8. Stretched Membrane Acoustical Systems (\$\$). Similar in concept to the stretched fabric acoustical systems described above, but usually only suitable for ceiling and high wall installation. Commonly used as an alternative to acoustical plaster systems due its monolithic appearance and resistance to water damage. Consisting of a stretched microperforated membrane instead of fabric, these systems are capable of large seamless applications with integrated lighting and sprinkler systems.
 - a. Barrisol. <https://barrisolusa.com/stretch-ceiling/stretch-ceilings-range/barrisol-acoustics>
 - b. Newmat. <https://newmatworld.com/>
9. Microperforated Wood Panels (\$\$\$). For a classic wood-look that has good acoustical performance, these are panels that include a microperforated face that is invisible from a few feet away. Various wood laminates are available and could be used as standalone wall panels or incorporated into furniture such as technology kiosks or desks.
 - a. Soundply by Navy Island. <https://soundply.com/>
10. Felt Panels (\$\$). Made from recycled polyester, felt products can be easily manufactured in custom shapes and recommended to be used as a finish material for custom-built elements such as technology kiosks or desks.
 - a. G&S Acoustics Acapella Scores. <https://gsacoustics.com/product/acapella-scores-as/>
11. Area Rugs (\$-\$\$). Thick area rugs can be used in select low-traffic areas of the public corridors to add sound absorption to the space.
12. Oil Paintings with Acoustical Media In-fill (\$\$\$): Hand painted artwork, thinly painted on canvas stretched over a wood frame. 1- to 2-inch-thick acoustical media installed within hollow cavity of frame such as fiberglass batt or mineral fiber insulation. This provides good low- and mid- frequency absorption but performs poorly at high-frequencies. Can be used in conjunction with other materials.
 - a. Johns Manville Linacoustic RC. https://www.jm.com/content/dam/jm/global/en/hvac-insulation/duct-liner/linacoustic-rc/JM_HVAC_LinacousticRC_Data_Sheet_EN.pdf



Please let us know if you have any questions.

Very truly yours,

AVANT ACOUSTICS, LLC

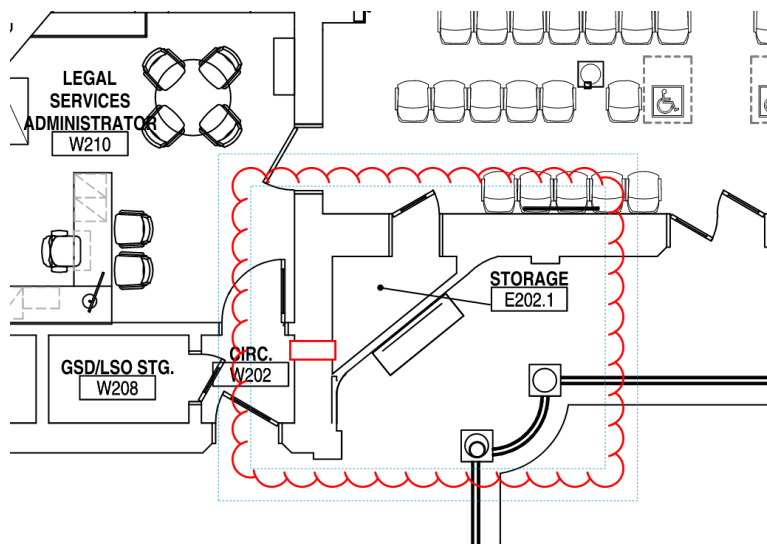


John M. Hodgson
Technical Operations Manager

SOUND SYSTEM UPDATES NARRATIVE FOR COST ESTIMATE
WYOMING STATE CAPITOL IMPROVEMENTS
Cheyenne, Wyoming
AVANT File C1117A

December 1, 2023

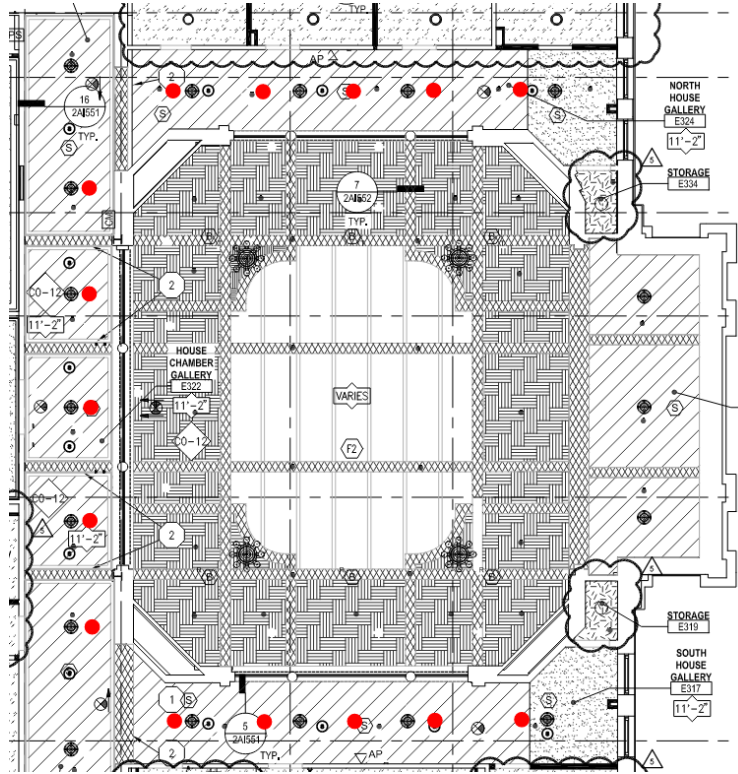
Item 1: Supreme Court Storage Room (E202.1). Install new inline exhaust fan through wall to Circ W202, including required power circuit, ductwork, grille(s), and undercut or grill in door.



Item 2: Joint Appropriations Committee (E301). Remove existing loudspeakers (two wall and twenty desk) and install twelve (12) new 6-inch ceiling loudspeakers (QSC AD-C6T-ZB or equivalent)

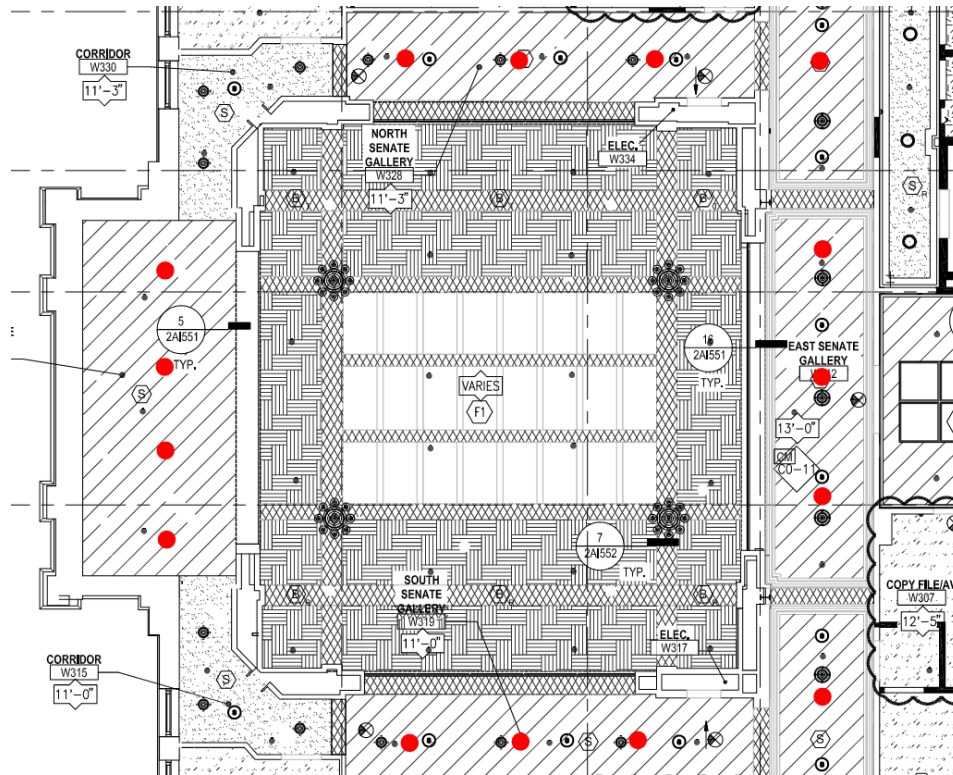


Item 3: House Chamber Gallery (E324). Remove existing loudspeakers and install fifteen (15) new flush mounted ceiling loudspeakers (QSC AD-C6T-ZB or equivalent).



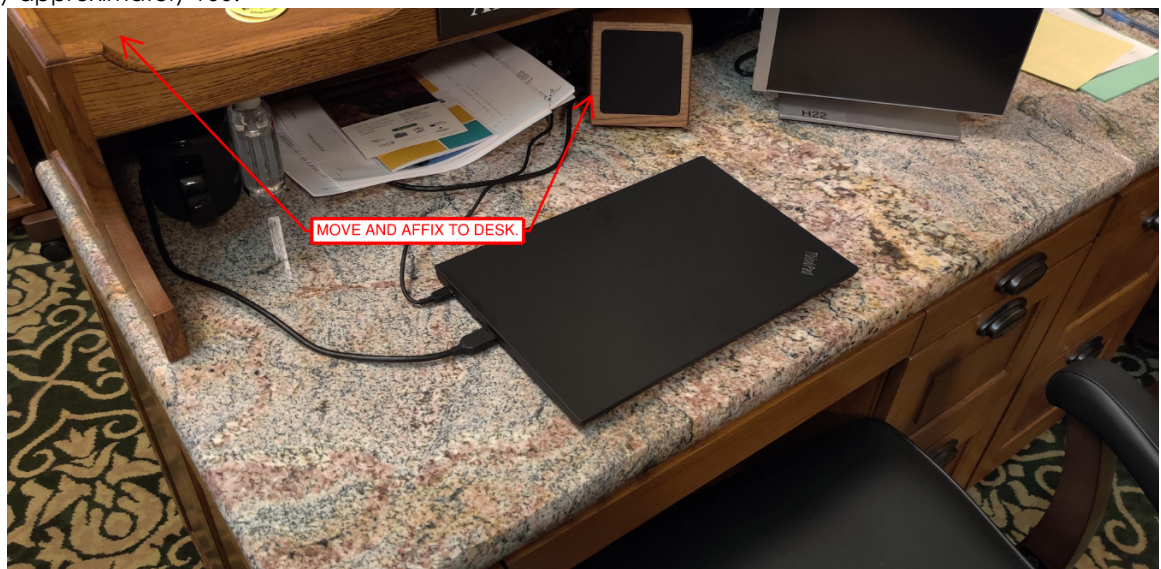
Item 4: Senate Chamber Gallery (E324). Remove existing loudspeakers and install fifteen (15) new flush mounted ceiling loudspeakers (QSC AD-C6T-ZB or equivalent).





Item 5: Desk Item: Create small portable wood placard with microphone etiquette instructions. Quantity 150. Update: Facility has already elected to implement stickers for this function.

Item 6: Desk Item: Move desk loudspeakers to upper shelf and permanently fix in place on millwork. Quantity approximately 100.



End of narrative.

December 12, 2023

Mr. William Wedemeyer
Construction Management Division
Wyoming State Construction Department
700 West 21st Street
Cheyenne, WY 82002

Re: Wyoming State Capitol Upgrades
Sound System Peer Review
Cheyenne, Wyoming
AVANT File: C1117A

Dear William:

Based on the results of our acoustical testing earlier this year (refer to our Site Visit Report dated May 5, 2023) we have been retained to assist with improvements to the intelligibility and operation of the sound systems at the Wyoming State Capitol. We recently visited the facility over three days, November 28-30, 2023, in part to gain a deeper understanding of the various sound systems and the backbone audio processing systems. We have also been in conversations with the audio processing manufacturer (QSC) and original audio system designers and maintenance providers (audio consultants at Salas O'Brien, formerly K2 Audio) to fully understand the systems. The following peer review presents our observations and recommendations for optimizing the systems.

EXECUTIVE SUMMARY

The scope of this report includes general sound system operation and maintenance discussions, and specific recommendations for the spaces in the Capitol listed in Table 1 below including on-site configuration of the existing systems. During our previous acoustical study, Speech Transmission Index (STI) testing was conducted using the existing sound systems in most of the rooms and general recommendations for improvement were presented. While the acoustics of each room is also recommended to be improved with the addition of sound absorbing materials (refer to ongoing project with the architect TreanorHL), specific changes to the sound system configuration are expected to make a noticeable improvement in STI performance as well.

There are two additional spaces that have been addressed in this report at the request of Capitol staff and based on feedback from the users. The Governor's Ceremonial Conference Room is reported to have similar intelligibility issues as other meeting rooms, but this was not previously tested for speech intelligibility. The Rotunda and Extension Corridor are currently used for special events with a temporary sound system which is reportedly insufficient and has poor performance.

Room	Existing Sound System Configuration Improvements	Existing Sound System Upgrades	New Portable or Installed System Recommendations
House Chamber E212	X	X	
Senate Chamber W214	X	X	
Historical Supreme Court Meeting Room E202	X	X	
Join Appropriations Committee Meeting Room E301	X	X	
Public Meeting Room W110	X	X	
Public Meeting Room W113	X	X	
Governor's Ceremonial Conference Room E107	X	X	
Rotunda Temporary Sound System			X
Capitol Extension Corridor Sound System			X

Table 1. List of spaces and associated topics in the scope of this report.

DEFINITIONS

Important terminology used throughout the report is defined below for reference.

1. **Acoustic Echo Cancelling (AEC):** Audio signal processing that automatically cancels out audio echo for the far-end of a tele- or video-conference call by detecting far-end audio being picked up by microphones in the room.
2. **Automatic Gain Control (AGC):** Audio signal processing that automatically adjusts the gain of an audio signal to match a preset level. Level adjustment can be up or down based on the detected signal level and the target level.
3. **Automatic Mixer:** Audio signal processing that automatically mixes the audio signals of a group of microphones based on signal level, number of microphones in simultaneous use, and other factors.
4. **Equalization:** Audio signal processing that is manually configured to adjust the tonality of an audio signal. The intent of equalization is to compensate for variations in audio response due to elements in the system such as the microphones and speakers.
5. **Narrowband Equalization:** Audio signal processing that is manually configured to reduce feedback in an audio system. Very narrow equalizer filters are applied to specific frequencies where the audio system is prone to feedback. Proper application of narrowband filters can increase the available gain-before-feedback in a system.
6. **Noise Suppression:** Audio signal processing that automatically detects background noise in a room that is picked up by microphones, and applies processing to cancel it out. Intended only for use on audio being sent to the far-end of a tele- or video-conference call. Algorithms work best with low frequencies and constant background noise sources such as mechanical fan noise.
7. **Speech Transmission Index for PA Systems (STIPA):** An objective field measurement of the speech intelligibility of a sound reinforcement system, as defined by American National Standards Institute (ANSI) Standard 3.5-1999 (R2017) and International Electrotechnical Commission (IEC) 60268-16. A table describing the rating system is listed below. A rating of 0.60 should be considered an absolute minimum for meeting rooms and government chambers within the Wyoming State Capitol, with a goal of 0.68 or higher. Intelligibility of a sound system is dependent on several factors, including frequency response of the system at the listener, reverberation time of the room, and signal-to-noise ratio (relative level of the reproduced speech to ambient noise).

Rating	STI Range	Examples of Typical Uses	Perceived Speech Intelligibility
A+	> 0.76	Recording studios	Excellent
A	0.72-0.76	Theatres, speech auditoria, parliaments, courts	Excellent
B	0.68-0.72	Theatres, speech auditoria, parliaments, courts	Good
C	0.64-0.68	Teleconference, theatres	Good
D	0.60-0.64	Classrooms, concert halls	Good
E	0.56-0.60	Concert halls, modern churches	Fair
F	0.52-0.56	PA in shopping malls, public offices, cathedrals	Fair
G	0.48-0.52	PA in shopping malls, public offices	Fair
H	0.44-0.48	PA in difficult acoustic environments	Poor
I	0.40-0.44	PA in very difficult spaces	Poor
J	0.36-0.40	Not suitable for PA systems	Bad
U	< 0.36	Not suitable for PA systems	Bad

Table 2. STI Rating System

SOUND SYSTEM TRAINING

One of the best ways to improve the performance of the system is to start at the source: the users. Proper usage of the system is critical for the best performance of any sound system. We recommend that additional training be provided for the users on the proper operation of microphone, loudspeakers, and the system controls. It has been suggested that this training be performed by AVANT ACOUSTICS at the next general session, after any system optimizations have been implemented. This could be done as a small group of selected individuals who then share their knowledge with other users as required.

1. Users should speak directly into the end of a gooseneck microphone from ideally 1-foot, and not more than 2-feet, away assuming a typical seated (or standing) position.
2. The moveable desk loudspeakers in some rooms should be positioned on the desktop directly facing the seated user, without obstruction. As discussed later, an alternative would be to permanently fix these loudspeakers to the upper portion of each desk.
3. It has been discussed that a small physical desk plaque with operational reminders may be beneficial, as new users (members) are elected. We agree with this approach and recommend that plaques be placed at each microphone location and each desk loudspeaker location (if moveable). These could be metal or wood with metal face plate, or other material, and could be standalone or attached to the sound system equipment. See Figure 2 below for an example.
4. As part of the system configuration and optimization process, the user interface will include some minor changes to prevent improper setting of microphone levels using the touchpanel and resultant audio feedback (refer to the sections below). Training on the new user interface controls will help with proper operation.



Figure 1. Improper uses of desktop loudspeaker.

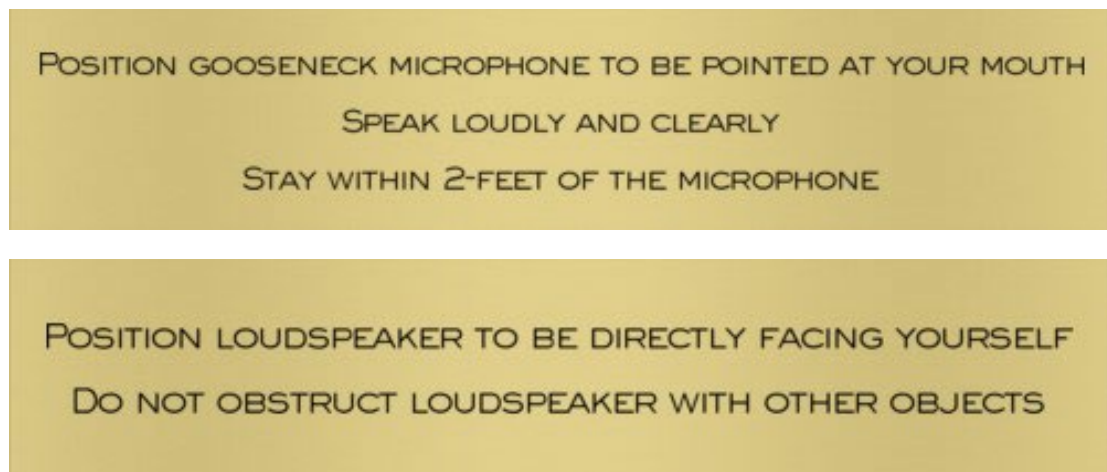


Figure 2. Example of microphone and loudspeaker desk plaques.

SOUND SYSTEM OPERATIONS AND MAINTENANCE

The central “brain” of each system is the QSC Q-sys Audio Processor, which provides audio signal processing and overall control of each system. This is a robust and highly flexible system and is an appropriate platform for these types of systems. However, due to its flexible nature, it can be prone to software and firmware bugs that threaten the stability of the system.

1. The current firmware on the processors at the facility is a custom non-public release version 9.6.0.1 written by the manufacturer to solve a USB issue. This issue has since been resolved in subsequent releases, and the current release is version 9.9.1. While many bug fixes and other quality-of-use improvements have been made, the manufacturer recommends (and original system designers at Salas O'Brien concurred) that if the system is in stable working condition, the firmware should not be upgraded unless a specific feature is required. After review of the release notes, we identified a few items of note in releases between 9.6.0.1 and 9.9.1, besides the known USB issues that were resolved:
 - a. Improvements to the Q-sys PTZ camera image quality.
 - b. Significant feature enhancements for the Reflect Enterprise Manager platform (see item 2 below).
 - c. Bug fix for Q-sys QIO peripheral audio issues. This product allows audio input and output expansion for Q-sys systems. While this product is not currently in any of the systems at the Capitol, the existing audio input/output boxes that are included in the systems have since been discontinued and replaced with the QIO product. Any future expansion would require the update to a newer version of firmware in order to use the QIO products.
2. During discussions with Capitol AV staff, there has been a commonly described issue regarding system maintenance, file management, and system monitoring. Currently the system is accessed via a series of local computers installed in racks and credenzas, either through local rack mounted KVM (keyboard/video/mouse) stations, or remotely through TeamViewer software. This has reportedly led to issues such as mis-matched firmware versions on different systems, out-of-date design files loaded into the processors, and difficulty monitoring the health and status of each system. Q-sys offers a product called Reflect Enterprise Manager that is intended to alleviate such issues in large deployments of multiple systems. This online management portal creates a centralized interface to manage multiple systems, including various access security features, design file backup, batch firmware and design file updates, and alert notifications sent to various messaging platforms (i.e. email) that can be customized as needed.
 - a. Complete details of this system and access to a 30-day trial can be found at: https://reflect.qsc.com/help/Content/QREM_Overview.htm and <https://www.qsys.com/products-solutions/q-sys/monitoring-management/q-sys-reflect-enterprise-manager/>.
 - b. We believe that this platform could be beneficial for long-term maintenance and management of these systems and recommend that it be considered.
 - c. If this platform is deemed desirable, we recommend that this system be purchased through your current Q-sys dealer (Salas O'Brien/Ford AV). The cost for this platform is a monthly fee based on the size and quantity of connected systems.
 - d. Using this platform will likely trigger the need to upgrade firmware to the latest public release version. This is still being evaluated by QSC.
 - e. In order to use this platform, internet access would need to be provided to each Q-sys Core. This can easily be done, as the secondary port (LAN B) on each Core is currently connected to the Voice-over-IP (VOIP) network for integrated phone conferencing. As described in subsequent sections, this function is no longer desired and these network connections could be repurposed for an internet connection to support Reflect Enterprise Manager.
3. Undertaking firmware upgrades for a Q-sys system should not be taken lightly. We highly recommend that this be done rarely and only if needed to solve a functionality problem or known system bug that is hindering system performance. Firmware updates should also only occur with ample time before the system will need to be used (at least one full day, during which stability testing is performed). While the upgrade process can be relatively quick, there is always a chance for peripheral devices to not update properly, or user interfaces do not function as intended. It is also best practice that all systems in a facility be updated to the same firmware version. While it is technically possible for these systems to operate together at different firmware versions, it adds complexity to the maintenance of

the systems and could lead to inadvertent firmware upgrades or downgrades during design file changes.

4. After reviewing the systems in depth and gathering data from the manufacturer, it is also our recommendation that the existing firmware NOT be updated at this upcoming site visit for system optimization. While we found no specific technical concerns against a firmware upgrade, there is some risk involved due to the short window of time before the next legislative session, only a select few of the systems at the facility would be getting the firmware upgrade at this time, and there appears to be only minimal benefit from such an undertaking. However, firmware updates may be required in the future if proceeding with a deployment of the Reflect Enterprise Manager (this is still being evaluated by the manufacturer).

SOUND SYSTEM CONFIGURATION IMPROVEMENTS

We propose a series of audio processor configuration changes to improve system intelligibility and performance. The implementation of these changes is anticipated to occur during January 2024 prior to the next General Session as a joint effort between Salas O'Brien (to perform the Q-sys design file changes as described in this report and assist with on-site implementation) and AVANT ACOUSTICS (to perform on-site configuration and testing). We suggest that these changes apply to all the systems in scope unless otherwise noted. Refer to Appendix A for detailed information from a sample audio processor file, and the provided sample file itself.

1. Design file changes:
 - a. Separate the in-room reinforcement processing path from the remote far-end path. This avoids audio artifacts from Acoustic Echo Cancellation (AEC) and Noise Suppression (NS) processing that can reduce system intelligibility and is only intended for the audio paths feeding the far-end of video and teleconferencing.
 - b. Leave the Automatic Gain Control (AGC) processing in the far-end audio path only and implement light audio compression prior to the automatic mixer in the in-room audio path.
 - c. Add narrowband equalization to reduce feedback (implemented with extremely narrow parametric filters within the loudspeaker equalization components).
 - d. Replace the standard matrix mixer currently used for mix-minus audio processing and implement a delay-matrix mixer for enhanced time-aligned mix-minus operation. Only applies to the following systems:
 - 1) House Chamber.
 - 2) Senate Chamber.
 - 3) Historical Supreme Court Meeting Room.
 - 4) Joint Appropriations Committee Meeting Room.
2. Graphical User Interface (GUI) changes:
 - a. Remove the "Main Volume" control and any current gooseneck microphone subset controls (applies to some systems).
 - b. Add a range-limited gooseneck microphone level control.
 - c. Remove any remaining teleconference/VoIP pages.
 - d. Remove audio-only recording control pages (to be confirmed).
 - e. Add an "Administrator" control interface with limited range individual microphone control for fine tune adjustments.
3. On-site configuration activities:
 - a. Re-equalize the loudspeaker systems for flat response.
 - b. Re-equalize the gooseneck microphones for natural and intelligible response.
 - c. Add narrowband filters for primary feedback frequencies.
 - d. Reset all gain structure for proper operation of automatic mixers, compressors, etc.
 - e. Set appropriate mix-minus delay and gain settings (as applicable by room).

EXISTING SOUND SYSTEM UPGRADES

We propose a few physical upgrades be considered for some of the rooms, as part of the larger architectural acoustics project, or separately. These upgrades involve physical installation of new components, and in some cases removal of existing components.

1. Loudspeaker Distribution

There are a few areas where the sound system coverage could be improved with the addition of new loudspeakers and/or rearrangement of existing loudspeakers. The table below summarizes the recommended changes. Refer to Appendix B for sketches of proposed loudspeaker arrangements. Estimated budget costs for these upgrades are being provided as a portion of the architectural package cost estimate, and it is assumed that these upgrades might only occur if larger ceiling modifications are pursued for acoustical improvement as part of that project.

Room	Recommended Loudspeaker Upgrade
House Chamber E212	<ol style="list-style-type: none"> 1. Add loudspeakers to the Gallery. Rearrange existing loudspeakers to provide even coverage to the entire Gallery. 2. Fix the desktop loudspeakers to the upper level of each member's desk to prevent tampering.
Senate Chamber W214	<ol style="list-style-type: none"> 1. Add loudspeakers to the Gallery. Rearrange existing loudspeakers to provide even coverage to the entire Gallery. 2. Fix the desktop loudspeakers to the upper level of each member's desk to prevent tampering.
Join Appropriations Committee Meeting Room E301	<ol style="list-style-type: none"> 1. Remove all existing loudspeakers. Install twelve (12) flush mounted ceiling loudspeakers evenly distributed across the ceiling. 2. Fix the desktop loudspeakers to the upper level of each member's desk to prevent tampering (if Item 1 is not implemented).

Table 3. Recommended Loudspeaker Upgrades

2. Ancillary Reinforcement Systems

All the sound reinforcement systems already include two (2) hearing assistance systems: a wireless radio-frequency system that utilize belt packs and headphones or neckloops for the user, and an under-carpet induction loop system that works in conjunction with hearing aids (other than the JAC room, which has no loop system). While these systems more than adequately cover ADA requirements and provide options for those who are hard-of-hearing to listen to the proceedings, there may be some aversion to using these systems on a regular basis by members. We recommend considering some additional ancillary systems to supplement the loudspeakers systems. The table below summarizes the options.



System	Description	Estimated Budget Cost
Wi-Fi Audio Streaming	For all systems, add an audio streaming server. This device can utilize the existing Wi-Fi network to stream audio to an app on users' phones and allow them to use their own personal wired or Bluetooth headphones to listen. https://williamsav.com/product/wavecast-c-wi-fi-audio-system-with-dante/	\$2,500 per system.
Local Headphone Output	For systems with desktop loudspeakers, add a headphone level output for personal listening to each desk, either under the counter or possibly to the side of each desktop loudspeaker. This would have a function similar to the RF hearing assistance system, but would have higher quality audio and might be simpler and more discreet to use.	\$500 per location. (Modification to existing custom loudspeaker enclosure not included.)

3. Microphone Systems

During our last site visit, some issues were discussed regarding the wireless microphone operation in the Governor's Ceremonial Conference Room. The usage of this room has perhaps changed since the original design and now is primarily used for general meetings and online meetings. The Shure Microflex Complete Wireless conference system that is currently installed does not appear to meet the needs of the current usage, as it is limited to a single sub-mixed output to feed the room loudspeakers, resulting in low gain-before-feedback and difficulty controlling audio levels. It is possible that this system could be reconfigured to work better, which will be explored during the system optimization trip in January.

If system optimization does not improve the performance of this system, we recommend upgrading the system to a more traditional wireless microphone system such as the standard Shure Microflex Wireless system (not the "Conference" system). This upgrade should alleviate the issues currently experienced with microphone control and gain before feedback.

- a. https://www.shure.com/en-US/products/wireless-systems/microflex_wireless
- b. Estimated budget cost for microphone upgrade: \$25,000.

CAPITOL ROTUNDA AND CAPITOL EXTENSION CORRIDOR

There are periodic special events that take place in the Capitol Rotunda and Capitol Extension Corridor. Currently a simple podium mounted speaker system is used to support these events, which results in reportedly poor performance. We would recommend upgrading this temporary system to meet the needs of these challenging acoustical spaces. Recommended products are listed below, with the common features being a bass/amplifier unit with integrated mixer, and a small column of loudspeakers stacked on top. Multiple systems can be daisy-chained together to provide coverage for various floor levels (Rotunda, 2 systems per level), or wide spaces (Extension Corridor, 2 systems in a stereo pair).

- a. Electro-Voice EVOLVE 50M. <https://products.electrovoice.com/na/en/evolve-50m/>
- b. JBL PRX One: <https://www.jbl.com/portable-pa-systems/JBL-PRX+ONE-NA-LS.html>

Since it appears that permanently installed acoustical treatments are not being considered for the Rotunda area and public corridors of the Capitol, we recommend considering the temporary installation of rental curtains (pipe and drape) in select areas to provide some sound absorption and reduce reflections of audio reproduced by the loudspeaker system. These curtains could also be used to partition off areas of the public corridors not used for the event, thereby reducing the acoustical volume of the space.

In the Extension Corridor, a permanent sound reinforcement could be considered, utilizing distributed ceiling loudspeakers flush mounted in the acoustical ceiling tiles. This system could be extremely simple, consisting of a wireless microphone or two, with an audio processor and amplifier located in the nearby existing auditorium equipment rack. Control could be limited to a small wall mounted volume control.

- a. Estimated budget cost for permanent system: \$20,000.

Please let us know if you have any questions.

Very truly yours,

AVANT ACOUSTICS, LLC



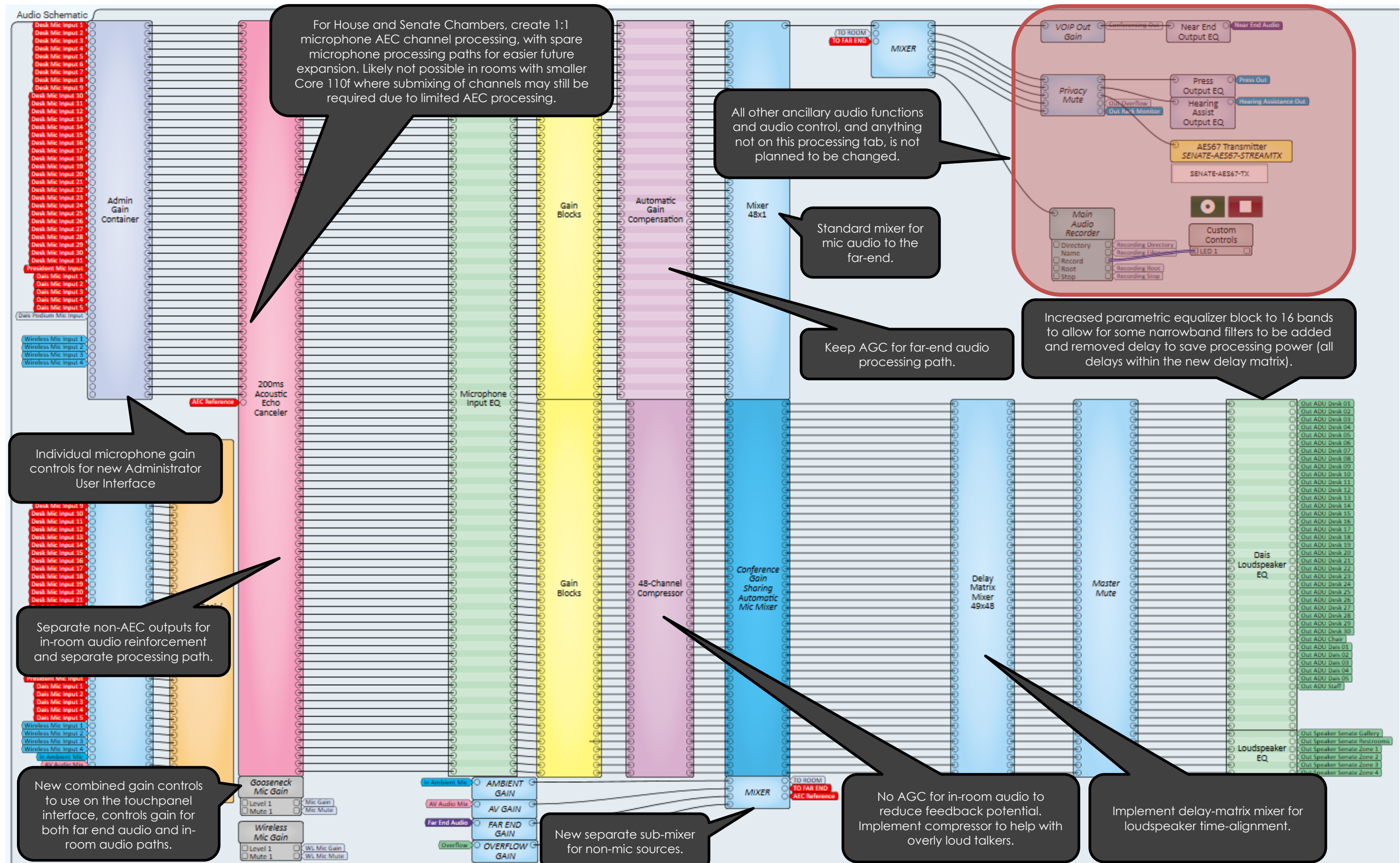
John M. Hodgson
Technical Operations Manager

Enclosures

Appendix A: Audio Processor Design File Example with Commentary.

Appendix B: Loudspeaker Upgrade Layout Drawings.





Record

Overflow

Microphones

Power

VIDEO

Click on a Source to Send to Displays and Audio Sy

Remove recording controls (to be confirmed).

Remove any remaining VOIP controls (if applicable) from each system.

Rename level controls for consistent and current language.

Change master volume control to gooseneck mic control only.

AUDIO

Web Conference

Room to Web Conference

AV Audio

Gooseneck Mics

Privacy

-

+

-

+

-

+

-

+

AUDIO LEVELS AND MUTES

Gooseneck Mics Volume

-

+

Reset

AV Audio

-

+

Reset

Wireless Mics

-

+

Reset

Web Conference Audio

-

+

Reset

Room to Web Conference

-

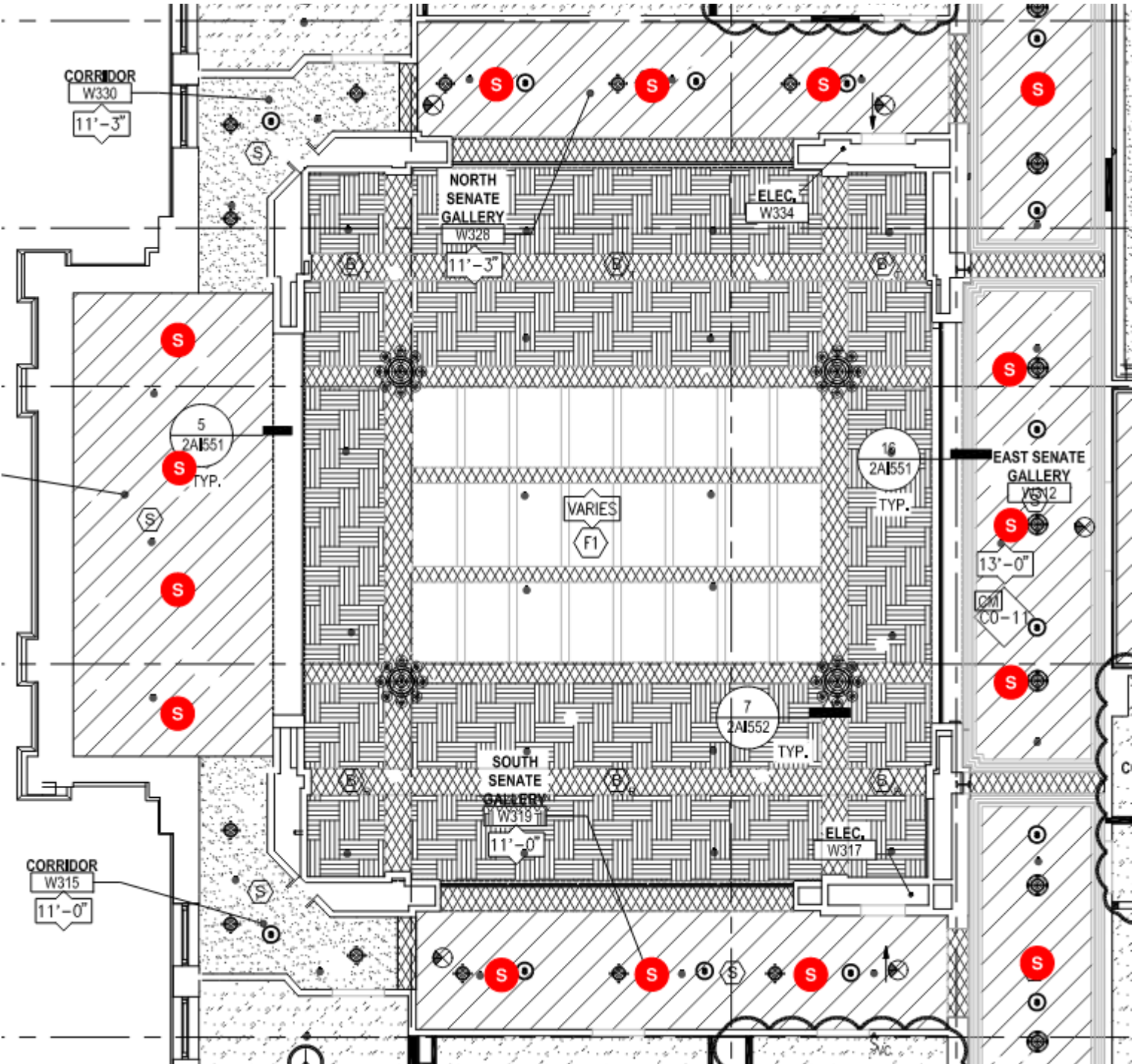
+

Reset

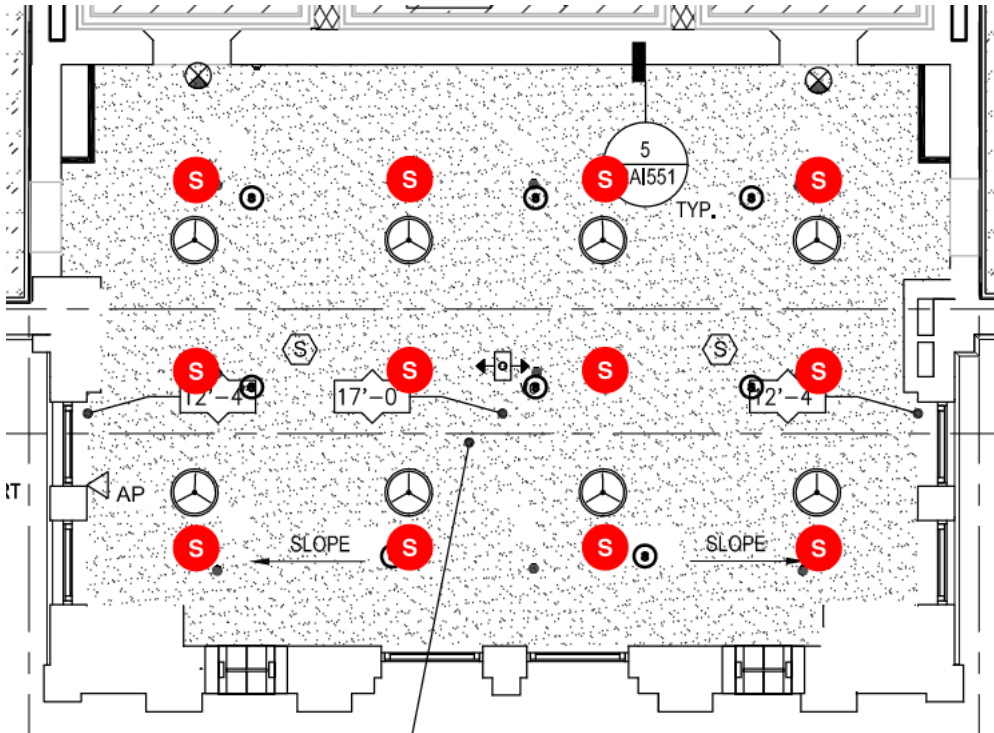
Change master volume control to gooseneck mic control only.

Rename level controls for consistent and current language.

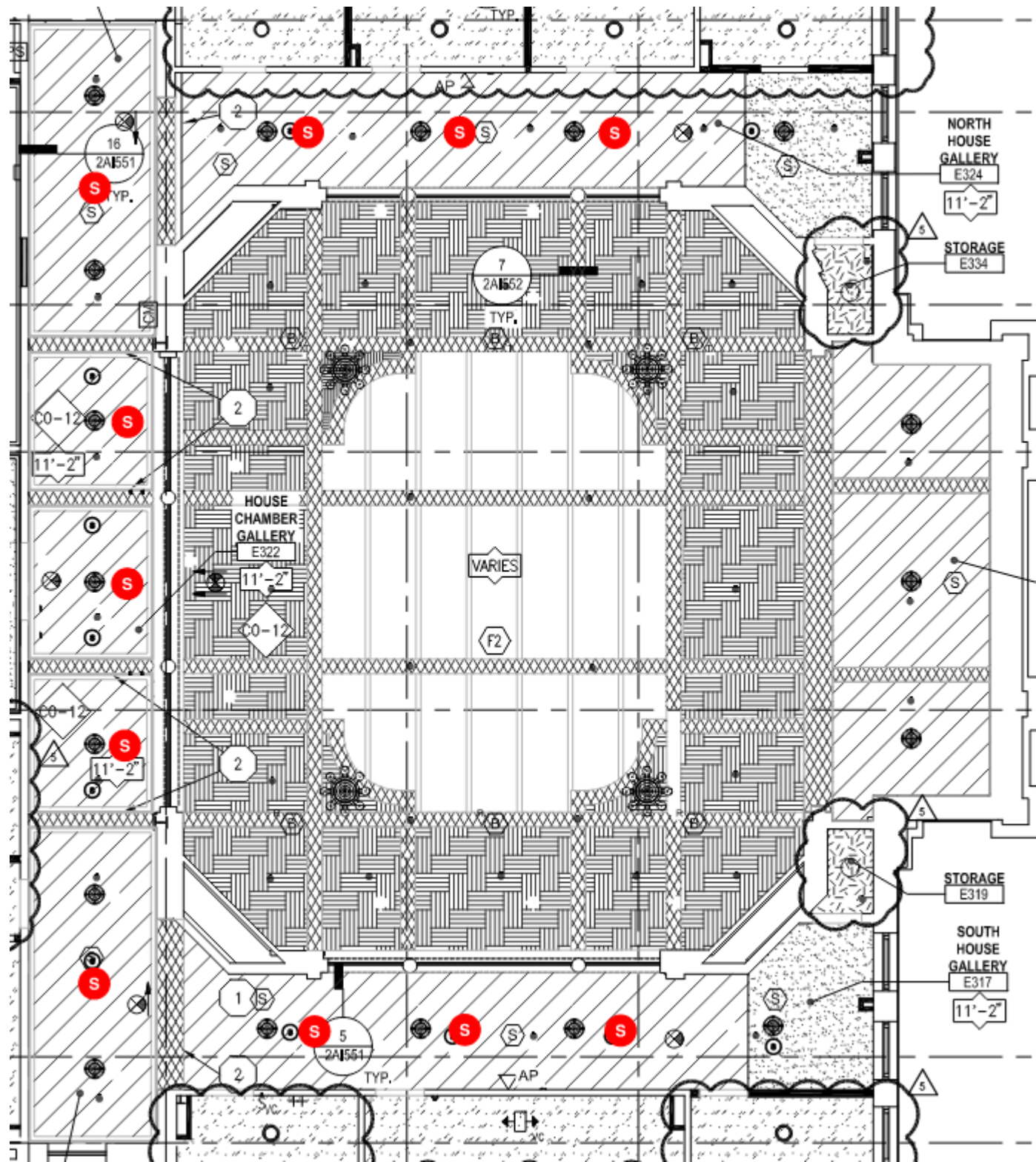
New administrator user interface with range-limited individual microphone level controls for fine tuning (not located on staff user interface).



1. Recommended Senate Gallery Loudspeaker Layout.



2. Recommended JAC Meeting Room Loudspeaker Layout.



3. Recommended House Gallery Loudspeaker Layout.



HENDERSON
ENGINEERS

WYOMING CAPITAL – ENGINEERING SCOPE

01/26/2024

ISSUED BY

Henderson Engineers, Inc.
800 18th Street, Suite 200
Denver, CO 80202

PROJECT INFO

Wyoming State Capital Acoustics
Cheyenne, Wyoming

The following narrative is an itemized description of the MEPF scope. Quantities of devices were based off available documents and site photographs. Scope listed below is arranged in order of priority.

FAN COIL UNITS

1. The following measures shall be taken to address noise generated by fan coil units as called out in sections below. Contractor to field verify each fan coil grille and connection size.
 - A. Fan Coil Discharge:
 - 1) The following suggestions shall be broken down in cost estimate for evaluation by the design team.
 - a) Option 1: Install 1" thick fiberglass duct lining on the perimeter of the fan coil discharge.
 - b) Option 2: Install duct lining as outlined above as well as installation of vertical baffles in each fan coil airstream. Baffles to be 1" thick and spaced every 12" across full length of discharge section. Exact baffle quantity to be coordinated with Avant.
 - B. Fan Coil Return:
 - a) Install a solid baffle on the inside of each return air inlet grille. The baffle shall be made of wood and shall be installed to ensure a 1" gap between the back of the existing return grille and the unit filter. The outside face of the baffle shall be lined with 1" thick fiberglass duct lining. Baffle assembly shall be removable to ensure access to unit filter is maintained.
2. Contractor to confirm fan coil control sequences have temperature a deadband as well as the ability to cycle the fans to only run when there is a call for heating or cooling in the space.
3. Contractor to verify spaces with multiple fan coils are not operating in series. Fan coils shall run in parallel to limit noise generated by each unit upon a call for cooling/heating.
4. Contractor to inspect all fan motors and replace any that are defective.
5. Refer to priority list below for fan coil treatments by space.

HIGH PRIORITY – LEGISLATIVE

1. Joint Appropriations Committee (E301)
 - A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (2) Wall mounted cameras.
2. Public Meeting Rooms (W110 & W113)
 - A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below. Quantities listed are the total for both W110 and W113.
 - 1) Wall Modifications
 - a) (8) Wall mounted cameras.
 - b) (7) Wall mounted grilles.
 - c) (6) Wall mounted sensors.
 - d) (4) TV display and associated data and electrical outlets.
 - e) (2) Wall mounted fire alarm notification device.
 - 2) Ceiling Modifications
 - a) (4) Ceiling mounted exit signs.
 - b) (4) Ceiling mounted security cameras.
 - c) (12) Pendant light fixtures.
 - d) (18) Ceiling mounted speakers.
 - e) (2) Wifi access point.
 - f) (4) Fire alarm notification devices.
 - g) (18) Concealed sprinkler heads.
3. Senate Chamber and Gallery (W212 & W312)
 - A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below. Quantities listed are the total for both W212 and W312.
 - 1) Wall Modifications
 - a) (4) Wall mounted cameras.
 - b) (4) Wall mounted grilles.
 - c) (2) TV display and associated data and electrical outlets.
 - 2) Ceiling Modifications
 - a) (1) Ceiling mounted exit signs.
 - b) (10) Pendant light fixtures.
 - c) (6) Ceiling mounted speakers.
 - d) (4) Fire alarm notification devices.
 - e) (2) Ceiling mounted sensors.
 - f) (11) Concealed sprinkler heads
4. House Chamber and Gallery (E214)
 - A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (4) Wall mounted cameras.
 - b) (2) Wall mounted access panels.
 - c) (4) Power/data outlets.
 - 2) Ceiling Modifications
 - a) (4) Ceiling mounted exit signs.
 - b) (18) Pendant light fixtures.
 - c) (16) Ceiling mounted speakers.
 - d) (8) Fire alarm notification devices.

- e) (22) Concealed fire sprinkler heads.
- f) (1) Ceiling mounted sensors.

HIGH PRIORITY – EXECUTIVE

1. Ceremonial Conference Room (E107)

- A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (2) Wall mounted sensors
 - b) (1) Electrical outlet.
 - c) (1) Wall mounted grille.
 - 2) Ceiling Modifications
 - a) (6) Pendant light fixtures.
 - b) (6) Ceiling mounted speakers.
 - c) (2) Ceiling mounted exist signs.
 - d) (2) Ceiling mounted cameras.
 - e) (2) Fire alarm notification devices.
 - f) (12) Concealed fire sprinkler heads.
- B. Fan Coil Treatments
 - 1) Apply fan coil modifications to (3) Fan Coil units.

2. Executive Conference Room (E142)

- A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (2) Wall mounted sensors
 - b) (1) Electrical outlet.
 - c) (1) Wall mounted grille.
 - 2) Ceiling Modifications
 - a) (6) Pendant light fixtures.
 - b) (6) Ceiling mounted speakers.
 - c) (1) Ceiling mounted exist signs.
 - d) (2) Ceiling mounted cameras.
 - e) (2) Fire alarm notification devices.
 - f) (12) Concealed fire sprinkler heads.
 - g) (1) Wall mounted grille.
- B. Fan Coil Treatments
 - 1) Apply fan coil modifications to (3) Fan Coil units.

3. Policy Conference Room (EG36)

- A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (2) Wall mounted cameras.
 - b) (2) Wall mounted grilles.
 - c) (2) Wall mounted sensors.
 - d) (2) TV display and associated data and electrical outlets.
 - e) (1) Wall mounted fire alarm notification device.
 - 2) Ceiling Modifications
 - a) (1) Ceiling mounted exit signs.
 - b) (2) Ceiling mounted security cameras.

- c) (6) Pendant light fixtures.
 - d) (12) Ceiling mounted speakers.
 - e) (1) Wifi access point.
 - f) (2) Fire alarm notification devices.
 - g) (16) Concealed sprinkler heads.
 - B. Fan Coil Treatments
 - 1) Apply fan coil modifications to (3) Fan Coil units.
- 4. Policy Group Reception (EG14)
 - A. The following measures shall be taken to address noise and vibration for the units listed below.
 - 1) Blower Coil Unit (BCU-1)
 - a) Remove shipping and installation hold down bolts from all spring hangers.
 - b) Added waffle pads at each beam clamp to mitigate vibration transfer to structure.
 - c) Demolish (3) branch ducts serving EG14, EG27E, and EG27B and provide new high efficiency, 45 degree transition from branch duct to grille connection.
 - d) Demolish unit supply and return duct connections and provide flexible fabric connection at blower coil unit. New supply and return duct to have 2" thick fiberglass duct lining on all supply and return ducts.
 - 2) Blower Coil Unit (BCU-2)
 - a) Remove shipping and installation hold down bolts from all spring hangers.
 - b) Added waffle pads at each beam clamp to mitigate vibration transfer to structure.
 - c) Demolish (3) branch ducts serving EG14, EG32E, and EG32B and provide new high efficiency, 45 degree transition from branch duct to grille connection.
 - d) Demolish unit supply and return duct connections and provide flexible fabric connection at blower coil unit. New supply and return duct to have 2" thick fiberglass duct lining on all supply and return ducts.
- 5. Governor's Formal Office (E129)
 - A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (2) Wall mounted grilles.
 - b) (2) Wall mounted sensors.
 - c) (1) Wall mounted fire alarm notification device.
 - 2) Ceiling Modifications
 - a) (1) Ceiling mounted exit signs.
 - b) (4) Pendant light fixtures.
 - c) (2) Ceiling mounted speakers.
 - d) (2) Fire alarm notification devices.
 - e) (1) Ceiling mounted sensors.
 - f) (6) Concealed sprinkler heads
 - B. Fan Coil Treatments
 - 1) Apply fan coil modifications to (1) Fan Coil units.
- 6. Individual Offices (E121 & E128)
 - A. Fan Coil Treatments
 - 1) Apply fan coil modifications to (2) Fan Coil units.

HIGH PRIORITY – COMMON

1. Broadcast Studio (E027)
 - A. The following measures shall be taken to address noise and vibration for mechanical and plumbing equipment/piping as well as fit out of studio and media room.
 - 1) Remove and reinstall terminal unit in corner of space to allow room for added ceiling.
 - 2) Remove and relocate existing piping that is currently embedded in the fire rated wall to all for a continuous fire barrier.
 - 3) Reinstall existing piping connections to unit.
 - 4) Install ductwork and associated supply and return grilles in space.
 - 5) Install troffer light fixtures to accommodate new ceiling in space.
 - 6) Install new fire alarm devices and adjust fire sprinkler heads to accommodate new ceiling in space.

LOW PRIORITY – LEGISLATIVE

1. Historic Supreme Court Meeting Room (E202)
 - A. Remove and reinstall the following devices to accommodate acoustical treatment method outlined below.
 - 1) Wall Modifications
 - a) (2) Wall mounted grilles.
 - 2) Ceiling Modifications
 - a) (1) Ceiling mounted exit signs.
 - b) (4) Pendant light fixtures.
 - c) (1) Fire alarm notification devices.
 - d) (4) Concealed sprinkler heads.
2. Supreme Court Data Closet (E201.1)
 - A. Replace existing plug-in fan with new quiet in-line fan.
 - 1) Provide (1) new in-line transfer fan and associated temperature sensor for removal of heat generated by space's AV rack.
 - a) Basis of Design Fan: Greenheck CSP with EC motor and factory vibration isolation kit. Fan shall be sized for 300 CFM and 0.3" ESP.
 - 2) Under-cut door to provide make-up air path back to space.
 - 3) Provide 10"x10" transfer ductwork routed to return air plenum or other approved location.
 - 4) Provide power to new fan. Demolish and re-patch existing ceiling as necessary to tie into existing circuit.
3. Senate Break Room (W205)
 - A. The following measures shall be taken to address noise and vibration for the space listed below.
 - 1) Demolish existing 12"x12" supply duct and associated grille.
 - 2) Demolish existing 12"x12" exhaust grille and 8"x8" exhaust duct back to riser.
 - 3) Install new 8"x8" exhaust duct with (1) 90-degree mitered elbow with turning vanes.
 - 4) Provide new 8"x8" louvered exhaust grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.
 - 5) Install new 10"x10" supply duct with (1) 90-degree mitered elbow with turning vanes and 1" thick fiberglass duct liner.
 - 6) Provide new 8"x8" louvered supply grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.

4. Senate Break Room (W205)

- A. The following measures shall be taken to address noise and vibration for the space listed below.
- 1) Demolish existing 12"x12" supply duct and associated grille.
 - 2) Demolish existing 12"x12" exhaust grille and 8"x8" exhaust duct back to riser.
 - 3) Install new 8"x8" exhaust duct with (1) 90-degree mitered elbow with turning vanes.
 - 4) Provide new 8"x8" louvered exhaust grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.
 - 5) Install new 10"x10" supply duct with (1) 90-degree mitered elbow with turning vanes and 1" thick fiberglass duct liner.
 - 6) Provide new 8"x8" louvered supply grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.

5. IT Work Room (WG11)

- A. The following measures shall be taken to address noise and vibration for the space listed below.
- 1) Demolish existing 6"x6" branch duct and associated supply grille.
 - 2) Install new 8"x8" branch duct with 1" thick acoustic fiberglass liner. Provide (2) 90 deg mitered elbows with turning vanes to mitigate noise transfer into the space. Refer to architectural scope for modifications to chase/soffit.
 - 3) Provide new 6"x6" louvered supply grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.

6. Identified Replicable Solution (EG02, WG02, E227, W213, & E313)

- A. Fan Coil Treatments
- 1) Apply fan coil modifications to (7) Fan Coil units.

LOW PRIORITY – EXECUTIVE

1. Shared Conference Room (W107 & W107A) and Secretary of State (W105)

- A. The following measures shall be taken to address noise and vibration for the space listed below.
- 1) Demolish existing 6"x6" and 12"x12" branch duct and associated supply grilles.
 - 2) Provide new 8"x8" tap off main and route over existing closet plan south of riser.
 - 3) Remove and re-install light fixture in existing closet to accommodate new ceiling/soffit layout.
 - 4) W105 – Secretary of State
 - a) Install new 6"x6" branch duct with 1" thick acoustic fiberglass liner. Duct to tap off new branch duct.
 - b) Provide new 6"x6" louvered supply grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.
 - 5) W107 Shared Conference
 - a) Install new 10"x4" branch duct with 1" thick fiberglass liner. Duct to tap off new branch duct.
 - b) Provide new 10"x4" louvered supply grille with double deflection bars and cable operated balancing damper. Damper shall be adjustable from face of device and grille shall be provided primed for field painting.

2. Individual Offices (EG25 & EG30)

- A. Fan Coil Treatments
- 1) Apply fan coil modifications to (4) Fan Coil units.

February 5, 2024

Mr. William Wedemeyer
Construction Management Division
Wyoming State Construction Department
700 West 21st Street
Cheyenne, WY 82002

Re: Wyoming State Capitol Upgrades
Sound System Configuration
Site Visit After-Action Report
Cheyenne, Wyoming
AVANT File: C1117A

Dear William:

We recently visited the facility January 22-26 to perform configuration changes in several rooms in the Capitol, as described per our Peer Review Report dated December 12, 2023. This after-action report describes the improvements that have been made, as well as any issues encountered and outstanding items that may still need to be addressed at a future date.

EXECUTIVE SUMMARY

The information in this report pertains to the spaces in the Capitol listed in Table 1 below. During our previous acoustical study, sound system frequency response and Speech Transmission Index (STI) testing was conducted using the existing sound systems in most of the rooms and comparative tests were performed after configuration changes were made to quantify improvements.

In general, we feel the configuration changes were very successful in achieving better intelligibility for the sound systems. While the acoustics of each room is still a limiting factor in performance, the systems should operate much better than before.

There are two spaces in which future configuration changes and/or upgrades should be considered: the Governor's Ceremonial Conference Room; and the Auditorium in the Capitol Extension, which was not previously tested or analyzed, but has been getting reports of similar issues.

Room	Existing Sound System Configuration Improvements	Outstanding Issues for Future Consideration
House Chamber E212	X	
Senate Chamber W214	X	
Historical Supreme Court Meeting Room E202	X	
Join Appropriations Committee Meeting Room E301	X	
Public Meeting Room W110	X	
Public Meeting Room W113	X	
Governor's Ceremonial Conference Room E107	X	X
Auditorium		X

Table 1. List of spaces and associated topics in the scope of this report.

DEFINITIONS

Important terminology used throughout the report is defined below for reference.

1. Speech Transmission Index for PA Systems (STIPA): An objective field measurement of the speech intelligibility of a sound reinforcement system, as defined by American National Standards Institute (ANSI) Standard 3.5-1999 (R2017) and International Electrotechnical Commission (IEC) 60268-16. A table describing the rating system is listed below. A rating of 0.60 should be considered an absolute minimum for meeting rooms and government chambers within the Wyoming State Capitol, with a goal of 0.68 or higher. Intelligibility of a sound system is dependent on several factors, including frequency response of the system at the listener, reverberation time of the room, and signal-to-noise ratio (relative level of the reproduced speech to ambient noise).

Rating	STI Range	Examples of Typical Uses	Perceived Speech Intelligibility
A+	> 0.76	Recording studios	Excellent
A	0.72-0.76	Theatres, speech auditoria, parliaments, courts	Excellent
B	0.68-0.72	Theatres, speech auditoria, parliaments, courts	Good
C	0.64-0.68	Teleconference, theatres	Good
D	0.60-0.64	Classrooms, concert halls	Good
E	0.56-0.60	Concert halls, modern churches	Fair
F	0.52-0.56	PA in shopping malls, public offices, cathedrals	Fair
G	0.48-0.52	PA in shopping malls, public offices	Fair
H	0.44-0.48	PA in difficult acoustic environments	Poor
I	0.40-0.44	PA in very difficult spaces	Poor
J	0.36-0.40	Not suitable for PA systems	Bad
U	< 0.36	Not suitable for PA systems	Bad

Table 2. STI Rating System

SOUND SYSTEM CONFIGURATION IMPROVEMENTS

We previously proposed a series of audio processor configuration changes to improve system intelligibility and performance. Most of the recommended changes were implemented, with the exception of a few rooms which had audio processor limitations.

The list from the Peer Review Report is included below, along with commentary from the site visit. Please refer to individual space sections below for detailed information.

1. Design file changes:
 - a. Separate the in-room reinforcement processing path from the remote far-end path. This avoids audio artifacts from Acoustic Echo Cancellation (AEC) and Noise Suppression (NS) processing that can reduce system intelligibility and is only intended for the audio paths feeding the far-end of video and teleconferencing. **Successful in all spaces.**
 - b. Leave the Automatic Gain Control (AGC) processing in the far-end audio path only and implement light audio compression prior to the automatic mixer in the in-room audio path.
 - c. Add narrowband equalization to reduce feedback (implemented with extremely narrow parametric filters within the loudspeaker equalization components). **Successful in all spaces.**
 - d. Replace the standard matrix mixer currently used for mix-minus audio processing and implement a delay-matrix mixer for enhanced time-aligned mix-minus operation. Only applies to the following systems:
 - 1) House Chamber. **Successful.**
 - 2) Senate Chamber. **Successful.**
 - 3) Historical Supreme Court Meeting Room. **Unsuccessful. Audio processing capability was limited.**
 - 4) Joint Appropriations Committee Meeting Room. **Unsuccessful. Audio processing capability was limited.**

2. Graphical User Interface (GUI) changes:
 - a. Remove the "Main Volume" control and any current gooseneck microphone subset controls (applies to some systems). **Successful in all spaces.**
 - b. Add a range-limited gooseneck microphone level control. **Successful in all spaces.**
 - c. Remove any remaining teleconference/VoIP pages. **Successful in all spaces.**
 - d. Remove audio-only recording control pages (to be confirmed). **Successful in all spaces.**
 - e. Add an "Administrator" control interface with limited range individual microphone control for fine tune adjustments. **Successful in all spaces.**
3. On-site configuration activities:
 - a. Re-equalize the loudspeaker systems for flat response. **Successful in all spaces.**
 - b. Re-equalize the gooseneck microphones for natural and intelligible response. **Successful in all spaces.**
 - c. Add narrowband filters for primary feedback frequencies. **Successful in all spaces.**
 - d. Reset all gain structure for proper operation of automatic mixers, compressors, etc. **Successful in all spaces.**
 - e. Set appropriate mix-minus delay and gain settings (as applicable by room). **Successful in all spaces (see note above regarding delay matrix mixer processing limitations).**

HOUSE CHAMBER (E212)

1. Specific Comments and Issues Encountered
 - a. Some desk loudspeakers not assigned to the correct output. Fixed in audio processor configuration.
 - b. Conference Room E313 not receiving correct audio. Fixed audio routing in audio processor configuration.
 - c. Induction Loop Amplifier reporting fault on both channels.
 - d. Per the request from Joe Peterson, wireless lapel microphones on channels 1 and 2 in lieu of the existing handheld microphones.
2. Measurements
 - a. The measured STIPA rating of the system is shown below on Table 3. As defined previously in the report, the minimum desirable STIPA rating is 0.60, with a goal of 0.68. A graph of the measured frequency response at each location is shown on Figure 1.

Location	Before		After	
	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
Desk with Good Speaker	0.66	0.55	0.66	0.62
Desk with Sideways Speaker	0.59	0.49	N/A	N/A
Desk with Obstructed Speaker	0.56	0.46	N/A	N/A
Gallery below Speaker	0.62	0.49	0.61	0.56
Gallery between Speakers	0.54	0.42	0.53	0.47
Floor Aisle North	0.58	0.49	0.59	0.54
Floor Aisle South	0.61	0.50	0.59	0.54
Speaker of the House Desk	0.50	0.38	0.66	0.62

Table 3. STIPA Measured at Various Positions in the House. For "After" measurements, all desk speakers were optimally positioned. Cells highlighted green indicate improvement from previous measurements.



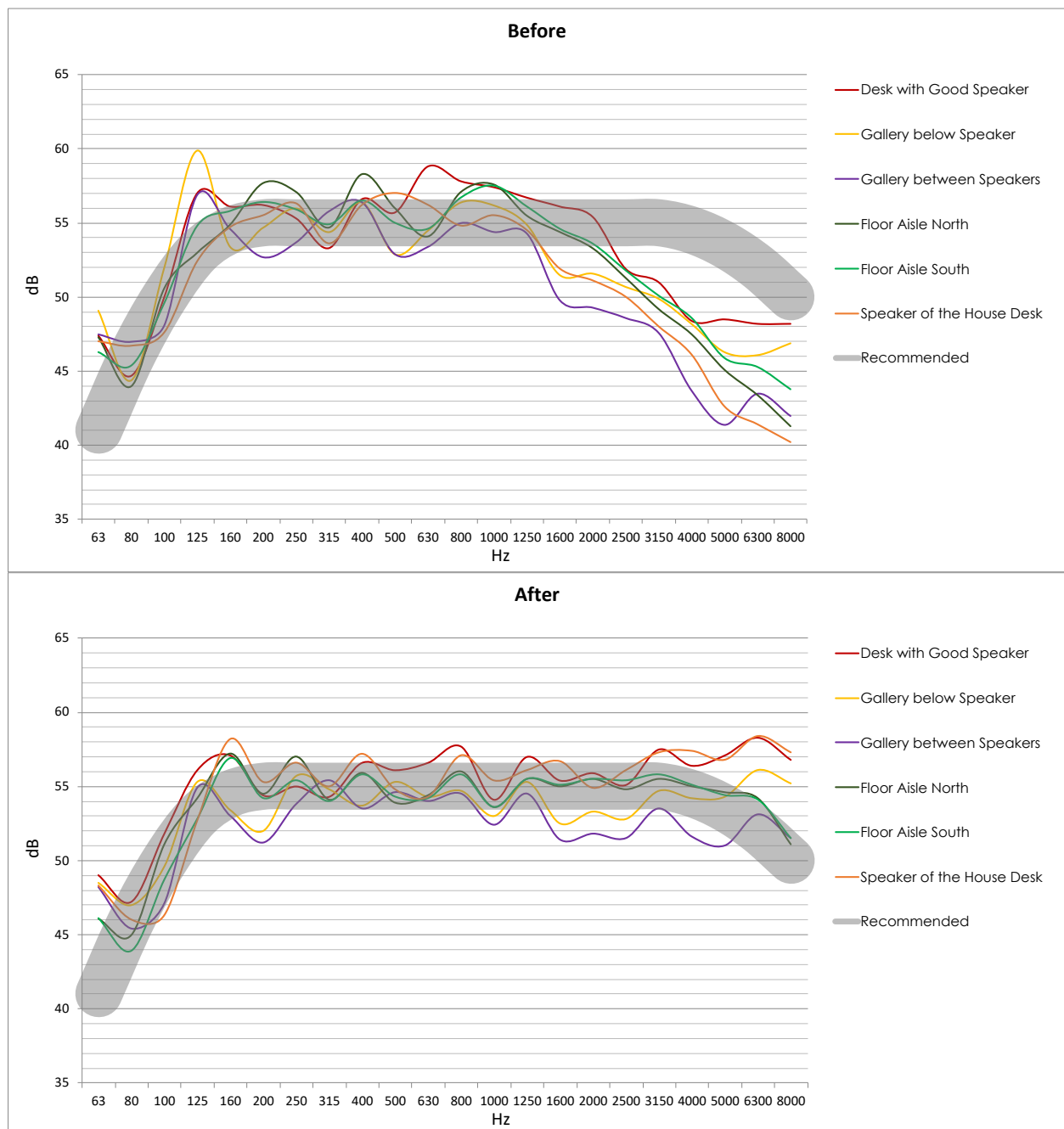


Figure 1. System Frequency Response at Various Positions in the House.

SENATE CHAMBER (W214)

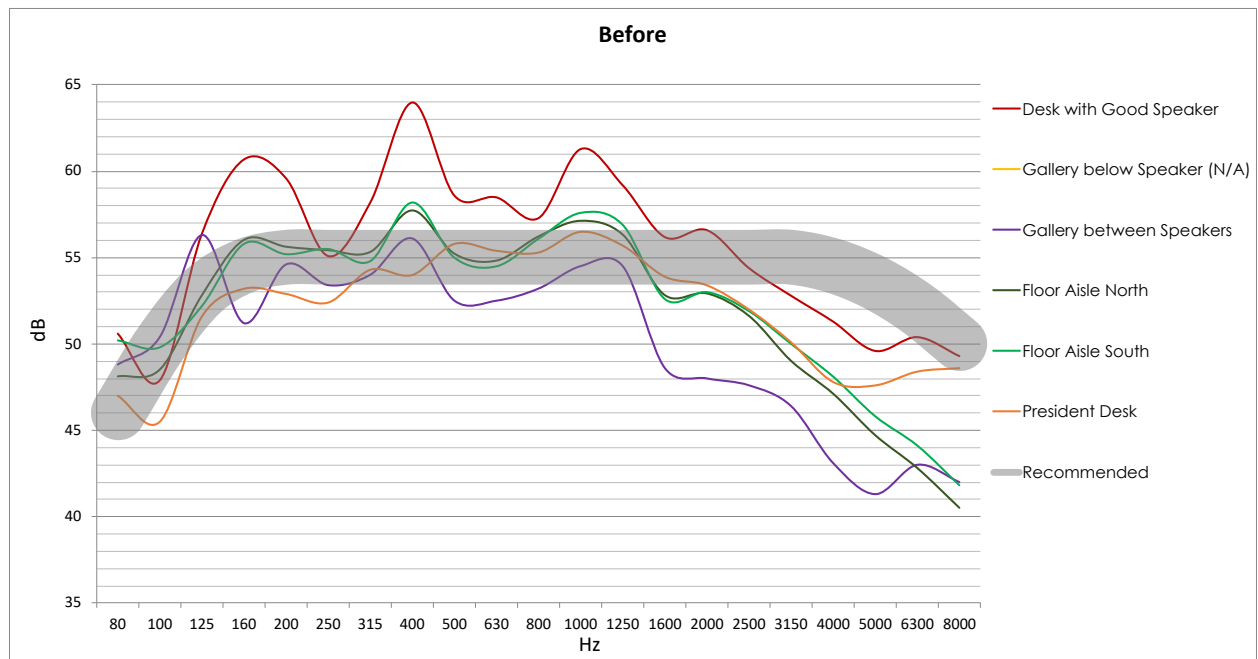
1. Specific Comments and Issues Encountered
 - a. Induction Loop Amplifier reporting fault on both channels.
 - b. Per the request from Joe Peterson, wireless lapel microphones on channel 1 in lieu of the existing handheld microphone.

2. Measurements

- a. The measured STIPA rating of the system is shown below on Table 4. A graph of the measured frequency response at each location is shown on Figure 2.

Location	Before		After	
	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
Desk with Good Speaker	0.70	0.65	0.67	0.64
Desk with Sideways Speaker	0.61	0.56	N/A	N/A
Desk with Obstructed Speaker	0.59	0.55	N/A	N/A
Gallery below Speaker	0.62	0.52	0.63	0.61
Gallery between Speakers	0.55	0.49	0.63	0.61
Floor Aisle North	0.53	0.54	0.60	0.58
Floor Aisle South	0.57	0.51	0.59	0.56
President Desk	0.64	0.58	0.62	0.60

Table 4. STIPA Measured at Various Positions in the Senate. For "After" measurements, all desk speakers were optimally positioned. Cells highlighted green indicate improvement from previous measurements.



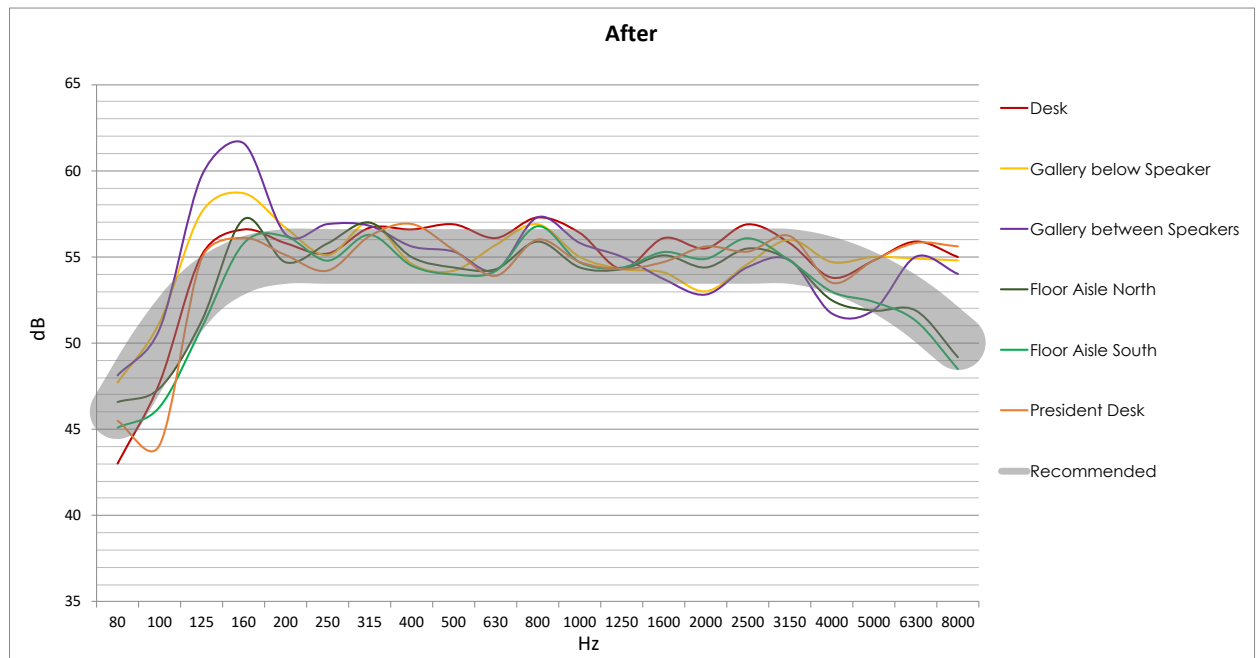


Figure 2. System Frequency Response at Various Positions in the Senate.

HISTORICAL SUPREME COURT CHAMBERS (E202)

1. Specific Comments and Issues Encountered
 - a. Q-sys Core 110f had limited audio processing resources. Delay matrix mixer is not utilized and automatic microphone mixing functions are compromised.
 - b. Mics 13/14 were swapped at the control interface. Changed audio processor configuration as appropriate.
 - c. Loudspeakers at the dais had backwards assignments for most pairs (5/6, 7/8, 9/10, 11/12, 13/14). Adjusted audio processor configuration as appropriate.
 - d. Loudspeaker at dais position 8 is not functioning.
 - e. Loudspeakers at both Staff Desks are not functioning.
2. Measurements
 - a. The measured STIPA rating of the system is shown below on Table 5. A graph of the measured frequency response at each location is shown on Figure 3.

Location	Before		After	
	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
Dais Seat	0.59	0.54	0.66	0.63
Testimony Table Seat	0.62	0.58	0.64	0.61
Lower Gallery Edge	0.51	0.45	0.58	0.55
Lower Gallery Center	0.55	0.50	0.66	0.63
Upper Gallery	0.52	0.46	0.64	0.62

Table 5. STIPA Measured at Various Positions in the Supreme Court. For "After" measurements, all desk speakers were optimally positioned. Cells highlighted green indicate improvement from previous measurements.

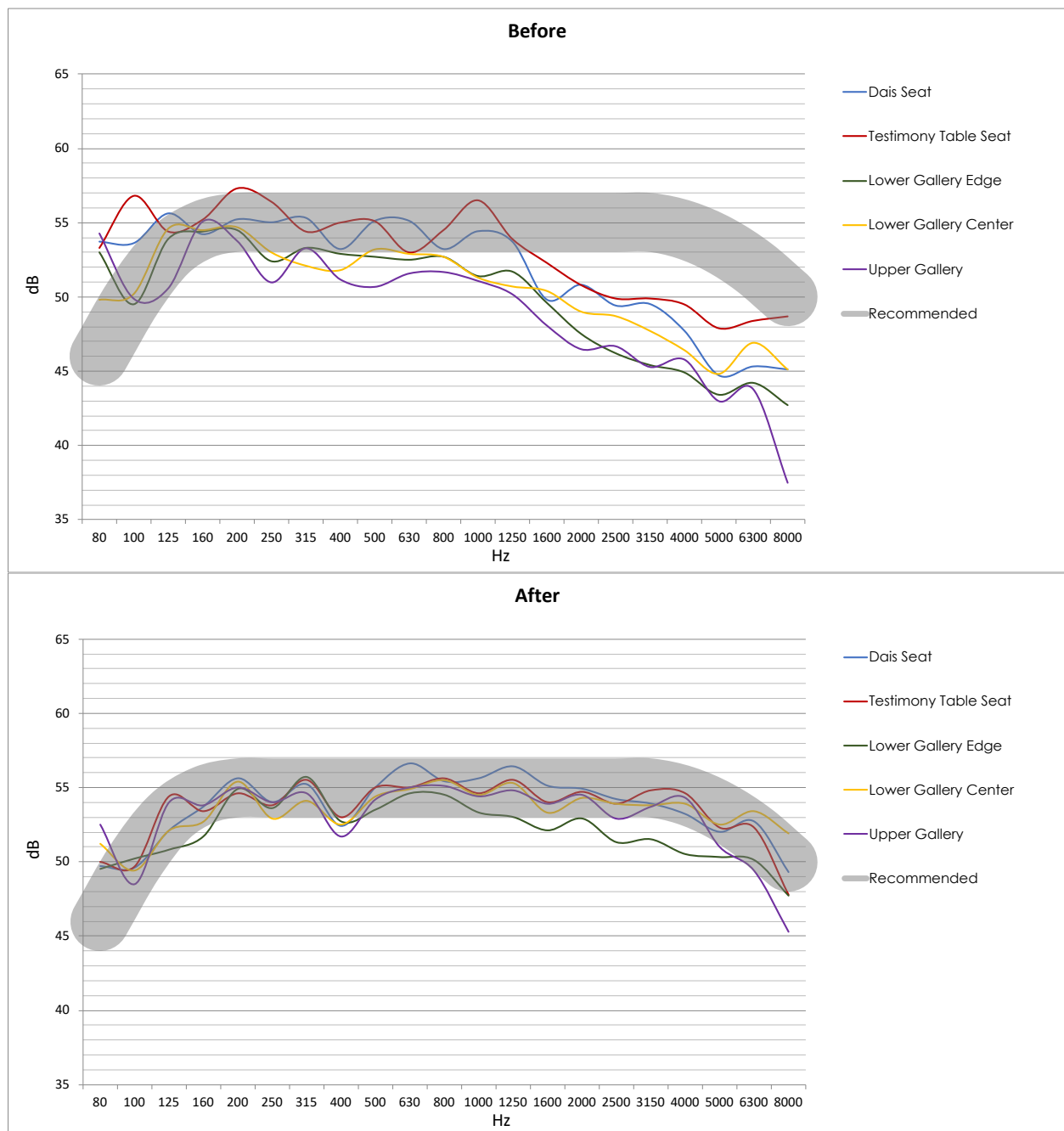


Figure 3. System Frequency Response at Various Positions in the Supreme Court.

JOINT APPROPRIATIONS COMMITTEE (JAC) MEETING ROOM (E301)

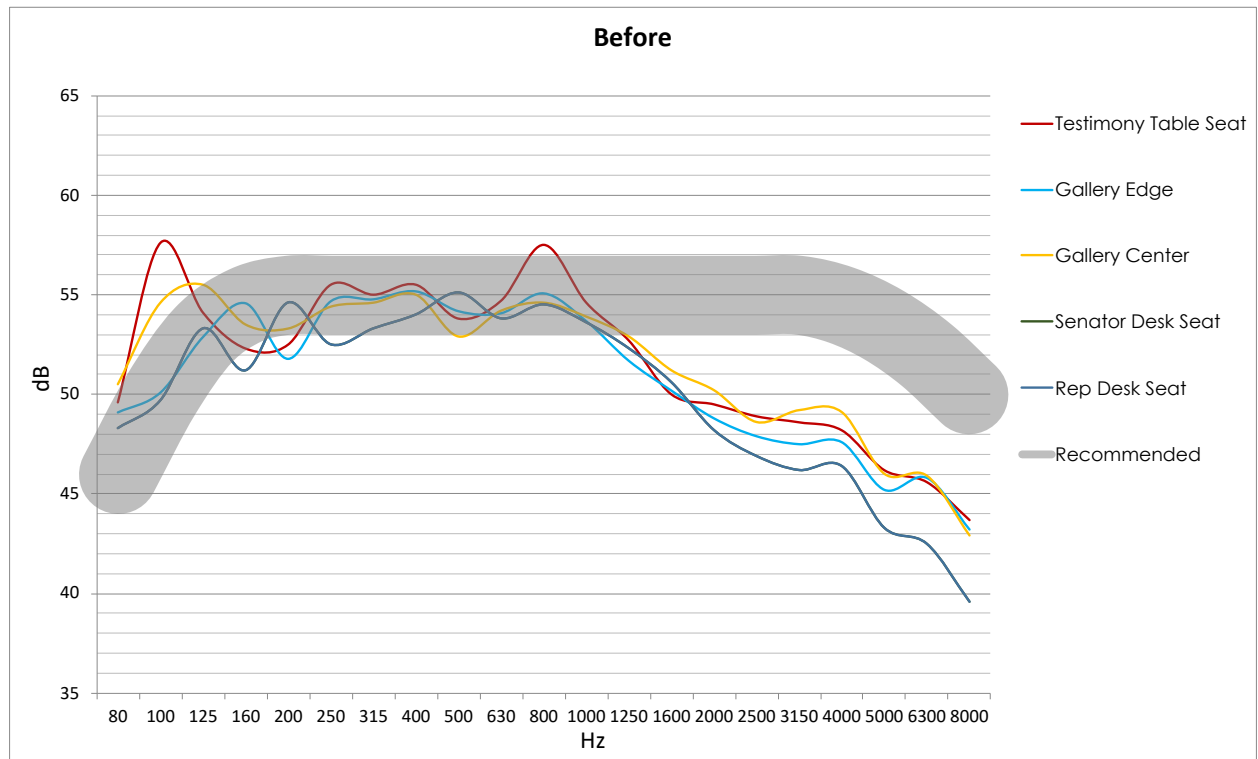
1. Specific Comments and Issues Encountered
 - a. Q-sys Core 110f had limited audio processing resources. Delay matrix mixer is not utilized and automatic microphone mixing functions are compromised.
 - b. East gallery loudspeaker at significantly lower level than west side. Suspected mismatched transformer tap setting at speaker. Level adjusted within audio processor configuration.

2. Measurements

- a. The measured STIPA rating of the system is shown below on Table 6. A graph of the measured frequency response at each location is shown on Figure 4.

Location	Before		After	
	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
Testimony Table Seat	0.54	0.51	0.63	0.60
Gallery Edge	0.58	0.54	0.62	0.59
Gallery Center	0.60	0.56	0.60	0.57
Representative Desk	0.62	0.58	0.63	0.60
Senator Desk	0.55	0.51	0.61	0.58

Table 6. STIPA Measured at Various Positions in the JAC Meeting Room. For “After” measurements, all desk speakers were optimally positioned. Cells highlighted green indicate improvement from previous measurements.



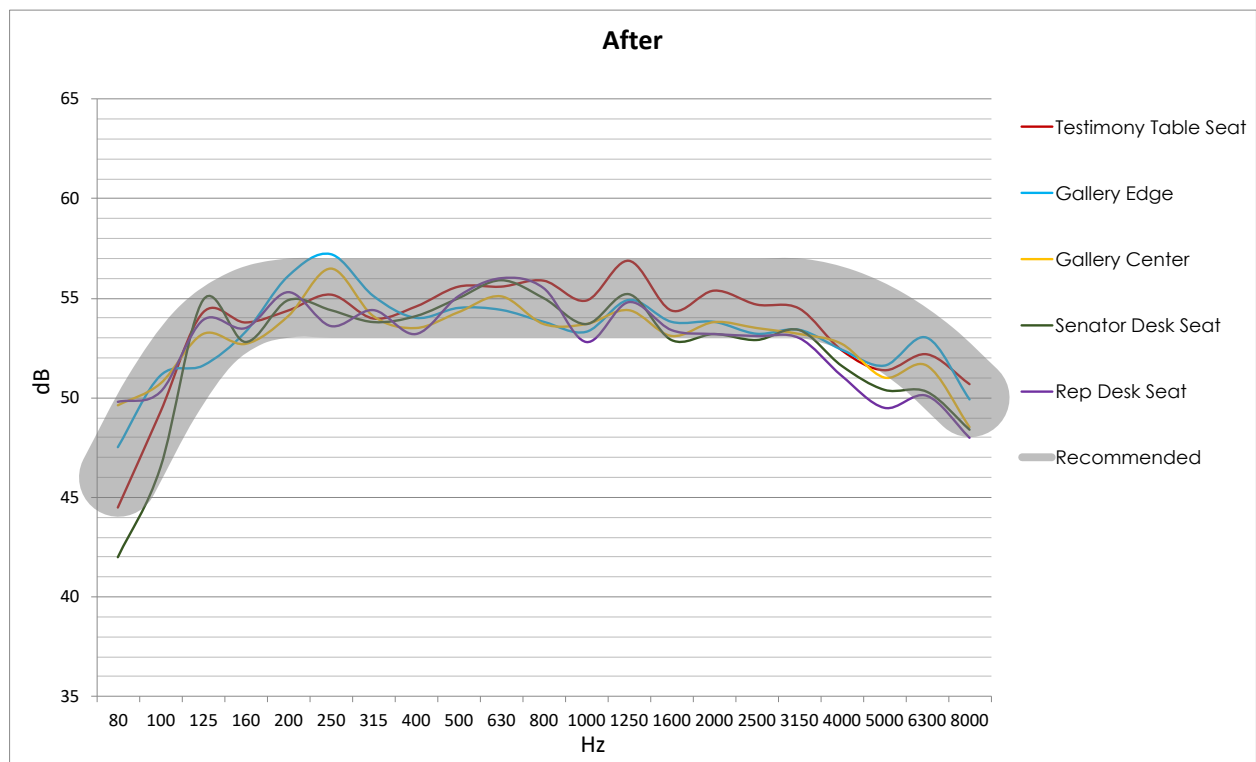


Figure 4. System Frequency Response at Various Positions in the JAC Meeting Room.

PUBLIC MEETING ROOMS (PMR) W110 AND W113

1. Specific Comments and Issues Encountered
 - a. Q-sys Core 110f had limited audio processing resources. Automatic microphone mixing functions are somewhat compromised.
2. Measurements
 - a. The measured STIPA rating of the system is shown below on Table 7. A graph of the measured frequency response at each location is shown on Figure 5.

Location	Before		After	
	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)	STIPA with no ambient noise (not in session)	STIPA with ambient noise (during session)
PMR-W110 Dais	0.56	0.51	0.61	0.58
PMR-W110 Testimony Table	0.59	0.54	0.61	0.57
PMR-W110 Gallery	0.62	0.55	0.63	0.59
PMR-W113 Dais	0.54	0.53	0.62	0.62
PMR-W113 Testimony Table	0.58	0.57	0.62	0.62
PMR-W113 Gallery	0.52	0.51	0.66	0.66

Table 7. STIPA Measured at Various Positions in the Public Meeting Rooms W110 and W113. Cells highlighted green indicate improvement from previous measurements.



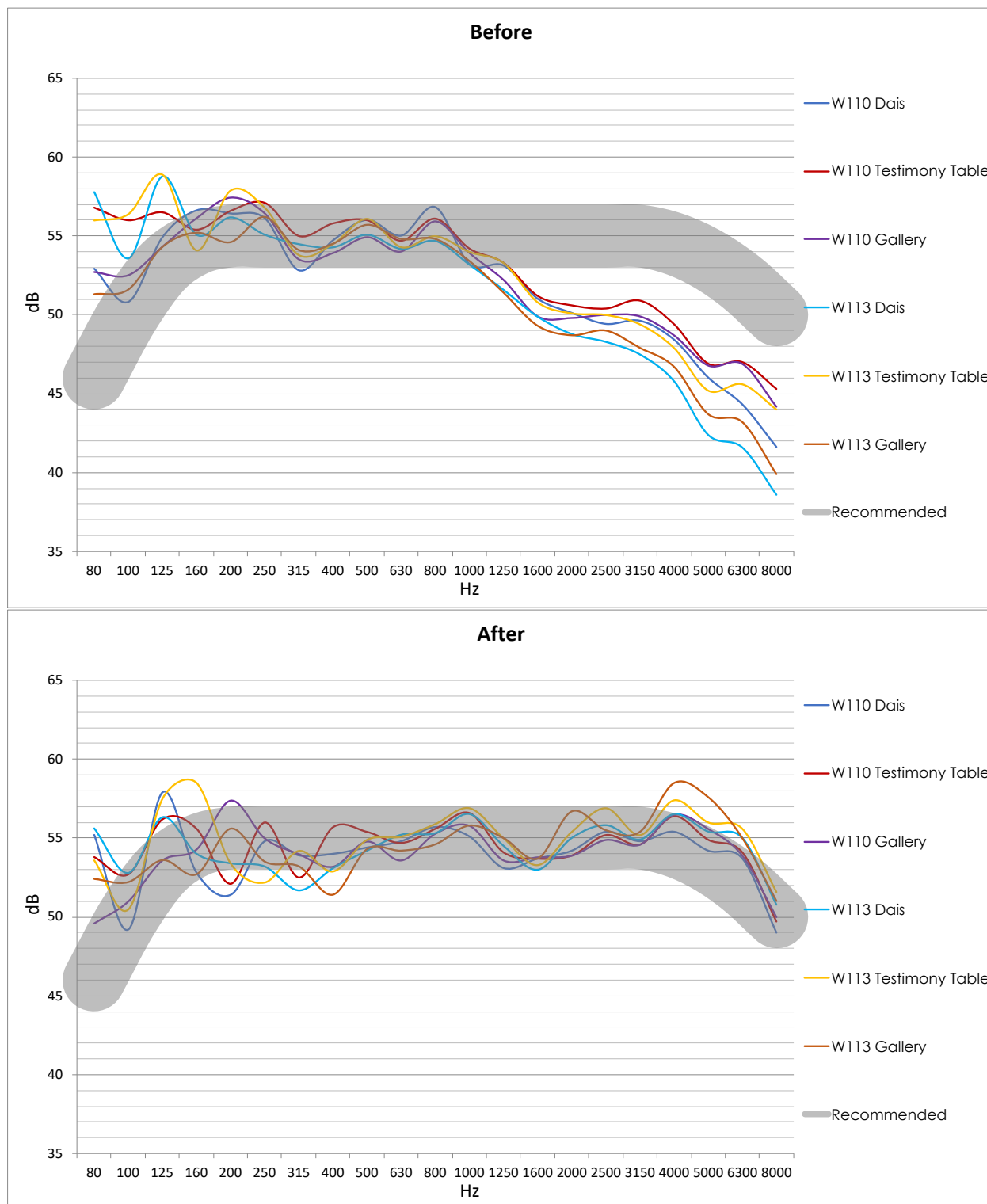


Figure 5. System Frequency Response at Various Positions in the Public Meeting Rooms W110 and W113.

GOVERNOR'S CEREMONIAL CONFERENCE ROOM (E107)

1. Specific Comments and Issues Encountered
 - a. The Shure Microflex Complete Wireless (MXCW) conference system that is currently installed has even more limitations than previously understood and is significantly reducing the in-room audio reinforcement.
 - b. We reconfigured the system so that the local loudspeakers on each gooseneck microphone base were turned off, and removed the automatic gain control processing that was occurring within the microphone system.
 - c. The microphone system only sends one mix of all the microphones to the room, and does not have any included automatic mixing functionality. This severely limits the gain-before-feedback of the system.
 - d. The method for remotely controlling microphone mutes via the room touchpanel is intermittent and inconsistent. We could not resolve this issue during on-site testing. However, the microphone system can be directly controlled with a web browser interface that is more robust and consistent than third-party control through the Q-sys touchscreen interface. This may satisfy the need for more robust control.
 - e. The current method for connecting video conference calls to the system is different than that of the other rooms. A laptop is hooked up to press outputs and the HDMI audio input. The touchpanel controls for "from" and "to far-end" do not apply appropriately to the video conference audio.
2. Measurements
 - a. Before and after measurements were unsuccessful in this room and the results were invalid.
3. Recommendations
 - a. It was discovered that the current firmware version of the MXCW system is very outdated. We believe that updating this firmware, and significant reconfiguration of how this system connects to the digital audio processor, could increase the performance of the system. Due to time limitations during our site visit, it was too risky to attempt a firmware update and significant digital audio routing changes. We recommend revisiting this issue after the next general session, and involving Shure (the manufacturer), Salas O'Brien, and possibly AVANT to perform additional updates and reconfiguration of this system.
 - 1) While we think that there are still some system optimizations that can be done, it is possible that the end result will not adequately improve the performance of this system. Should that occur, we would recommend upgrading the system to a more traditional wireless microphone system such as the standard Shure Microflex Wireless system (not the "Conference" system). This upgrade should alleviate any issues related to gain-before-feedback. https://www.shure.com/en-US/products/wireless-systems/microflex_wireless
 - b. Updating the firmware for the MXCW microphone may help resolve some of the control issues currently experienced.
 - c. We recommend that the method of connecting the video conference laptop computer to the audio system be upgraded to be a USB connection similar to that of all other spaces in the facility. That can be done in one of several ways.
 - 1) Installing a local PC in the rack with direct USB connection.
 - 2) Installing a USB extender to the laptop location.
 - 3) Adding a network connection and portable Q-sys I/O USB Bridge device.

AUDITORIUM (W040)

1. We were not able to physically test or examine this room due to time constraints. However, looking through as-built drawings, audio processor files, and discussing the current design with Salas O'Brien, we have an understanding of the system and the issues that may be encountered.

2. Recommendations

- a. The primary microphone system in this space is the same MXCW system used in the Governor's Ceremonial Conference Room. Based on our experience in that system, we suspect that any audio issues in the Auditorium may be related to the setup, configuration, and inherent limitations in this system. We recommend that the system be reconfigured in a similar fashion to the Governor's Ceremonial Conference Room listed above.
 - 1) While we think that there are many system optimizations that can be done, it is possible that the end result will not adequately improve the performance of this system. Should that occur, we would recommend upgrading the system to a more traditional wireless microphone system such as the standard Shure Microflex Wireless system (not the "Conference" system). This upgrade should alleviate any issues related to gain-before-feedback. https://www.shure.com/en-US/products/wireless-systems/microflex_wireless

Please let us know if you have any questions.

Very truly yours,

AVANT ACOUSTICS, LLC



John M. Hodgson
Technical Operations Manager



Wyoming State Capitol Acoustical Improvement



Submitted To:
TreanorHL
719 SW Van Buren Street
Topeka, KS 66603

Owner:
Wyoming State Capitol

4/17/2024

CCS Project #23.208



1815 South Meyers Road
Suite 1070
Oakbrook Terrace, IL 60181
630.678.0808
www.CCSdifference.com

Clarifications and Qualifications

00 - Notes Regarding This Estimate

- 1 This Concept Level estimate is based on drawings and specifications, prepared by the office of TreanorHL dated 12/1/23 and received 12/1/23, together with discussions with their staff.
- 2 This estimate assumes a normal market condition.
- 3 This estimate assumes five or more qualified Contractors competitively bidding on this project.
- 4 This estimate assumes one contract awarded to one General Contractor.
- 5 Those cost estimates provided by the Architect and/or Consultants are identified in the body of the estimate.
- 6 After six months, this estimate should be updated for current market conditions.
- 7 Escalation is included assuming one year to the mid point of construction.

THIS ESTIMATE EXCLUDES:

- 1 Professional fees, testing, moving expense, etc. for Owner's account,
 - 2 Furnishings and equipment other than those shown in the body of the estimate,
 - 3 Premium costs for work done in phases, out of sequence, out of hours,
 - 4 Hazardous material removal and abatement,
 - 5 Construction Contingencies,
 - 6 Building Permits,
 - 7 Builder's Risk Insurance.
-
- 8 This estimate is based on information available at this time. The scope of this estimate should be reviewed to ensure our interpretation of the drawings and other information is correct. This estimate should be updated as the design evolves and is completed.
 - 9 This cost estimate represents our opinion of probable construction cost for this project. We have exercised due professional diligence in the preparation of this estimate. Since we have no control over final material selection, bidding strategies and market conditions, no guarantee is given or implied with this estimate.

Clarifications and Qualifications

08 - Mechanical

- 1 All work is figured during normal business hours.
- 2 Modification to blower coil units are included with high priority common space.
- 3 Adjusting wet sprinkler heads is included in rooms with new ceilings.
- 4 Plumbing is not included.
- 5 EG02 and EG02A is included.
- 6 Replacement of fan coil units are not included. Assumed to be modifications.

09 - Electrical

- 1 Electrical Estimate is based upon Architect Drawings dated 12/1/2024
- 2 Electrical Estimate is based upon Engineering Scope dated 12/1/2023
- 3 Electrical Estimate is based upon Avant Acoustics Narrative dated 12/1/2024
- 4 Corridors C301 & C304 are included in the low priority common space capitol monumental corridors breakdown.
- 5 All work to be performed during normal working hours. No premium time is included.

Wyoming State Capitol Acoustic Improvements

April 17, 2024

[illegible]

Lower Priority: Legislative Space										
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room	\$64,939	25.00%	\$16,235	12.00%	\$9,741	5.00%	\$4,546	9.00%	\$8,591	\$104,052
A04 - Low Priority: Legislative Space **** A04b - Supreme Court Data Closet	\$25,400	25.00%	\$6,350	12.00%	\$3,810	5.00%	\$1,778	9.00%	\$3,360	\$40,698
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies	\$14,025	25.00%	\$3,506	12.00%	\$2,104	5.00%	\$982	9.00%	\$1,856	\$22,472
A04 - Low Priority: Legislative Space **** A04d - IT Work Room	\$19,241	25.00%	\$4,810	12.00%	\$2,886	5.00%	\$1,347	9.00%	\$2,546	\$30,829
A04 - Low Priority: Legislative Space **** A04e - Senate President	\$27,858	25.00%	\$6,964	12.00%	\$4,179	5.00%	\$1,950	9.00%	\$3,686	\$44,636
A04 - Low Priority: Legislative Space **** A04f - House Speaker	\$26,995	25.00%	\$6,749	12.00%	\$4,049	5.00%	\$1,890	9.00%	\$3,571	\$43,254
A04 - Low Priority: Legislative Space **** A04g - House Conference Room	\$18,940	25.00%	\$4,735	12.00%	\$2,841	5.00%	\$1,326	9.00%	\$2,506	\$30,348
A04 - Low Priority: Legislative Space **** A04h - Individual Offices	\$43,276	25.00%	\$10,819	12.00%	\$6,491	5.00%	\$3,029	9.00%	\$5,725	\$69,340
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205	\$19,816	25.00%	\$4,954	12.00%	\$2,972	5.00%	\$1,387	9.00%	\$2,622	\$31,752
Lower Priority: Executive Space										
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room	\$19,963	25.00%	\$4,991	12.00%	\$2,994	5.00%	\$1,397	9.00%	\$2,641	\$31,986
A05 - Low Priority: Executive Space **** A05b - Individual Offices	\$71,047	25.00%	\$17,762	12.00%	\$10,657	5.00%	\$4,973	9.00%	\$9,400	\$113,839
A05 - Low Priority: Executive Space **** A05c - Storage W201.1	\$21,333	25.00%	\$5,333	12.00%	\$3,200	5.00%	\$1,493	9.00%	\$2,822	\$34,181
Lower Priority: Common Space										
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors	\$16,141	25.00%	\$4,035	12.00%	\$2,421	5.00%	\$1,130	9.00%	\$2,135	\$25,863
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors	\$9,284	25.00%	\$2,321	12.00%	\$1,393	5.00%	\$650	9.00%	\$1,228	\$14,875
EG02.2A Demo and Construction	\$165,831	25.00%	\$41,458	12.00%	\$24,875	5.00%	\$11,608	9.00%	\$21,939	\$265,710
Low Priority Scope of Work Total										\$903,837
										\$3,051,293

Project: Wyoming State Capitol

Date: 4/17/2024



PROJECT RECAP & SUMMARY

Description	Unit Price Ext
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 06 - Interior Construction **** 0621 - Wall Finishes	\$19,217.94
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 06 - Interior Construction - SUBTOTAL	\$19,217.94
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 09 - Electrical **** 0930 - Special Electrical Systems	\$10,000.00
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 09 - Electrical - SUBTOTAL	\$10,000.00
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 11 - Equipment **** 1120 - Furnishings	\$6,650.00
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 11 - Equipment - SUBTOTAL	\$6,650.00
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee - SUBTOTAL	\$35,867.94
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$81,100.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 06 - Interior Construction - SUBTOTAL	\$81,100.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 08 - Mechanical **** 0820 - HVAC	\$51,957.40
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 08 - Mechanical **** 0830 - Fire Protection	\$5,891.82
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 08 - Mechanical - SUBTOTAL	\$57,849.22
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 09 - Electrical **** 0930 - Special Electrical Systems	\$30,000.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 09 - Electrical - SUBTOTAL	\$30,000.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 11 - Equipment **** 1120 - Furnishings	\$19,570.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 11 - Equipment - SUBTOTAL	\$19,570.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms - SUBTOTAL	\$188,519.22
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction **** 0621 - Wall Finishes	\$44,056.76
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction **** 0622 - Floor Finishes	\$2,160.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$34,850.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction - SUBTOTAL	\$81,066.76
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 08 - Mechanical **** 0820 - HVAC	\$39,336.00

Project: Wyoming State Capitol

Date: 4/17/2024



PROJECT RECAP & SUMMARY

Description	Unit Price Ext
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 08 - Mechanical **** 0830 - Fire Protection	\$4,237.56
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 08 - Mechanical - SUBTOTAL	\$43,573.56
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 09 - Electrical **** 0930 - Special Electrical Systems	\$85,570.20
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 09 - Electrical - SUBTOTAL	\$85,570.20
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 11 - Equipment **** 1120 - Furnishings	\$14,858.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 11 - Equipment - SUBTOTAL	\$14,858.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery - SUBTOTAL	\$225,068.52
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction **** 0621 - Wall Finishes	\$47,387.27
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction **** 0622 - Floor Finishes	\$2,160.00
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$107,250.00
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction - SUBTOTAL	\$156,797.27
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 08 - Mechanical **** 0830 - Fire Protection	\$4,372.65
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 08 - Mechanical - SUBTOTAL	\$4,372.65
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 09 - Electrical **** 0930 - Special Electrical Systems	\$46,160.20
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 09 - Electrical - SUBTOTAL	\$46,160.20
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 11 - Equipment **** 1120 - Furnishings	\$9,234.00
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 11 - Equipment - SUBTOTAL	\$9,234.00
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery - SUBTOTAL	\$216,564.12
A01 - High Priority: Legislative Space - SUBTOTAL	\$666,019.80
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$38,900.00
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 06 - Interior Construction - SUBTOTAL	\$38,900.00
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 08 - Mechanical **** 0820 - HVAC	\$49,828.66

Project: Wyoming State Capitol

Date: 4/17/2024



PROJECT RECAP & SUMMARY

Description	Unit Price Ext
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 08 - Mechanical **** 0830 - Fire Protection	\$1,512.06
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 08 - Mechanical - SUBTOTAL	\$51,340.72
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems	\$15,000.00
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 09 - Electrical - SUBTOTAL	\$15,000.00
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room - SUBTOTAL	\$105,240.72
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$14,700.00
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 06 - Interior Construction - SUBTOTAL	\$14,700.00
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 08 - Mechanical **** 0820 - HVAC	\$40,113.06
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 08 - Mechanical **** 0830 - Fire Protection	\$578.28
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 08 - Mechanical - SUBTOTAL	\$40,691.34
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems	\$22,428.17
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 09 - Electrical - SUBTOTAL	\$22,428.17
A02 - High Priority: Executive Space **** A02b - Executive Conference Room - SUBTOTAL	\$77,819.51
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$13,900.00
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 06 - Interior Construction - SUBTOTAL	\$13,900.00
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 08 - Mechanical **** 0820 - HVAC	\$38,319.76
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 08 - Mechanical **** 0830 - Fire Protection	\$540.36
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 08 - Mechanical - SUBTOTAL	\$38,860.12
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems	\$2,428.17
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 09 - Electrical - SUBTOTAL	\$2,428.17
A02 - High Priority: Executive Space **** A02c - Policy Conference Room - SUBTOTAL	\$55,188.29
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 06 - Interior Construction **** 0621 - Wall Finishes	\$30,000.00

Project: Wyoming State Capitol

Date: 4/17/2024



PROJECT RECAP & SUMMARY

Description	Unit Price Ext
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 06 - Interior Construction - SUBTOTAL	\$30,000.00
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 08 - Mechanical **** 0820 - HVAC	\$99,448.01
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 08 - Mechanical - SUBTOTAL	\$99,448.01
A02 - High Priority: Executive Space **** A02d - Policy Group Reception - SUBTOTAL	\$129,448.01
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 06 - Interior Construction **** 0621 - Wall Finishes	\$11,401.67
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 06 - Interior Construction - SUBTOTAL	\$11,401.67
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 08 - Mechanical **** 0820 - HVAC	\$30,597.34
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 08 - Mechanical - SUBTOTAL	\$30,597.34
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 09 - Electrical **** 0930 - Special Electrical Systems	\$1,618.78
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 09 - Electrical - SUBTOTAL	\$1,618.78
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office - SUBTOTAL	\$43,617.79
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 08 - Mechanical **** 0820 - HVAC	\$45,958.56
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 08 - Mechanical - SUBTOTAL	\$45,958.56
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 09 - Electrical **** 0930 - Special Electrical Systems	\$2,428.17
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 09 - Electrical - SUBTOTAL	\$2,428.17
A02 - High Priority: Executive Space **** A02f - Individual Offices - SUBTOTAL	\$48,386.73
A02 - High Priority: Executive Space - SUBTOTAL	\$459,701.05
A03 - High Priority: Common Space **** A03a - Rotunda **** 06 - Interior Construction **** 0621 - Wall Finishes	\$14,092.04
A03 - High Priority: Common Space **** A03a - Rotunda **** 06 - Interior Construction **** 0622 - Floor Finishes	\$990.00
A03 - High Priority: Common Space **** A03a - Rotunda **** 06 - Interior Construction - SUBTOTAL	\$15,082.04
A03 - High Priority: Common Space **** A03a - Rotunda **** 08 - Mechanical **** 0830 - Fire Protection	\$3,455.46

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Description	Unit Price Ext
A03 - High Priority: Common Space **** A03a - Rotunda **** 08 - Mechanical - SUBTOTAL	\$3,455.46
A03 - High Priority: Common Space **** A03a - Rotunda **** 09 - Electrical **** 0930 - Special Electrical Systems	\$100,000.00
A03 - High Priority: Common Space **** A03a - Rotunda **** 09 - Electrical - SUBTOTAL	\$100,000.00
A03 - High Priority: Common Space **** A03a - Rotunda - SUBTOTAL	\$118,537.50
A03 - High Priority: Common Space **** A03b - Capitol Extension Corridor **** 09 - Electrical **** 0930 - Special Electrical Systems	\$15,000.00
A03 - High Priority: Common Space **** A03b - Capitol Extension Corridor **** 09 - Electrical - SUBTOTAL	\$15,000.00
A03 - High Priority: Common Space **** A03b - Capitol Extension Corridor - SUBTOTAL	\$15,000.00
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 08 - Mechanical **** 0820 - HVAC	\$52,664.06
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 08 - Mechanical **** 0830 - Fire Protection	\$3,325.11
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 08 - Mechanical - SUBTOTAL	\$55,989.17
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 09 - Electrical **** 0900 - Electrical	\$24,985.64
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 09 - Electrical - SUBTOTAL	\$24,985.64
A03 - High Priority: Common Space **** A03c - Broadcast Studio - SUBTOTAL	\$80,974.81
A03 - High Priority: Common Space - SUBTOTAL	\$214,512.31
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$17,950.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 06 - Interior Construction - SUBTOTAL	\$17,950.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 08 - Mechanical **** 0820 - HVAC	\$1,458.60
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 08 - Mechanical **** 0830 - Fire Protection	\$3,142.62
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 08 - Mechanical - SUBTOTAL	\$4,601.22
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 09 - Electrical **** 0930 - Special Electrical Systems	\$30,000.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 09 - Electrical - SUBTOTAL	\$30,000.00

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Description	Unit Price Ext
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 11 - Equipment **** 1120 - Furnishings	\$12,388.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 11 - Equipment - SUBTOTAL	\$12,388.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room - SUBTOTAL	\$64,939.22
A04 - Low Priority: Legislative Space **** A04b - Data Closet **** 08 - Mechanical **** 0820 - HVAC	\$25,400.00
A04 - Low Priority: Legislative Space **** A04b - Data Closet **** 08 - Mechanical - SUBTOTAL	\$25,400.00
A04 - Low Priority: Legislative Space **** A04b - Data Closet - SUBTOTAL	\$25,400.00
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies **** 06 - Interior Construction **** 0622 - Floor Finishes	\$14,025.00
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies **** 06 - Interior Construction - SUBTOTAL	\$14,025.00
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies - SUBTOTAL	\$14,025.00
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$4,500.00
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 06 - Interior Construction - SUBTOTAL	\$4,500.00
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 08 - Mechanical **** 0820 - HVAC	\$14,740.74
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 08 - Mechanical - SUBTOTAL	\$14,740.74
A04 - Low Priority: Legislative Space **** A04d - IT Work Room - SUBTOTAL	\$19,240.74
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 08 - Mechanical **** 0820 - HVAC	\$26,238.94
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 08 - Mechanical - SUBTOTAL	\$26,238.94
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 09 - Electrical **** 0930 - Special Electrical Systems	\$1,618.78
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 09 - Electrical - SUBTOTAL	\$1,618.78
A04 - Low Priority: Legislative Space **** A04e - Senate President - SUBTOTAL	\$27,857.72
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 08 - Mechanical **** 0820 - HVAC	\$25,376.34
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 08 - Mechanical - SUBTOTAL	\$25,376.34

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Description	Unit Price Ext
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 09 - Electrical **** 0930 - Special Electrical Systems	\$1,618.78
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 09 - Electrical - SUBTOTAL	\$1,618.78
A04 - Low Priority: Legislative Space **** A04f - House Speaker - SUBTOTAL	\$26,995.12
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 08 - Mechanical **** 0820 - HVAC	\$18,130.62
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 08 - Mechanical - SUBTOTAL	\$18,130.62
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems	\$809.39
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 09 - Electrical - SUBTOTAL	\$809.39
A04 - Low Priority: Legislative Space **** A04g - House Conference Room - SUBTOTAL	\$18,940.01
A04 - Low Priority: Legislative Space **** A04h - Individual Offices **** 08 - Mechanical **** 0820 - HVAC	\$43,275.54
A04 - Low Priority: Legislative Space **** A04h - Individual Offices **** 08 - Mechanical - SUBTOTAL	\$43,275.54
A04 - Low Priority: Legislative Space **** A04h - Individual Offices - SUBTOTAL	\$43,275.54
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205 **** 08 - Mechanical **** 0820 - HVAC	\$19,816.37
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205 **** 08 - Mechanical - SUBTOTAL	\$19,816.37
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205 - SUBTOTAL	\$19,816.37
A04 - Low Priority: Legislative Space - SUBTOTAL	\$260,489.72
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 08 - Mechanical **** 0820 - HVAC	\$19,212.64
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 08 - Mechanical - SUBTOTAL	\$19,212.64
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems	\$750.00
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 09 - Electrical - SUBTOTAL	\$750.00
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room - SUBTOTAL	\$19,962.64

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Description	Unit Price Ext
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 08 - Mechanical **** 0820 - HVAC	\$67,059.72
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 08 - Mechanical - SUBTOTAL	\$67,059.72
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 09 - Electrical **** 0930 - Special Electrical Systems	\$3,987.56
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 09 - Electrical - SUBTOTAL	\$3,987.56
A05 - Low Priority: Executive Space **** A05b - Individual Offices - SUBTOTAL	\$71,047.28
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 08 - Mechanical **** 0820 - HVAC	\$18,680.25
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 08 - Mechanical - SUBTOTAL	\$18,680.25
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 09 - Electrical **** 0930 - Special Electrical Systems	\$2,652.48
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 09 - Electrical - SUBTOTAL	\$2,652.48
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 - SUBTOTAL	\$21,332.73
A05 - Low Priority: Executive Space - SUBTOTAL	\$112,342.65
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction **** 0621 - Wall Finishes	\$7,846.07
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction **** 0622 - Floor Finishes	\$2,595.00
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$5,700.00
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction - SUBTOTAL	\$16,141.07
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors - SUBTOTAL	\$16,141.07
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 06 - Interior Construction **** 0622 - Floor Finishes	\$2,595.00
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 06 - Interior Construction - SUBTOTAL	\$2,595.00
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 09 - Electrical **** 0900 - Electrical	\$6,688.50
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 09 - Electrical - SUBTOTAL	\$6,688.50
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors - SUBTOTAL	\$9,283.50

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Description	Unit Price Ext
A06 - Low Priority: Common Space - SUBTOTAL	\$25,424.57
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0610 - Partitions	\$20,720.00
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0621 - Wall Finishes	\$39,941.33
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0622 - Floor Finishes	\$1,500.00
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0623 - Ceiling Finishes	\$1,500.00
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction - SUBTOTAL	\$63,661.33
A07 - EG02.2A Demo and Construction **** 08 - Mechanical **** 0820 - HVAC	\$52,664.06
A07 - EG02.2A Demo and Construction **** 08 - Mechanical **** 0830 - Fire Protection	\$3,325.11
A07 - EG02.2A Demo and Construction **** 08 - Mechanical - SUBTOTAL	\$55,989.17
A07 - EG02.2A Demo and Construction **** 09 - Electrical **** 0900 - Electrical	\$38,680.00
A07 - EG02.2A Demo and Construction **** 09 - Electrical - SUBTOTAL	\$38,680.00
A07 - EG02.2A Demo and Construction **** 12 - Sitework **** 1210 - Site Preparation	\$7,500.00
A07 - EG02.2A Demo and Construction **** 12 - Sitework - SUBTOTAL	\$7,500.00
A07 - EG02.2A Demo and Construction **** - SUBTOTAL	\$165,830.50
A07 - EG02.2A Demo and Construction - SUBTOTAL	\$165,830.50



PROJECT RECAP & SUMMARY

Description	Unit Price Ext
**** REPORT TOTAL ****	\$1,904,320.50
===== SUMMARY =====	
SUMMARY MARKUPS	
Premium for Supervision and Lost Time for Small Size Projects *** 25.00% of Total	\$476,080.13
General Conditions OH & P *** 12.00% of Total	\$285,648.09
Design Contingency *** 5.00% of Total	\$133,302.44
Escalation *** 9.00% of Total	\$251,941.61
MARKUP TOTAL	\$1,146,972.00
ESTIMATE TOTAL	\$3,051,293.00

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 06 - Interior Construction **** 0621 - Wall Finishes				
E301				
Acoustic Plaster at Walls	294	SQFT	\$45.01	\$13,232.94
Wood Moulding at Perimeter of Plaster	279	LNFT	\$15.00	\$4,185.00
Scaffolding	1	LSUM	\$1,800.00	\$1,800.00
				<u>\$19,217.94</u>
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 06 - Interior Construction - SUBTOTAL				\$19,217.94
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** E301 - Joint Appropriations Committee ****				
Remove and Reinstall Camera's	1	LSUM	\$10,000.00	\$10,000.00
				<u>\$10,000.00</u>
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 09 - Electrical - SUBTOTAL				\$10,000.00
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 11 - Equipment **** 1120 - Furnishings				
E301				
Acoustic Fabric Curtains	175	SQFT	\$38.00	\$6,650.00
				<u>\$6,650.00</u>
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee **** 11 - Equipment - SUBTOTAL				\$6,650.00
A01 - High Priority: Legislative Space **** A01a - Joint Appropriations Committee - SUBTOTAL				\$35,867.94
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
W110 & W113				
Acoustic Plaster at Ceiling	1,382	SQFT	\$50.00	\$69,100.00
Scaffolding	1	LSUM	\$12,000.00	\$12,000.00
				<u>\$81,100.00</u>
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 06 - Interior Construction - SUBTOTAL				\$81,100.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM W110 & W113 ****				
Remove & Reinstall HVAC Equipment to Accommodate Ceiling Acoustical Treatment	2,486	SQFT	\$20.90	\$51,957.40
				<u>\$51,957.40</u>
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM W110 & W113 ****				
Adjust Sprinkler Heads to Accommodate New Ceiling	2,486	SQFT	\$2.37	\$5,891.82
				<u>\$5,891.82</u>

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 08 - Mechanical - SUBTOTAL				\$57,849.22
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** W110 & W113 Public Meeting Rooms *****				
Electrical Extension of Conduit and Wire as Needed	2	LSUM	\$15,000.00	<u>\$30,000.00</u>
				\$30,000.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 09 - Electrical - SUBTOTAL				\$30,000.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 11 - Equipment **** 1120 - Furnishings				
***** W110 & W113 *****				
Acoustic Fabric Curtains	515	SQFT	\$38.00	<u>\$19,570.00</u>
				\$19,570.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms **** 11 - Equipment - SUBTOTAL				\$19,570.00
A01 - High Priority: Legislative Space **** A01b - Public Meeting Rooms - SUBTOTAL				\$188,519.22
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction **** 0621 - Wall Finishes				
***** W212 / W312 *****				
Acoustic Plaster at Walls	676	SQFT	\$45.01	\$30,426.76
Wood Moulding at Perimeter of Plaster	642	LNFT	\$15.00	\$9,630.00
Scaffolding	1	LSUM	\$4,000.00	<u>\$4,000.00</u>
				\$44,056.76
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction **** 0622 - Floor Finishes				
***** W212 / W312 *****				
Area Rug Allowance	144	SQFT	\$15.00	<u>\$2,160.00</u>
				\$2,160.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
***** W212 / W312 *****				
Acoustic Plaster at Ceiling	597	SQFT	\$50.00	\$29,850.00
Scaffolding	1	LSUM	\$5,000.00	<u>\$5,000.00</u>
				\$34,850.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 06 - Interior Construction - SUBTOTAL				\$81,066.76
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 08 - Mechanical **** 0820 - HVAC				
***** ROOM W212 *****				
Remove & Reinstall HVAC Equipment to Accommodate Wall & Ceiling Acoustical Treatment	1,788	SQFT	\$22.00	<u>\$39,336.00</u>
				\$39,336.00

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM W212 **** Adjust Sprinkler Heads to Accommodate New Ceiling	1,788	SQFT	\$2.37	<u>\$4,237.56</u> \$4,237.56
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 08 - Mechanical - SUBTOTAL				\$43,573.56
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** W212 Senate Chamber ***** Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$30,000.00	\$30,000.00
New Security Camera's	2	EACH	\$4,705.00	\$9,410.00
***** W214 Senate Gallery ***** Electrical Extension of Conduit and Wire as Needed	4	LSUM	\$10,000.00	\$40,000.00
Remove and Replace Speakers	15	EACH	\$410.68	\$6,160.20
***** W319 Senate Gallery *****				
***** W328 Senate Gallery *****				
***** W331 Senate Gallery *****				<u>\$85,570.20</u>
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 09 - Electrical - SUBTOTAL				\$85,570.20
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 11 - Equipment **** 1120 - Furnishings				
W212 / W312 Acoustic Fabric Curtains	391	SQFT	\$38.00	<u>\$14,858.00</u> \$14,858.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery **** 11 - Equipment - SUBTOTAL				\$14,858.00
A01 - High Priority: Legislative Space **** A01c - Senate Chamber & Gallery - SUBTOTAL				\$225,068.52
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction **** 0621 - Wall Finishes				
E214 / E314 Acoustic Plaster at Walls	727	SQFT	\$45.01	\$32,722.27
Wood Moulding at Perimeter of Plaster	691	LNFT	\$15.00	\$10,365.00
Scaffolding	1	LSUM	\$4,300.00	<u>\$4,300.00</u> \$47,387.27
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction **** 0622 - Floor Finishes				
E214 / E314 Area Rug Allowance	144	SQFT	\$15.00	<u>\$2,160.00</u> \$2,160.00
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction **** 0623 - Ceiling Finishes				

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Description	Quantity	U/M	Unit Price	Unit Price Ext
E214 / E314	****			
Acoustic Plaster at Ceiling	1,845	SQFT	\$50.00	\$92,250.00
Scaffolding	1	LSUM	\$15,000.00	\$15,000.00
				<u>\$107,250.00</u>
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 06 - Interior Construction - SUBTOTAL				\$156,797.27
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM E214 & E314 ****				
Adjust Sprinkler Heads to Accommodate New Ceiling	1,845	SQFT	\$2.37	\$4,372.65
				<u>\$4,372.65</u>
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 08 - Mechanical - SUBTOTAL				\$4,372.65
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** E214 House Chamber *****				
Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$30,000.00	\$30,000.00
***** E212 House Gallery *****				
Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$10,000.00	\$10,000.00
Remove and Replace Speakers	15	EACH	\$410.68	\$6,160.20
				<u>\$46,160.20</u>
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 09 - Electrical - SUBTOTAL				\$46,160.20
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 11 - Equipment **** 1120 - Furnishings				
E214 / E314				
Acoustic Fabric Curtains	243	SQFT	\$38.00	\$9,234.00
				<u>\$9,234.00</u>
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery **** 11 - Equipment - SUBTOTAL				\$9,234.00
A01 - High Priority: Legislative Space **** A01d - House Chamber & Gallery - SUBTOTAL				\$216,564.12
A01 - High Priority: Legislative Space - SUBTOTAL				\$666,019.80
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
E107				
Acoustic Plaster at Ceiling	638	SQFT	\$50.00	\$31,900.00
Scaffolding	1	LSUM	\$7,000.00	\$7,000.00
				<u>\$38,900.00</u>

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 06 - Interior Construction - SUBTOTAL				\$38,900.00
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E107 ****				
Modify Fan Coil Units	3	EACH	\$2,670.38	\$8,011.14
Sheetmetal	1,043	LBS	\$18.21	\$18,993.03
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	1,043	SQFT	\$4.49	\$4,683.07
Controls - Fan Coil Units	3	EACH	\$3,156.82	\$9,470.46
Start Up	6	HOUR	\$126.24	\$757.44
Testing, Adjusting, & Balancing	12	HOUR	\$126.24	\$1,514.88
3rd Party Cx Assist	6	HOUR	\$126.24	\$757.44
Rigging	1	LSUM	\$1,014.53	\$1,014.53
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<u>\$49,828.66</u>
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM E107 ****				
Adjust Sprinkler Heads to Accommodate New Ceiling	638	SQFT	\$2.37	\$1,512.06
				<u>\$1,512.06</u>
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 08 - Mechanical - SUBTOTAL				\$51,340.72
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** E107 Ceremonial Conference Room ****				
Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$15,000.00	\$15,000.00
				<u>\$15,000.00</u>
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room **** 09 - Electrical - SUBTOTAL				\$15,000.00
A02 - High Priority: Executive Space **** A02a - Ceremonial Conference Room - SUBTOTAL				\$105,240.72
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
E142				
Acoustic Plaster at Ceiling	244	SQFT	\$50.00	\$12,200.00
Scaffolding	1	LSUM	\$2,500.00	\$2,500.00
				<u>\$14,700.00</u>
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 06 - Interior Construction - SUBTOTAL				\$14,700.00

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E142 ****				
Modify Fan Coil Units	3 EACH		\$2,670.38	\$8,011.14
Sheetmetal	615 LBS		\$18.21	\$11,199.15
Sheetmetal Specialties	1 LSUM		\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	615 SQFT		\$4.49	\$2,761.35
Controls - Fan Coil Units	3 EACH		\$3,156.82	\$9,470.46
Start Up	6 HOUR		\$126.24	\$757.44
Testing, Adjusting, & Balancing	12 HOUR		\$126.24	\$1,514.88
3rd Party Cx Assist	6 HOUR		\$126.24	\$757.44
Rigging	1 LSUM		\$1,014.53	\$1,014.53
Project Supervision	16 HOUR		\$126.24	\$2,019.84
Coordination	8 HOUR		\$126.24	\$1,009.92
				<u>\$40,113.06</u>
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM E142 ****				
Adjust Sprinkler Heads to Accommodate New Ceiling	244 SQFT		\$2.37	<u>\$578.28</u>
				\$578.28
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 08 - Mechanical - SUBTOTAL				\$40,691.34
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** ROOM E142 ****				
Fan Coil Unit - Remove & Replace Electrical Connection	3 EACH		\$809.39	\$2,428.17
Misc. Work - Electrical and Special Systems	1 LSUM		\$20,000.00	<u>\$20,000.00</u>
				\$22,428.17
A02 - High Priority: Executive Space **** A02b - Executive Conference Room **** 09 - Electrical - SUBTOTAL				\$22,428.17
A02 - High Priority: Executive Space **** A02b - Executive Conference Room - SUBTOTAL				\$77,819.51
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
EG36				
Acoustic Plaster at Ceiling	228 SQFT		\$50.00	\$11,400.00
Scaffolding	1 LSUM		\$2,500.00	<u>\$2,500.00</u>
				\$13,900.00
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 06 - Interior Construction - SUBTOTAL				\$13,900.00
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM EG36 ****				

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Modify Fan Coil Units	3 EACH		\$2,670.38	\$8,011.14
Sheetmetal	536 LBS		\$18.21	\$9,760.56
Sheetmetal Specialties	1 LSUM		\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	536 SQFT		\$4.49	\$2,406.64
Controls - Fan Coil Units	3 EACH		\$3,156.82	\$9,470.46
Start Up	6 HOUR		\$126.24	\$757.44
Testing, Adjusting, & Balancing	12 HOUR		\$126.24	\$1,514.88
3rd Party Cx Assist	6 HOUR		\$126.24	\$757.44
Rigging	1 LSUM		\$1,014.53	\$1,014.53
Project Supervision	16 HOUR		\$126.24	\$2,019.84
Coordination	8 HOUR		\$126.24	\$1,009.92
				<u>\$38,319.76</u>
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM EG35 ****				
Adjust Sprinkler Heads to Accommodate New Ceiling	228 SQFT		\$2.37	\$540.36
				<u>\$540.36</u>
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 08 - Mechanical - SUBTOTAL				\$38,860.12
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** Room EG36 ****				
Fan Coil Unit - Remove & Replace Electrical Connection	3 EACH		\$809.39	\$2,428.17
				<u>\$2,428.17</u>
A02 - High Priority: Executive Space **** A02c - Policy Conference Room **** 09 - Electrical - SUBTOTAL				\$2,428.17
A02 - High Priority: Executive Space **** A02c - Policy Conference Room - SUBTOTAL				\$55,188.29
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 06 - Interior Construction **** 0621 - Wall Finishes				
Added Scope and Pricing per Architect				
	1 LSUM		\$30,000.00	\$30,000.00
				<u>\$30,000.00</u>
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 06 - Interior Construction - SUBTOTAL				\$30,000.00
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E102 ****				
Modify Fan Coil Units	1 EACH		\$2,670.38	\$2,670.38
Sheetmetal	2,363 LBS		\$18.21	\$43,030.23
Sheetmetal Specialties	1 LSUM		\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	266 SQFT		\$4.49	\$1,194.34
Controls - Fan Coil Units	3 EACH		\$3,156.82	\$9,470.46

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Start Up	18 HOUR		\$126.24	\$2,272.32
Testing, Adjusting, & Balancing	20 HOUR		\$126.24	\$2,524.80
3rd Party Cx Assist	10 HOUR		\$126.24	\$1,262.40
Rigging	1 LSUM		\$1,014.53	\$1,014.53
Project Supervision	56 HOUR		\$126.24	\$7,069.44
Coordination	32 HOUR		\$126.24	\$4,039.68
**** BLOWER COIL UNITS ****				
Modifications to Blower Coil Units - BCU 1 & 2	2 EACH		\$2,465.85	\$4,931.70
Sheetmetal Specialties	1 LSUM		\$6,669.56	\$6,669.56
Sheetmetal Acoustical Lining	2,097 SQFT		\$5.58	\$11,701.26
				<u>\$99,448.01</u>
A02 - High Priority: Executive Space **** A02d - Policy Group Reception **** 08 - Mechanical - SUBTOTAL				\$99,448.01
A02 - High Priority: Executive Space **** A02d - Policy Group Reception - SUBTOTAL				\$129,448.01
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 06 - Interior Construction **** 0621 - Wall Finishes				
E129				****
Acoustic Plaster at Walls	167 SQFT		\$45.01	\$7,516.67
Wood Moulding at Perimeter of Plaster	159 LNFT		\$15.00	\$2,385.00
Scaffolding	1 LSUM		\$1,500.00	\$1,500.00
				<u>\$11,401.67</u>
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 06 - Interior Construction - SUBTOTAL				\$11,401.67
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E129 ****				
Modify Fan Coil Units	2 EACH		\$2,670.38	\$5,340.76
Sheetmetal	497 LBS		\$18.21	\$9,050.37
Sheetmetal Specialties	1 LSUM		\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	497 SQFT		\$4.49	\$2,231.53
Controls - Fan Coil Units	2 EACH		\$3,156.82	\$6,313.64
Start Up	4 HOUR		\$126.24	\$504.96
Testing, Adjusting, & Balancing	8 HOUR		\$126.24	\$1,009.92
3rd Party Cx Assist	4 HOUR		\$126.24	\$504.96
Rigging	1 LSUM		\$1,014.53	\$1,014.53
Project Supervision	16 HOUR		\$126.24	\$2,019.84
Coordination	8 HOUR		\$126.24	\$1,009.92
				<u>\$30,597.34</u>
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 08 - Mechanical - SUBTOTAL				\$30,597.34

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** Room E129 **** Fan Coil Unit - Remove & Replace Electrical Connection	2	EACH	\$809.39	<u>\$1,618.78</u>
				\$1,618.78
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office **** 09 - Electrical - SUBTOTAL				\$1,618.78
A02 - High Priority: Executive Space **** A02e - Governor's Formal Office - SUBTOTAL				\$43,617.79
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E121 **** Modify Fan Coil Units	3	EACH	\$2,670.38	\$8,011.14
Sheetmetal	624	LBS	\$18.21	\$11,363.04
Sheetmetal Specialties	2	LSUM	\$1,596.91	\$3,193.82
Sheetmetal Acoustical Lining	624	SQFT	\$4.49	\$2,801.76
Controls - Fan Coil Units	3	EACH	\$3,156.82	\$9,470.46
Start Up	6	HOUR	\$126.24	\$757.44
Testing, Adjusting, & Balancing	12	HOUR	\$126.24	\$1,514.88
3rd Party Cx Assist	6	HOUR	\$126.24	\$757.44
Rigging	2	LSUM	\$1,014.53	\$2,029.06
Project Supervision	32	HOUR	\$126.24	\$4,039.68
Coordination	16	HOUR	\$126.24	\$2,019.84
**** ROOM E128 ****				<u>\$45,958.56</u>
				\$45,958.56
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 08 - Mechanical - SUBTOTAL				\$45,958.56
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** Room E121 **** Fan Coil Unit - Remove & Replace Electrical Connection	3	EACH	\$809.39	<u>\$2,428.17</u>
				\$2,428.17
A02 - High Priority: Executive Space **** A02f - Individual Offices **** 09 - Electrical - SUBTOTAL				\$2,428.17
A02 - High Priority: Executive Space **** A02f - Individual Offices - SUBTOTAL				\$48,386.73
A02 - High Priority: Executive Space - SUBTOTAL				\$459,701.05

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A03 - High Priority: Common Space **** A03a - Rotunda **** 06 - Interior Construction **** 0621 - Wall Finishes				
C202				
Acoustic Plaster at Walls	204	SQFT	\$45.01	\$9,182.04
Wood Moulding at Perimeter of Plaster	194	LNFT	\$15.00	\$2,910.00
Scaffolding	1	LSUM	\$2,000.00	\$2,000.00
				<u>\$14,092.04</u>
A03 - High Priority: Common Space **** A03a - Rotunda **** 06 - Interior Construction **** 0622 - Floor Finishes				
C202				
Area Rug Allowance	66	SQFT	\$15.00	\$990.00
				<u>\$990.00</u>
A03 - High Priority: Common Space **** A03a - Rotunda **** 06 - Interior Construction - SUBTOTAL				\$15,082.04
A03 - High Priority: Common Space **** A03a - Rotunda **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROTUNDA C202 ****				
Adjust Sprinkler Heads to Accommodate New Ceiling	1,458	SQFT	\$2.37	\$3,455.46
				<u>\$3,455.46</u>
A03 - High Priority: Common Space **** A03a - Rotunda **** 08 - Mechanical - SUBTOTAL				\$3,455.46
A03 - High Priority: Common Space **** A03a - Rotunda **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** C202 Rotunda *****				
Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$100,000.00	\$100,000.00
				<u>\$100,000.00</u>
A03 - High Priority: Common Space **** A03a - Rotunda **** 09 - Electrical - SUBTOTAL				\$100,000.00
A03 - High Priority: Common Space **** A03a - Rotunda - SUBTOTAL				\$118,537.50
A03 - High Priority: Common Space **** A03b - Capitol Extension Corridor **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** Corridors *****				
Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$15,000.00	\$15,000.00
				<u>\$15,000.00</u>
A03 - High Priority: Common Space **** A03b - Capitol Extension Corridor **** 09 - Electrical - SUBTOTAL				\$15,000.00
A03 - High Priority: Common Space **** A03b - Capitol Extension Corridor - SUBTOTAL				\$15,000.00
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 08 - Mechanical **** 0820 - HVAC				
Cut, Cap, Make Safe Existing HVAC	1	LSUM	\$3,475.73	\$3,475.73

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Remove & Dispose Existing HVAC	1	LSUM	\$3,193.83	\$3,193.83
Remove & Reinstall Terminal Unit	1	EACH	\$1,232.92	\$1,232.92
Registers, Grilles, & Diffusers	10	EACH	\$490.23	\$4,902.30
Sheetmetal	948	LBS	\$18.21	\$17,263.08
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Hot Water Piping	10	LNFT	\$52.24	\$522.40
Remove & Reinstall Existing Piping at Fire Rated Wall	1	LSUM	\$6,223.49	\$6,223.49
Piping Specialties	1	LSUM	\$2,792.83	\$2,792.83
Sheetmetal Acoustical Lining	948	SQFT	\$4.49	\$4,256.52
Piping Insulation	10	LNFT	\$13.00	\$130.00
Start Up	6	HOUR	\$126.24	\$757.44
Testing, Adjusting, & Balancing	12	HOUR	\$126.24	\$1,514.88
3rd Party Cx Assist	6	HOUR	\$126.24	\$757.44
Rigging	1	LSUM	\$1,014.53	\$1,014.53
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<hr/>
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 08 - Mechanical **** 0830 - Fire Protection				\$52,664.06
Adjust Sprinkler Heads to Accommodate New Ceiling	1,403	SQFT	\$2.37	\$3,325.11
				<hr/>
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 08 - Mechanical - SUBTOTAL				\$55,989.17
 A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 09 - Electrical **** 0900 - Electrical				
***** E027 Broadcast Studio *****				
Electrical Extension of Conduit and Wire as Needed	1	LSUM	\$10,000.00	\$10,000.00
Install New Light Fixtures	1	LSUM	\$7,500.00	\$7,500.00
Install New Fire Alarm Devices	1	LSUM	\$2,500.00	\$2,500.00
Mechanical Equipment Connections (BCU1-BCU2)	2	EACH	\$2,492.82	\$4,985.64
				<hr/>
A03 - High Priority: Common Space **** A03c - Broadcast Studio **** 09 - Electrical - SUBTOTAL				\$24,985.64
 A03 - High Priority: Common Space **** A03c - Broadcast Studio - SUBTOTAL				\$80,974.81
 A03 - High Priority: Common Space - SUBTOTAL				\$214,512.31
 A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
E202 *****				
Acoustic Plaster at Ceiling	299	SQFT	\$50.00	\$14,950.00

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Scaffolding	1	LSUM	\$3,000.00	\$3,000.00
				<u>\$17,950.00</u>
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 06 - Interior Construction - SUBTOTAL				\$17,950.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E202 ****				
Modify 2 Grilles	1,326	SQFT	\$1.10	\$1,458.60
				<u>\$1,458.60</u>
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 08 - Mechanical **** 0830 - Fire Protection				
**** ROOM E202 ****				
Adjust New Sprinkler Heads to Accommodate New Ceiling	1,326	SQFT	\$2.37	\$3,142.62
				<u>\$3,142.62</u>
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 08 - Mechanical - SUBTOTAL				\$4,601.22
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** Room E202 *****				
Misc. Work - Electrical and Special Systems	1	LSUM	\$30,000.00	\$30,000.00
				<u>\$30,000.00</u>
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 09 - Electrical - SUBTOTAL				\$30,000.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 11 - Equipment **** 1120 - Furnishings				
E202 ****				
Acoustic Fabric Curtains	326	SQFT	\$38.00	\$12,388.00
				<u>\$12,388.00</u>
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room **** 11 - Equipment - SUBTOTAL				\$12,388.00
A04 - Low Priority: Legislative Space **** A04a - Historic Supreme Court Meeting Room - SUBTOTAL				\$64,939.22
A04 - Low Priority: Legislative Space **** A04b - Data Closet **** 08 - Mechanical **** 0820 - HVAC				
Supreme Court Data Closet Scope and Pricing Provided by Architect				
	1	LSUM	\$25,400.00	\$25,400.00
				<u>\$25,400.00</u>
A04 - Low Priority: Legislative Space **** A04b - Data Closet **** 08 - Mechanical - SUBTOTAL				\$25,400.00
A04 - Low Priority: Legislative Space **** A04b - Data Closet - SUBTOTAL				\$25,400.00

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies **** 06 - Interior Construction **** 0622 - Floor Finishes				
W206/C305 & E208/C303				
Area Rug Allowance	935	SQFT	\$15.00	\$14,025.00
				<u>\$14,025.00</u>
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies **** 06 - Interior Construction - SUBTOTAL				\$14,025.00
A04 - Low Priority: Legislative Space **** A04c - Senate & House Lobbies - SUBTOTAL				\$14,025.00
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
WG11				
Soffit Allowance	1	LSUM	\$4,500.00	\$4,500.00
				<u>\$4,500.00</u>
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 06 - Interior Construction - SUBTOTAL				\$4,500.00
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM WG11 ****				
Cut, Cap, Make Safe Existing HVAC	1	LSUM	\$1,737.87	\$1,737.87
Remove & Dispose Existing HVAC	1	LSUM	\$2,101.86	\$2,101.86
Registers, Grilles, & Diffusers	1	EACH	\$490.23	\$490.23
Sheetmetal	153	LBS	\$18.21	\$2,786.13
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	153	SQFT	\$4.49	\$686.97
Start Up	4	HOUR	\$126.24	\$504.96
Testing, Adjusting, & Balancing	4	HOUR	\$126.24	\$504.96
3rd Party Cx Assist	4	HOUR	\$126.24	\$504.96
Rigging	1	LSUM	\$796.13	\$796.13
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<u>\$14,740.74</u>
A04 - Low Priority: Legislative Space **** A04d - IT Work Room **** 08 - Mechanical - SUBTOTAL				\$14,740.74
A04 - Low Priority: Legislative Space **** A04d - IT Work Room - SUBTOTAL				\$19,240.74
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E213 ****				
Modify Fan Coil Units	2	EACH	\$2,670.38	\$5,340.76
Sheetmetal	305	LBS	\$18.21	\$5,554.05

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	305	SQFT	\$4.49	\$1,369.45
Controls - Fan Coil Units	2	EACH	\$3,156.82	\$6,313.64
Start Up	4	HOUR	\$126.24	\$504.96
Testing, Adjusting, & Balancing	8	HOUR	\$126.24	\$1,009.92
3rd Party Cx Assist	4	HOUR	\$126.24	\$504.96
Rigging	1	LSUM	\$1,014.53	\$1,014.53
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<hr/>
				\$26,238.94
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 08 - Mechanical - SUBTOTAL				\$26,238.94
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** Room E213 *****				
Fan Coil Unit - Remove & Replace Electrical Connection	2	EACH	\$809.39	\$1,618.78
				<hr/>
				\$1,618.78
A04 - Low Priority: Legislative Space **** A04e - Senate President **** 09 - Electrical - SUBTOTAL				\$1,618.78
A04 - Low Priority: Legislative Space **** A04e - Senate President - SUBTOTAL				\$27,857.72
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 08 - Mechanical **** 0820 - HVAC				
***** ROOM E227 *****				
Modify Fan Coil Units	2	EACH	\$2,670.38	\$5,340.76
Sheetmetal	267	LBS	\$18.21	\$4,862.07
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	267	SQFT	\$4.49	\$1,198.83
Controls - Fan Coil Units	2	EACH	\$3,156.82	\$6,313.64
Start Up	4	HOUR	\$126.24	\$504.96
Testing, Adjusting, & Balancing	8	HOUR	\$126.24	\$1,009.92
3rd Party Cx Assist	4	HOUR	\$126.24	\$504.96
Rigging	1	LSUM	\$1,014.53	\$1,014.53
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<hr/>
				\$25,376.34
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 08 - Mechanical - SUBTOTAL				\$25,376.34
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** Room E227 *****				

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Fan Coil Unit - Remove & Replace Electrical Connection	2	EACH	\$809.39	\$1,618.78
				<u>\$1,618.78</u>
A04 - Low Priority: Legislative Space **** A04f - House Speaker **** 09 - Electrical - SUBTOTAL				\$1,618.78
A04 - Low Priority: Legislative Space **** A04f - House Speaker - SUBTOTAL				\$26,995.12
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM E313 ****				
Modify Fan Coil Units	1	EACH	\$2,670.38	\$2,670.38
Sheetmetal	249	LBS	\$18.21	\$4,534.29
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	249	SQFT	\$4.49	\$1,118.01
Controls - Fan Coil Units	1	EACH	\$3,156.82	\$3,156.82
Start Up	2	HOUR	\$126.24	\$252.48
Testing, Adjusting, & Balancing	4	HOUR	\$126.24	\$504.96
3rd Party Cx Assist	2	HOUR	\$126.24	\$252.48
Rigging	1	LSUM	\$1,014.53	\$1,014.53
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<u>\$18,130.62</u>
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 08 - Mechanical - SUBTOTAL				\$18,130.62
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** Room E313 ****				
Fan Coil Unit - Remove & Replace Electrical Connection	1	EACH	\$809.39	\$809.39
				<u>\$809.39</u>
A04 - Low Priority: Legislative Space **** A04g - House Conference Room **** 09 - Electrical - SUBTOTAL				\$809.39
A04 - Low Priority: Legislative Space **** A04g - House Conference Room - SUBTOTAL				\$18,940.01
A04 - Low Priority: Legislative Space **** A04h - Individual Offices **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM EG02 ****				
Modify Fan Coil Units	2	EACH	\$2,670.38	\$5,340.76
Sheetmetal	807	LBS	\$18.21	\$14,695.47
Sheetmetal Specialties	2	LSUM	\$1,596.91	\$3,193.82
Sheetmetal Acoustical Lining	807	SQFT	\$4.49	\$3,623.43
Controls - Fan Coil Units	2	EACH	\$3,156.82	\$6,313.64

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Start Up	4 HOUR		\$126.24	\$504.96
Testing, Adjusting, & Balancing	8 HOUR		\$126.24	\$1,009.92
3rd Party Cx Assist	4 HOUR		\$126.24	\$504.96
Rigging	2 LSUM		\$1,014.53	\$2,029.06
Project Supervision	32 HOUR		\$126.24	\$4,039.68
Coordination	16 HOUR		\$126.24	\$2,019.84
**** ROOM WG02 ****				
				<hr/>
				\$43,275.54
A04 - Low Priority: Legislative Space **** A04h - Individual Offices **** 08 - Mechanical - SUBTOTAL				\$43,275.54
A04 - Low Priority: Legislative Space **** A04h - Individual Offices - SUBTOTAL				\$43,275.54
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205 **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM W205 ****				
Cut, Cap, Make Safe Existing HVAC	1 LSUM		\$1,737.87	\$1,737.87
Remove & Dispose Existing HVAC	1 LSUM		\$2,101.86	\$2,101.86
Registers, Grilles, & Diffusers	2 EACH		\$490.23	\$980.46
Sheetmetal	355 LBS		\$18.21	\$6,464.55
Sheetmetal Specialties	1 LSUM		\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	355 SQFT		\$4.49	\$1,593.95
Start Up	4 HOUR		\$126.24	\$504.96
Testing, Adjusting, & Balancing	4 HOUR		\$126.24	\$504.96
3rd Party Cx Assist	4 HOUR		\$126.24	\$504.96
Rigging	1 LSUM		\$796.13	\$796.13
Project Supervision	16 HOUR		\$126.24	\$2,019.84
Coordination	8 HOUR		\$126.24	\$1,009.92
				<hr/>
				\$19,816.37
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205 **** 08 - Mechanical - SUBTOTAL				\$19,816.37
A04 - Low Priority: Legislative Space **** A04i - Senate Break Room 205 - SUBTOTAL				\$19,816.37
A04 - Low Priority: Legislative Space - SUBTOTAL				\$260,489.72
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM W107 ****				
Cut, Cap, Make Safe Existing HVAC	1 LSUM		\$1,737.87	\$1,737.87
Remove & Dispose Existing HVAC	1 LSUM		\$2,101.86	\$2,101.86

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Registers, Grilles, & Diffusers	1 EACH		\$490.23	\$490.23
Sheetmetal	350 LBS		\$18.21	\$6,373.50
Sheetmetal Specialties	1 LSUM		\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	350 SQFT		\$4.49	\$1,571.50
Start Up	4 HOUR		\$126.24	\$504.96
Testing, Adjusting, & Balancing	4 HOUR		\$126.24	\$504.96
3rd Party Cx Assist	4 HOUR		\$126.24	\$504.96
Rigging	1 LSUM		\$796.13	\$796.13
Project Supervision	16 HOUR		\$126.24	\$2,019.84
Coordination	8 HOUR		\$126.24	\$1,009.92
				<u>\$19,212.64</u>
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 08 - Mechanical - SUBTOTAL				\$19,212.64
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** Room W107 ****				
Install New Light Fixture	1 LSUM		\$750.00	\$750.00
				<u>\$750.00</u>
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room **** 09 - Electrical - SUBTOTAL				\$750.00
A05 - Low Priority: Executive Space **** A05a - Shared Conference Room - SUBTOTAL				\$19,962.64
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM EG25 ****				
Modify Fan Coil Units	4 EACH		\$2,670.38	\$10,681.52
Sheetmetal	756 LBS		\$18.21	\$13,766.76
Sheetmetal Specialties	3 LSUM		\$1,596.91	\$4,790.73
Sheetmetal Acoustical Lining	756 SQFT		\$4.49	\$3,394.44
Controls - Fan Coil Units	4 EACH		\$3,156.82	\$12,627.28
Start Up	12 HOUR		\$126.24	\$1,514.88
Testing, Adjusting, & Balancing	20 HOUR		\$126.24	\$2,524.80
3rd Party Cx Assist	12 HOUR		\$126.24	\$1,514.88
Rigging	2 LSUM		\$1,014.53	\$2,029.06
Project Supervision	48 HOUR		\$126.24	\$6,059.52
Coordination	24 HOUR		\$126.24	\$3,029.76
**** ROOM EG30 ****				
**** ROOM W105 ****				
Cut, Cap, Make Safe Existing HVAC	1 LSUM		\$1,737.87	\$1,737.87
Remove & Dispose Existing HVAC	1 LSUM		\$2,101.86	\$2,101.86
Registers, Grilles, & Diffusers	1 EACH		\$490.23	\$490.23

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Rigging	1	LSUM	\$796.13	\$796.13
				<u>\$67,059.72</u>
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 08 - Mechanical - SUBTOTAL				\$67,059.72
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 09 - Electrical **** 0930 - Special Electrical Systems				
**** Room W105 ****				
Install New Light Fixture	1	LSUM	\$750.00	\$750.00
**** Room EG02 ****				
Fan Coil Unit - Remove & Replace Electrical Connection	4	EACH	\$809.39	\$3,237.56
**** Room EG25 ****				
				<u>\$3,987.56</u>
A05 - Low Priority: Executive Space **** A05b - Individual Offices **** 09 - Electrical - SUBTOTAL				\$3,987.56
A05 - Low Priority: Executive Space **** A05b - Individual Offices - SUBTOTAL				\$71,047.28
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 08 - Mechanical **** 0820 - HVAC				
**** ROOM W201.1 ****				
Registers, Grilles, & Diffusers	2	EACH	\$490.23	\$980.46
Inline Exhaust Fan	1	EACH	\$854.22	\$854.22
Sheetmetal	355	LBS	\$18.21	\$6,464.55
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Sheetmetal Acoustical Lining	355	SQFT	\$4.49	\$1,593.95
Controls - Inline Exhaust Fan	1	EACH	\$1,849.39	\$1,849.39
Start Up	4	HOUR	\$126.24	\$504.96
Testing, Adjusting, & Balancing	4	HOUR	\$126.24	\$504.96
3rd Party Cx Assist	4	HOUR	\$126.24	\$504.96
Rigging	1	LSUM	\$796.13	\$796.13
Project Supervision	16	HOUR	\$126.24	\$2,019.84
Coordination	8	HOUR	\$126.24	\$1,009.92
				<u>\$18,680.25</u>
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 08 - Mechanical - SUBTOTAL				\$18,680.25
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 09 - Electrical **** 0930 - Special Electrical Systems				
***** E201.1 Data *****				
In-Line Fan Connection	1	EACH	\$552.48	\$552.48
Power Feed	1	EACH	\$2,100.00	\$2,100.00
				<u>\$2,652.48</u>

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 **** 09 - Electrical - SUBTOTAL				\$2,652.48
A05 - Low Priority: Executive Space **** A05c - Storage W201.1 - SUBTOTAL				\$21,332.73
A05 - Low Priority: Executive Space - SUBTOTAL				\$112,342.65
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction **** 0621 - Wall Finishes				
EG11				
Acoustic Plaster at Walls	107	SQFT	\$45.01	\$4,816.07
Wood Moulding at Perimeter of Plaster	102	LNFT	\$15.00	\$1,530.00
Scaffolding	1	LSUM	\$1,500.00	\$1,500.00
				<u>\$7,846.07</u>
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction **** 0622 - Floor Finishes				
Capitol Extension Corridors				
Area Rug Allowance	173	SQFT	\$15.00	\$2,595.00
				<u>\$2,595.00</u>
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
EG11				
Acoustic Plaster at Ceiling	84	SQFT	\$50.00	\$4,200.00
Scaffolding	1	LSUM	\$1,500.00	\$1,500.00
				<u>\$5,700.00</u>
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors **** 06 - Interior Construction - SUBTOTAL				\$16,141.07
A06 - Low Priority: Common Space **** A06b - Capitol Extension Corridors - SUBTOTAL				\$16,141.07
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 06 - Interior Construction **** 0622 - Floor Finishes				
Capitol Monument Corridors				
Area Rug Allowance	173	SQFT	\$15.00	\$2,595.00
				<u>\$2,595.00</u>
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 06 - Interior Construction - SUBTOTAL				\$2,595.00
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 09 - Electrical **** 0900 - Electrical				
***** Corridors C301 & C304 *****				
Remove and Replace HVAC Equipment Electrical Connections	1,365	SQFT	\$4.90	\$6,688.50
				<u>\$6,688.50</u>
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors **** 09 - Electrical - SUBTOTAL				\$6,688.50

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Description	Quantity	U/M	Unit Price	Unit Price Ext
A06 - Low Priority: Common Space **** A06c - Capitol Monumental Corridors - SUBTOTAL				\$9,283.50
A06 - Low Priority: Common Space - SUBTOTAL				\$25,424.57
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0610 - Partitions				
New Partitions, Taping and Demo Scars	886	SQFT	\$20.00	\$17,720.00
Allowance for Painting at New Drywall Partitions and Affected Areas	1	LSUM	\$3,000.00	\$3,000.00
				<u>\$20,720.00</u>
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0621 - Wall Finishes				
Acoustic Plaster at Walls	633	SQFT	\$45.01	\$28,491.33
Wood Moulding at Perimeter of Plaster	630	LNFT	\$15.00	\$9,450.00
Scaffolding	1	LSUM	\$2,000.00	\$2,000.00
				<u>\$39,941.33</u>
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0622 - Floor Finishes				
Allowance to Patch Floor at Demo	1	LSUM	\$1,500.00	\$1,500.00
				<u>\$1,500.00</u>
A07 - EG02.2A Demo and Construction **** 06 - Interior Construction **** 0623 - Ceiling Finishes				
Allowance to Patch Ceiling at Demo	1	LSUM	\$1,500.00	\$1,500.00
				<u>\$1,500.00</u>
A07 - EG02.2A Demo and Construction **** **** 06 - Interior Construction - SUBTOTAL				\$63,661.33
A07 - EG02.2A Demo and Construction **** 08 - Mechanical **** 0820 - HVAC				
Cut, Cap, Make Safe Existing HVAC	1	LSUM	\$3,475.73	\$3,475.73
Remove & Dispose Existing HVAC	1	LSUM	\$3,193.83	\$3,193.83
Remove & Reinstall Terminal Unit	1	EACH	\$1,232.92	\$1,232.92
Registers, Grilles, & Diffusers	10	EACH	\$490.23	\$4,902.30
Sheetmetal	948	LBS	\$18.21	\$17,263.08
Sheetmetal Specialties	1	LSUM	\$1,596.91	\$1,596.91
Hot Water Piping	10	LNFT	\$52.24	\$522.40
Remove & Reinstall Existing Piping at Fire Rated Wall	1	LSUM	\$6,223.49	\$6,223.49
Piping Specialties	1	LSUM	\$2,792.83	\$2,792.83
Sheetmetal Acoustical Lining	948	SQFT	\$4.49	\$4,256.52
Piping Insulation	10	LNFT	\$13.00	\$130.00
Start Up	6	HOUR	\$126.24	\$757.44
Testing, Adjusting, & Balancing	12	HOUR	\$126.24	\$1,514.88
3rd Party Cx Assist	6	HOUR	\$126.24	\$757.44
Rigging	1	LSUM	\$1,014.53	\$1,014.53
Project Supervision	16	HOUR	\$126.24	\$2,019.84

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Description	Quantity	U/M	Unit Price	Unit Price Ext
Coordination	8	HOUR	\$126.24	\$1,009.92
				\$52,664.06
A07 - EG02.2A Demo and Construction **** 08 - Mechanical **** 0830 - Fire Protection				
Adjust Sprinkler Heads to Accommodate New Ceiling	1,403	SQFT	\$2.37	\$3,325.11
				\$3,325.11
A07 - EG02.2A Demo and Construction **** **** 08 - Mechanical - SUBTOTAL				\$55,989.17
A07 - EG02.2A Demo and Construction **** 09 - Electrical **** 0900 - Electrical				
**** Suite EG02.2.A (1403 SqFt) ****				
Electrical Demolition and New Construction	1	LSUM	\$38,680.00	\$38,680.00
				\$38,680.00
A07 - EG02.2A Demo and Construction **** **** 09 - Electrical - SUBTOTAL				\$38,680.00
A07 - EG02.2A Demo and Construction **** 12 - Sitework **** 1210 - Site Preparation				
Demolition Allowance of Partitions, D/F/H, Casework, Floors and Ceilings	1	LSUM	\$7,500.00	\$7,500.00
				\$7,500.00
A07 - EG02.2A Demo and Construction **** **** 12 - Sitework - SUBTOTAL				\$7,500.00
A07 - EG02.2A Demo and Construction **** - SUBTOTAL				\$165,830.50



Figure 22 – JAC Room Rendering





Figure 23 – Senate Chamber Rendering



Figure 24 – House Chamber Rendering



Figure 25 – Ceremonial Conference Room Rendering