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Houston Center for Musical Arts

Feasibility Study

October 2023

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Acknowledgement

AMS Planning & Research would like to thank the many organizations and individuals who supported the work of this study over the past year. To the Houston Center for Musical Arts' Board of Directors who worked with us to define the opportunity and vision for a new center for musical arts on the Heights Christian Church Campus: Michael Bos Feldman, Alecia Lawyer, Amy Gibbs, Rodney Thorin, Bob Frater, Frank Donnelly, Elise Bungo, and Paul Marsden. To the design team who were partners in bringing that vision to life through this study: Paul Vaivoda and Tom Hains (Wilson Butler Architects), Adam Shalleck (The Shalleck Collaborative), Scott Pfeiffer and Laura Brill (Threshold Acoustics), Andy Solberg (Collaborative Engineering), Cathy Byrd and Steve Ryan (Venue). To the staff and Board of Directors from ROCO, Houston Saengerbund, Opera in the Heights, and Heights Rotary; community cultural-sector leaders; and the many local musical arts organizations who provided critical input. Our gratitude goes to Michael Bos Feldman and Amy Gibbs for their stewardship of this study from beginning to end.

Introduction

In Spring 2022, the Heights Christian Church campus at 1703 Heights Boulevard, Houston, TX, was placed on the market for sale. The historic property consisted of a church sanctuary (Sängerhalle), education building, and Lambert Hall, the 95-year-old church converted into a performing arts venue that is on the National Register of Historic Places. It had a storied history of providing space for the local arts community, from opera and dance to the visual arts. Opera in the Heights, a long-time tenant of Heights Christian Church, had been operating full-time in Lambert Hall.

Following a community town-hall for interested parties in the future of the Heights Christian Church property, Opera in the Heights, Houston Saengerbund, Heights Rotary, and ROCO, along with the support of individual community members, identified their common interest in the purchase of the property to serve as a home for their organizations and a center for musical arts. The consortium purchased the property in September 2022 and shortly thereafter, the Houston Center for Musical Arts (HCMA) not-for-profit organization was founded to steward the vision and restoration.

AMS Planning & Research was engaged by the HCMA Board of Directors to assess the opportunity with support from a team of professional consultants: Wilson Butler Architects, The Shalleck Collaborative (theater planner), Threshold Acoustics, Collaborative Engineering, and Venue (cost consultant).

Study Methodology

Market Assessment. To assess user needs, AMS deployed two online surveys to potential users. AMS also undertook an environmental scan to understand the regional market for the arts and entertainment and documented market growth and changing demographics. Furthermore, AMS identified five national organizations to exemplify activity, operating, and governance scenarios for HCMA.

Facility Assessment. To understand the site and facility potential for expansion and improvement, the consultant team completed in-depth site visits, investigated site and facility plans and documentation, existing conditions, and major systems' lifecycles.

Focused Conversations. To obtain detailed input from Opera in the Heights, Houston Saengerbund, Heights Rotary, and ROCO, AMS and the consultant team held confidential interviews and in-person meetings to define the opportunity and facility recommendations.

These data have informed the resulting analyses, synthesis, and recommendations.

Success Defined

Based on interviews with the Board of Directors and local arts and culture leaders in Houston, the following vision for HCMA took shape and guided the study. Success for HCMA is defined as:

Thriving musical arts in Houston. HCMA would stimulate the culture of concert going in Houston, be affordable to small-budget organizations, and spark collaboration among its users/tenants.

Community hub and home. HCMA would be a hive of varied mix-used activity, a vibrant asset for the community, and full-time home for Opera in the Heights, Houston Saengerbund, and Heights Rotary.

New audiences and entry points. HCMA would foster the cross-pollination of audiences from all users/tenants, provide an upgraded audience experience, and be an entry point for the next generation of audiences.

Preserved and restored buildings. HCMA would propose a design solution that preserves Lambert Hall and the sanctuary and welcomes the community in.

Efficient, well-run, and sustainable organization. HCMA would have an operating model that ensures long-term viability.

Marketplace

Situated in the Greater Heights, within the Inner Loop of the City of Houston, HCMA is in a distinct marketplace.

Since 2000, there has been a notable transition in population in the Greater Heights from a Hispanic majority to that of Non-Hispanic White, paralleling shifts visible in the Inner Loop, while citywide the Hispanic population has grown its plurality from 37% to 45%. As the neighborhood has experienced this marked shift in demographics, so too has there been a rise in education level (% of population with a bachelor's or higher).

Median household income has also nearly tripled, notably out of step with citywide income growth that has been more modest. Over half of Greater Heights residents have earnings of above $100,000 and a parallel rise in home values has more than tripled Greater Heights residents' wealth. The share of households with children has remained constant (from 24% in 2010 to 23% in 2021) in the Greater Heights as the share has declined across the Inner Loop (from 26% in 2010 to 21% in 2021).

When it comes to the landscape of existing venues for performance and entertainment in the Inner Loop, venues are clustered notably around Downtown Houston and the south-west quadrant, leaving gaps in the northern and eastern neighborhoods. A number of active churches fall within the existing venue landscape, 22 of which were named as current performance venues by surveyed potential users.

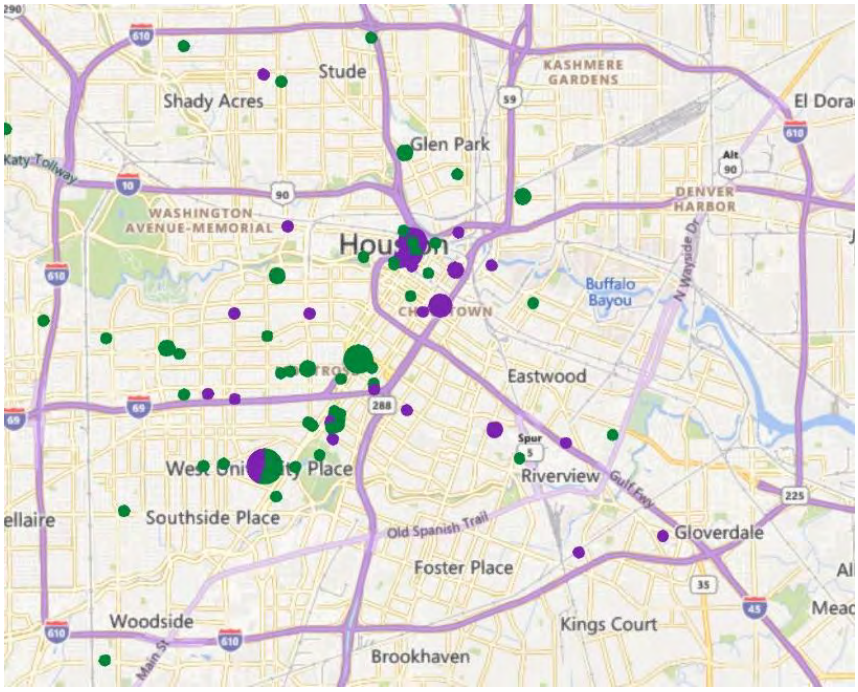


FIGURE 1: GREATER HOUSTON PERFORMANCE VENUE INVENTORY

Support for the music industry is growing state and city wide, as the public sector has created initiatives to drive music industry impact. In 2017 the Texas Music Office published the 2017 Economic Impact of Music in Texas and in 2022 the City of Houston established its first Houston Music Advisory Board. There will be opportunity to align with their three areas of focus: history and preservation, education, and collaboration.

Users

Potential user survey respondents (n=30) all expressed interest in using HCMA, with 73% being very or somewhat likely to use a new facility for their activities. They are small to mid-sized chamber music organizations that currently perform across 65 different area venues. 53% of respondents currently pay rent for their performance or rehearsal spaces.

Affordability and availability are key priorities for potential users of HCMA. In terms of space, performance spaces dedicated to chamber music and rehearsal spaces are in most demand, with respondents estimating 311 use days and 430 use days respectively. When broken down between performance use (which includes performance-related rehearsals and tech use) and non-performance use (which includes regular rehearsals as well as classes and meetings), the demand for HCMA

among potential user survey respondents is strong, as illustrated below. Detailed survey results can be found in Appendix A.

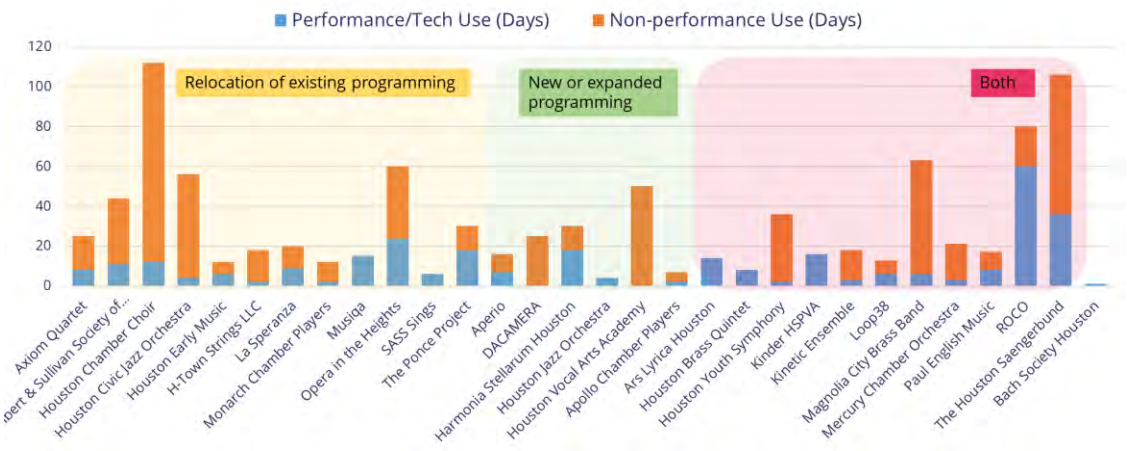
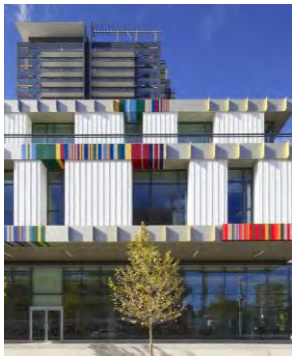


FIG. 2: PROJECTED USE DAYS FOR PERFORMANCE AND NON-PERFORMANCE USE

Exemplars

The following exemplars were identified, studied, and discussed to illustrate activity, operating, and governance opportunities for HCMA. Complete details can be found in Appendix B.

Daniels Spectrum, Toronto, ON (Canada)



Owner: Regent Park Arts Non-Profit Development Corporation
Operator: Artscape Toronto
Opened: 2012

Daniels Spectrum is a community cultural hub in Toronto's Regent Park neighborhood. It is home to many outstanding arts-based and community-focused organizations and contains several events, performance, and exhibition spaces that host tens of thousands of visitors and hundreds of arts and cultural events each year.

National Sawdust, Brooklyn, NY

Owner/Operator: National Sawdust
Opened: 2015

National Sawdust is a non-profit performing arts organization and music venue in the heart of Williamsburg, Brooklyn. National Sawdust's mission is rooted in music discovery that is open, inclusive, and based in active mentorship of emerging artists, while building new audiences and communities of music devotees. National Sawdust engages artists in an ecosystem of incubation to dissemination, programming groundbreaking new music in the state-of-the-art Williamsburg venue, and developing and touring new, collaborative music-driven projects.

Riverside Revival, Nashville, TN

Owner/Operator: The Boedecker Foundation
Opened: 2020

Riverside Revival is an event space with excellent sound, on-site parking, natural light, and exquisite interiors located in the heart of East Nashville. The space was previously a church and has been restored as a state-of-the-art venue for concerts, weddings, corporate functions, and other private events. It is part of the Boedecker Foundation Collaborative Campus, which provides meeting and office space for nonprofit organizations as they advance their missions and serve the community.

Epiphany Center for the Arts, Chicago, IL

Owner: Private Individuals
Operator: Epiphany Center for the Arts
Opened: 2020

The historic Church of the Epiphany has been preserved and adapted into an iconic cultural hub 'For the Good of Art, Entertainment and Events'. This campus boasts three distinct venues and an array of amenities, including art studios, classroom, exhibit space and gallery, a commercial and catering kitchen, café, VIP suite and outdoor spaces, a quarter-acre courtyard, a spacious terrace and

patio. With its mission "to instill an artistic, cultural experience in all patrons who cross our threshold with the hope that each will be inspired to realize their own Epiphany", Epiphany's diverse and inclusive arts programming serves to unite community and artists alike while 'Bringing Chicago Together'.

Mr. Smalls, Pittsburgh, PA

Owner: Private Individuals
Operator: Mr. Smalls
Opened: 2002

Mr. Smalls is a live-music venue in the Millvale neighborhood of Pittsburgh, Pennsylvania. It was converted from an 18th-century Catholic church. It has multiple interior event spaces (including four stages, a recording studio, multiple bars, and a restaurant). It has hosted thousands of national, regional, and local artists since its inception as a venue. Mr. Smalls has a not-for-profit arm, Creative.Life.Support, which provides learning, artist career development, and professional opportunities for Pittsburgh area youth.

Guiding Principles

Based on HCMA's definition of success, market findings and needs, and learnings from the exemplars, the following assertions were made to guide the development of the operating and business plan as well as the facility recommendation:

- Not-for-profit business model driven by earned revenue and some subsidy for below-market rental rates with a strong visible brand distinct from users and user-generated activity
- Prioritized access to small and mid-sized chamber music organizations, with some community and private rentals, and focus on serving the entire Houston area
- Spaces for chamber music with excellent acoustics and standard artist support (performance and rehearsal spaces)
- Mixed-use spaces to allow for greater levels of flexibility in participation and audience experience
- Improved audience amenities (expanded lobby space, gathering space, and outdoor space) with physical accessibility a priority

Operations and Business Plan

Activity

In the baseline model for HCMA, 242 activity days are included in Sängerhalle (sanctuary), 196 activity days are included in Lambert Hall, and 205 activity days are included in the Rehearsal Hall. These modeled days meet the performance and regular rehearsal needs for Opera in the Heights, Houston Saengerbund, Heights Rotary, and ROCO, and include estimated use by the small to mid-sized local chamber music organizations deemed most likely to use the facility based upon their survey responses. Rehearsals for large ensembles are included in the activity days for Sängerhalle which best accommodates those acoustic needs. Sixty days of not-for-profit community rentals above and beyond the use of surveyed potential users have been modeled into Lambert Halls activity days. Additionally, 12 weekend days of private event rentals have been modeled into the rehearsal hall activity. A full calendar of events across the three spaces for the base year of operations can be found in Appendix C.

Summary Financial Results from Operations

Based on the proposed activity model, it is anticipated that HCMA will have an operating budget of $930,000 (including 5% contingency) in its base year of operations. Earned revenues in the base scenario total $630,000. The presumed operating 'gap' of $300,000 would be funded through philanthropic avenues to be defined. This allows for subsidized rental rates for not-for-profit organizations.

HCMA SCHEDULE 2: SUMMARY BASE PRO FORMA	
Earned Revenues	**Base Year**
Facility Rentals	$543,300
Chargebacks	$33,000
Ancillary	$51,500
Subtotal, Earned Revenues	*$627,800*
Contributed Revenues	
Contributed Revenue or Income from Endowment TBD	$300,000
Subtotal, Contributed Revenues	*$300,000*
TOTAL OPERATING REVENUES	**$927,800**
Operating Expenses	
Personnel	$407,000
Overhead	$81,700
Operations & Occupancy	$390,600
Subtotal, Operating Expenses	*$879,300*
Expense Contingency (5%)	$44,000
TOTAL OPERATING EXPENSES	**$923,300**
TOTAL ANNUAL RESULT	**$4,500**

Revenues

Revenues from operations come from facility rentals; annual leases for Houston Saengerbund, Opera in the Heights, and Heights Rotary; ancillary revenue such as ticketing fees and concessions sales; and additional service charges to rental clients. Contributed revenue is reflected in the model. The means by which funds are raised are to be further defined and may include income from an endowment raised as part of the capital campaign.

Facility Rentals

Rental activity falls within two broad categories: not-for-profit use and private use. Based on the rental rates at comparable venues such as MATCH, Asia Society Texas Center (Brown Foundation Performing Arts Theater), and Holocaust Museum Houston (Albert and Ethel Herzstein Theater), the following rental rates were modeled for HCMA:

Sängerhalle (not-for-profit)		
Performance/Public Event	1/2 day (4-hour)	1 day (8-hour)
Monday-Thursday	$505	$1,0010
Friday-Sunday	$619	$1,240
Rehearsal	1/2 day (4-hour)	1 day (8-hour)
Monday-Thursday	$392	$790
Friday-Sunday	$506	$1,020

Lambert Hall (not-for-profit)		
Performance/Public Event	1/2 day (4-hour)	1 day (8-hour)
Monday-Thursday	$594	$1,190
Friday-Sunday	$728	$1,460
Rehearsal	1/2 day (4-hour)	1 day (8-hour)
Monday-Thursday	$461	$930
Friday-Sunday	$595	$1,200

Rehearsal Hall (not-for-profit)		
Performance/Public Event	1/2 day (4-hour)	1 day (8-hour)
Monday-Thursday	$145	$290
Friday-Sunday	$175	$350

Rehearsal Hall (private)		
Performance/Public Event	1/2 day (4-hour)	1 day (8-hour)
Monday-Thursday	N/A	$1,700
Friday-Sunday	N/A	$2,400

Annual Leases

Annual leases will be negotiated on a case-by-case basis with the resident organizations, projected as Opera in the Heights, Houston Saengerbund, and Heights Rotary. Annual leases account for needed office space, regular gathering space and rehearsals, and storage space, for example. Those with annual leases who also hold performances at HCMA are expected to incur rental rates for performance-related activity. Annual leases are modeled at $80,000 total for the three organizations.

Rental Chargebacks

The rental chargebacks for performance-related staffing (box office, custodial, event set-up and equipment rental) are charged to renters.

Ancillary Revenue

This model reflects a conservative approach to in-house concessions for events. Estimated concessions sales are based on a per capita sale rate of $7.00 per attendee, with a 35% capture rate and 20% cost of goods sold.

Contributed Revenue

Philanthropy is expected at the level of $300,000 annually. There are many options

available to do so – from government grants and special events to endowment distributions. How HCMA chooses to define the contributed revenue sources will be explored at a future date.

Expenses

Operating expenses are organized into three categories: personnel, overhead, and occupancy. As with any new venture, there will be some expenses which cannot be foreseen. A 5% contingency is modeled into the summary details to account for these eventualities at this stage in planning.

Personnel Expenses

Personnel needs for the modeled level of activity is 4.5 full-time equivalent employees: Director, Administrative Assistant, Booking Coordinator, Production Manager, and Grants Writer (part-time role). Compensation is modeled after publicly available salary bands for comparable positions in the local market and 25% allocation for benefits & taxes.

Overhead

Administrative overhead (office supplies/equipment, telephone/internet, professional fees/accounting, and credit card fees) is modeled based on number of staff.

Occupancy

Occupancy costs include utilities, cleaning and routine maintenance/grounds upkeep, insurance, non-event security, and non-capital annual maintenance and repairs. These occupancy costs are modeled after the median SqFt costs (2022) from nearly 50 performing arts facilities across the United States. The model does not include an expense item for depreciation or capital repair and replacement.

The complete pro forma can be found in Appendix D.

Facility Solution

Based upon all inputs to date, a solution was proposed to unify the campus and significantly improve both artist and patron experience by replacing the existing education building, extensively renovating Lambert Hall, and investing in acoustical and artistic accommodations of the sanctuary.

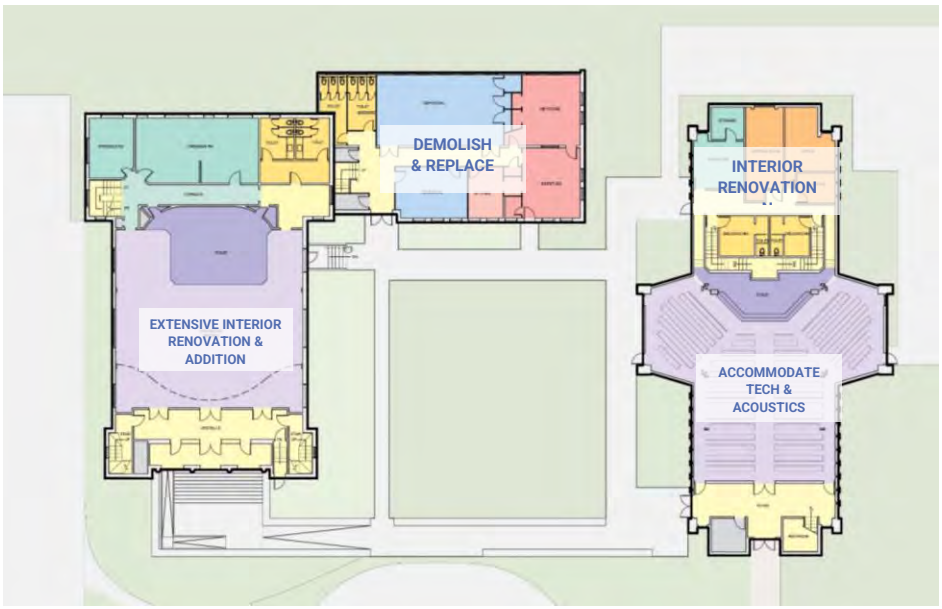


FIG. 3: RECOMMENDED FACILITY SOLUTION FOR HCMA

Building Program

Based on the developed activity profile, a building program was developed by the Shalleck Collaborative, experts in the planning and design of theaters. The Shalleck Collaborative recommends a 25,217 net square foot facility with two performance spaces equipped with patron amenities, front-of house and back-of-house support, and technical areas, as well as other facilities which include rehearsal facilities, warm-up rooms, storage space, catering pantry, administrative spaces, and a donor lounge. The full building program as well as room diagrams can be found in Appendix E.

Acoustic Narrative

Reflecting preliminary interpretations of the building program and an assessment of existing conditions, an acoustic narrative developed by Threshold Acoustics describes the design criteria for architectural acoustics for the performance hall, as well as the audience, rehearsal, and technical spaces. The acoustic narrative can be found in Appendix F.

Architectural Concept

Wilson Butler Architects, with their building type expertise in architecture for arts and entertainment, completed a preliminary organization of program space needs to support the vision for HCMA. The resulting drawings and documents that

include general information relating to systems and construction components can be found in Appendix G. A further assessment of the current conditions for mechanical, electrical, and plumbing systems was completed by Engineering Collaborative and can be found in Appendix H. Both were used to assign the construction values used in determining the preliminary construction cost.

Capital Cost Information

The narratives and concept design were the basis for an order-of-magnitude cost estimate for the renovation completed by Venue, cost consultants specializing in arts and culture facilities. With a 10% design/pricing allowance and escalation to July 2025, the estimated total bid cost for the renovation and expansion of HCMA is $43.5 million. With an overall 40,685 gross square feet, the bid comes in at $1,071/gsf. The full cost estimate can be found in Appendix I.

It is important to note that the cost estimate solely accounts for construction costs. Soft costs (30% of construction costs) and owner costs (20% of construction costs) should be planned for in addition. A parking solution, purchase of the land, and endowment fund would be considered as further additions.

Conclusion

The feasibility of renovating the Heights Christian Church campus into a center for the musical arts in Houston, while providing a permanent home for key community organizations, is strongly supported by the findings of this study. HCMA leadership is poised to materialize their vision, serving the community and strengthening the fabric of small to mid-sized chamber music organizations in Houston.

Appendices

Appendix A Potential User Survey

Appendix B Exemplar Research

Appendix C Activity Calendar

Appendix D Pro Forma

Appendix E Building Program & Production Systems Engineering Report

Appendix F Acoustical Narrative

Appendix G Architectural Concept

Appendix H Mechanical, Electrical, and Plumbing

Appendix I Cost Estimate

APPENDIX A

Potential User Survey Analysis

POTENTIAL USER SURVEY

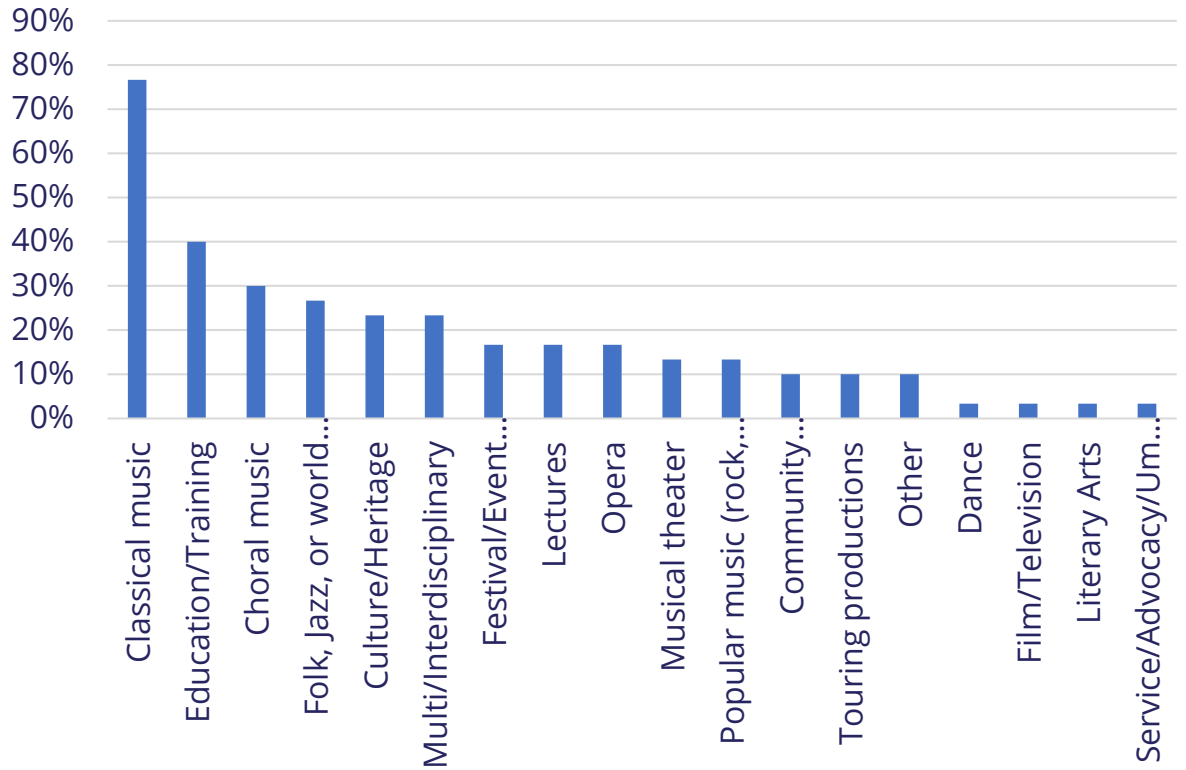
30 Respondents: All note interest in use

Small to mid-sized classical music organizations perform in 65 area venues

Annual Budget	# Respondents	
$0	4	***50%*** *< $100k*
$1 - $44,999	6	
$50,000 - $100,000	5	
$100,000 - $249,999	4	***50%*** *> $100k*
$250,000 - $499,999	4	
$500,000 - $999,999	4	
$1,000,000+	3	

- *65 facilities used, 19 being churches*
- *11 respondents perform at MATCH*
- *53% rent performance or rehearsal space*
- *The median rental cost per event is $2,500*
- *73% very/somewhat likely to use a new facility that offered space and availability for their activities*

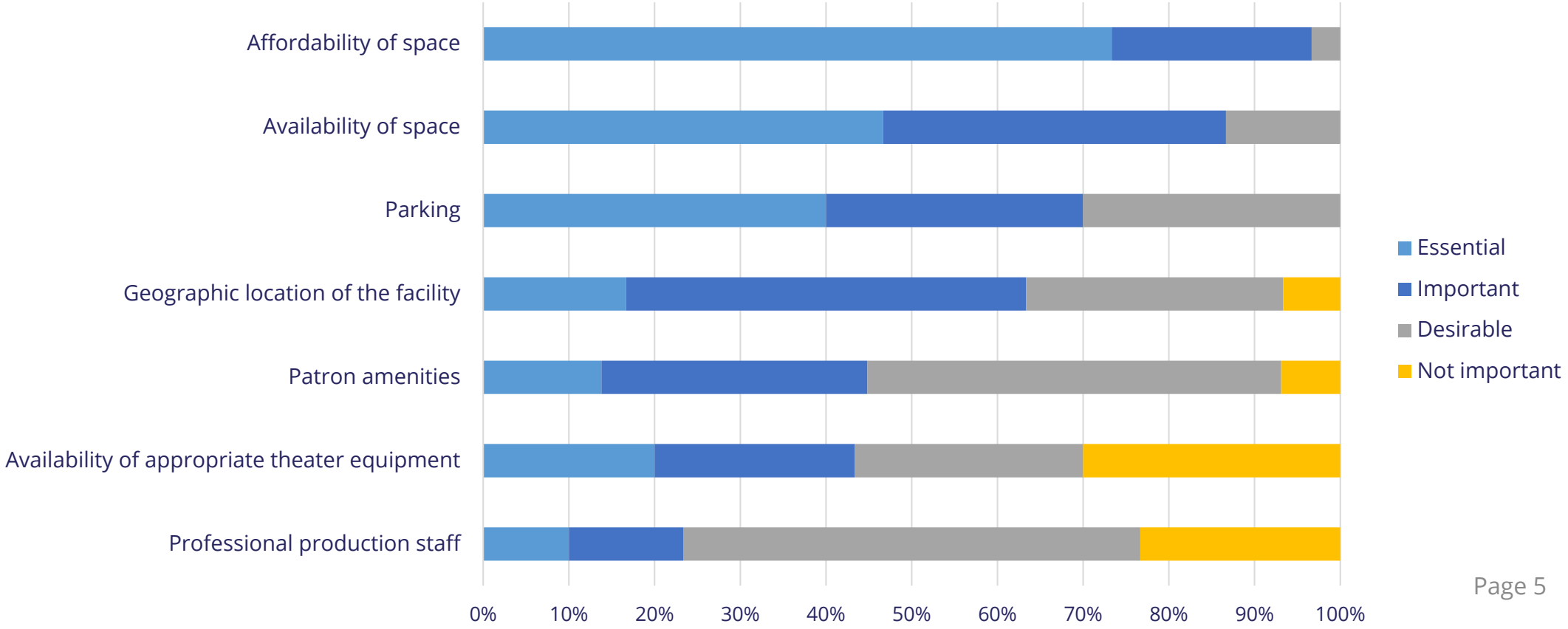
Which of the following best describes your organization's programming/activity? (Check all that apply)



Potential Users: Why choose a new facility?

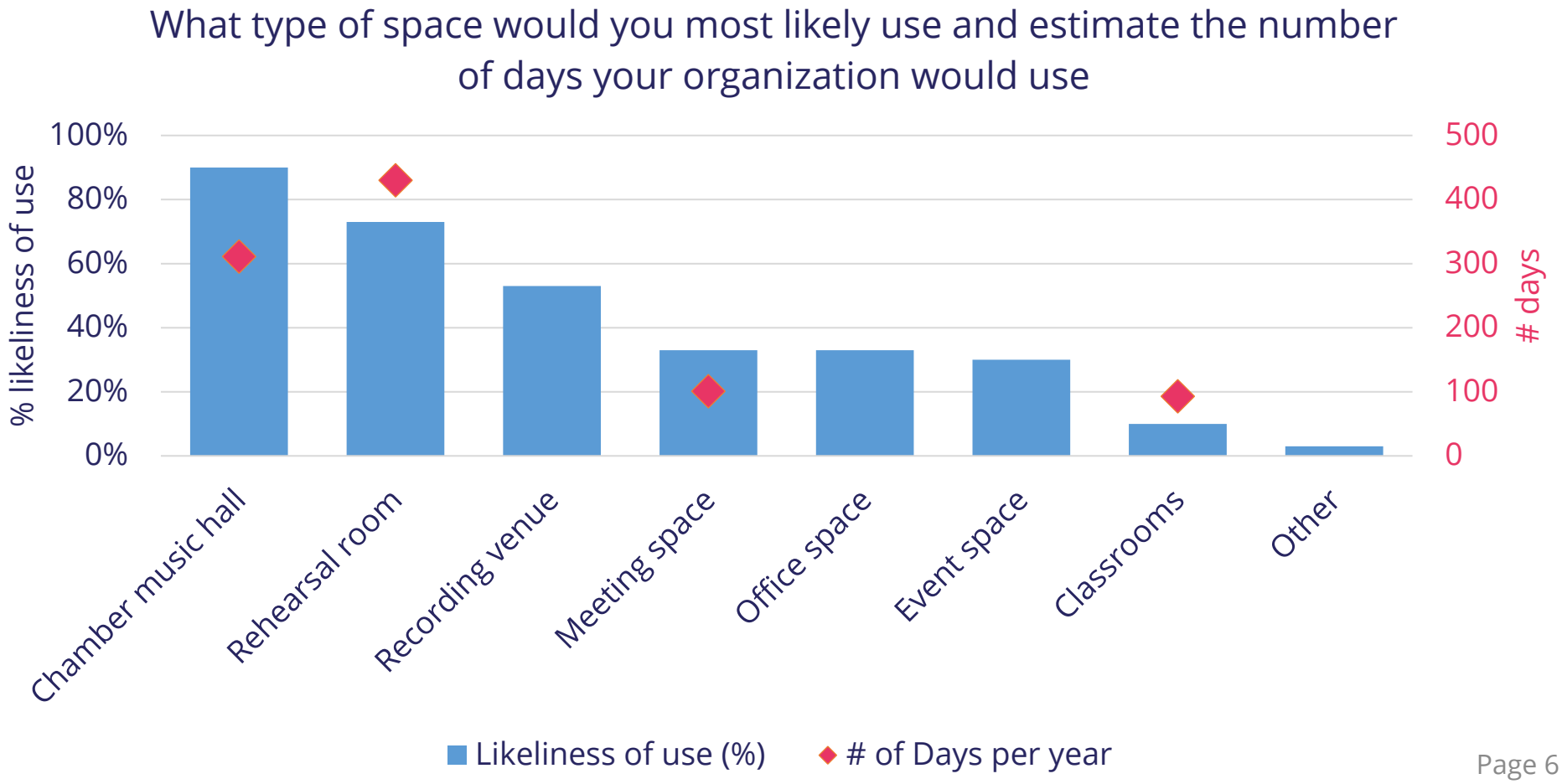
Affordability and availability are necessities to capitalize on interest

How "essential, important, desirable, or not important" would the following specific factors be in choosing a new facility?



Potential Users: What spaces will they use and how often?

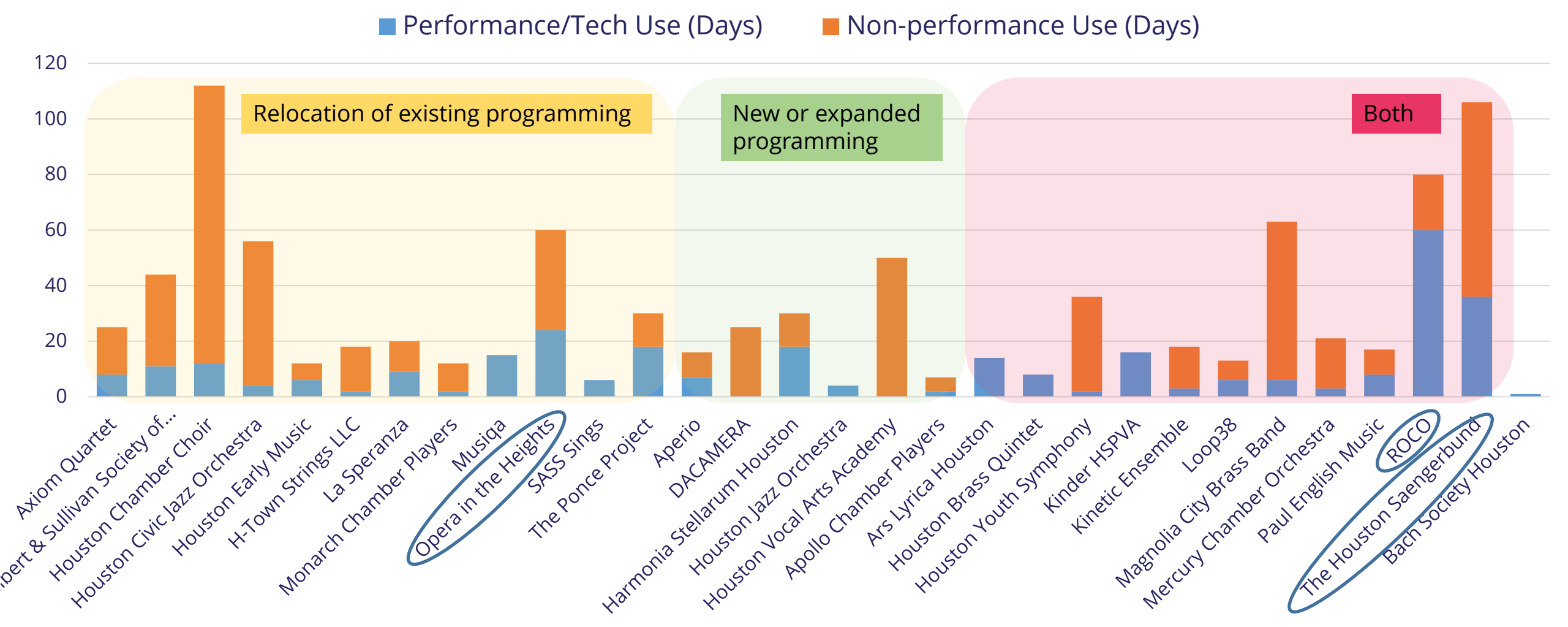
Chamber music hall, rehearsal rooms, and recording venues would be most used



POTENTIAL USER SURVEY

Utilization: What is annual demand?

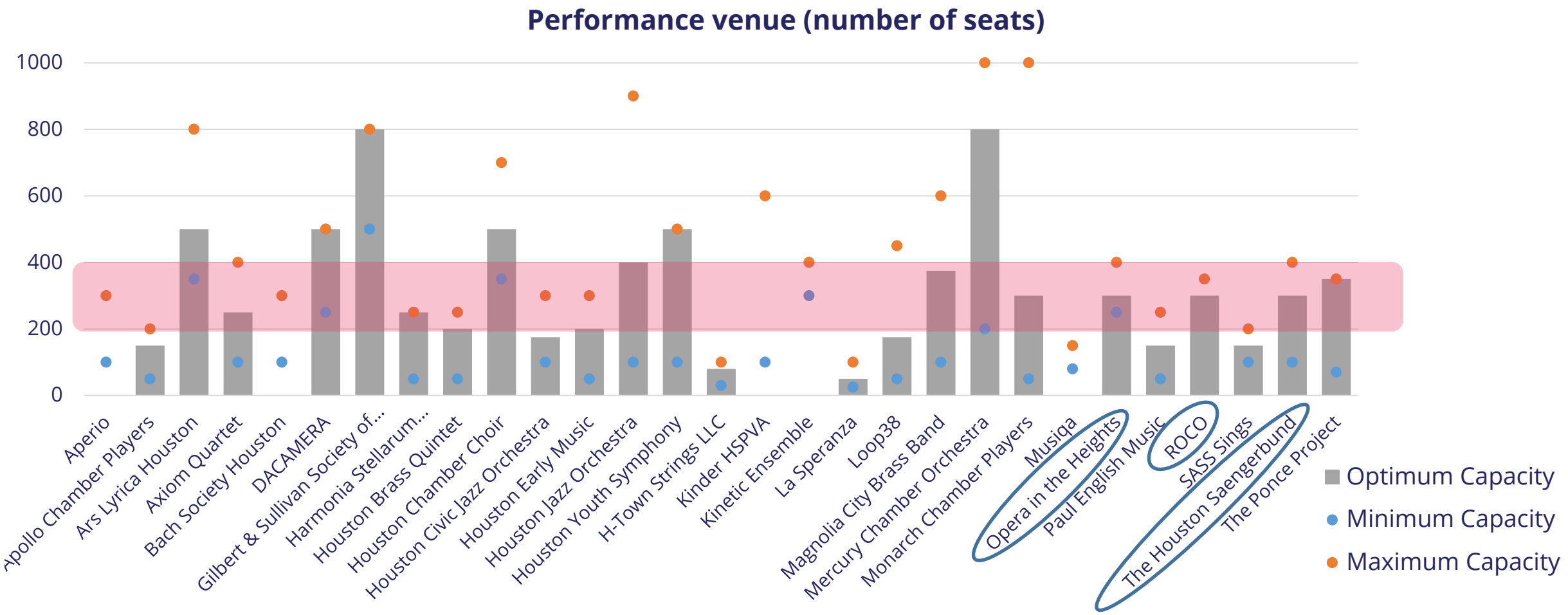
Significant non-performance use driven by regular rehearsal days



POTENTIAL USER SURVEY

Performance Venue: What is the desired capacity?

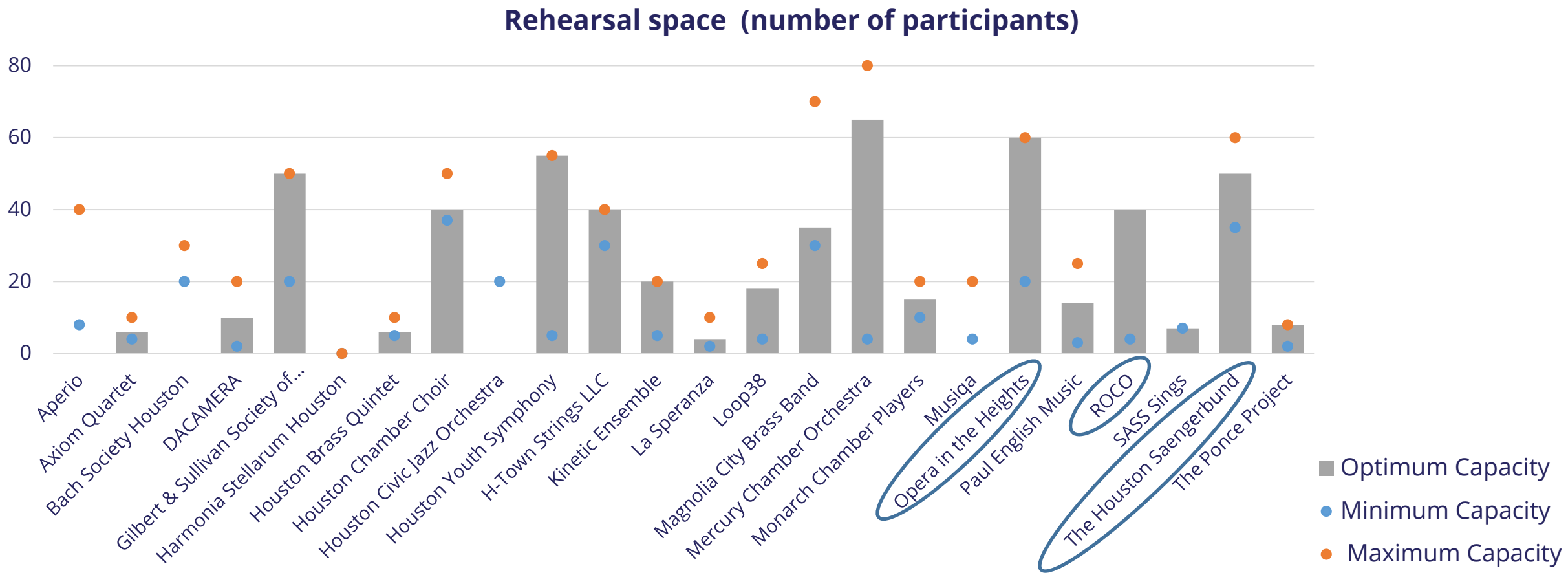
Preliminary responses suggest a preferred capacity between 200 - 400



POTENTIAL USER SURVEY

Rehearsal Space: What is the desired capacity?

Variously sized rehearsal rooms desired for 5 to over 50 participants

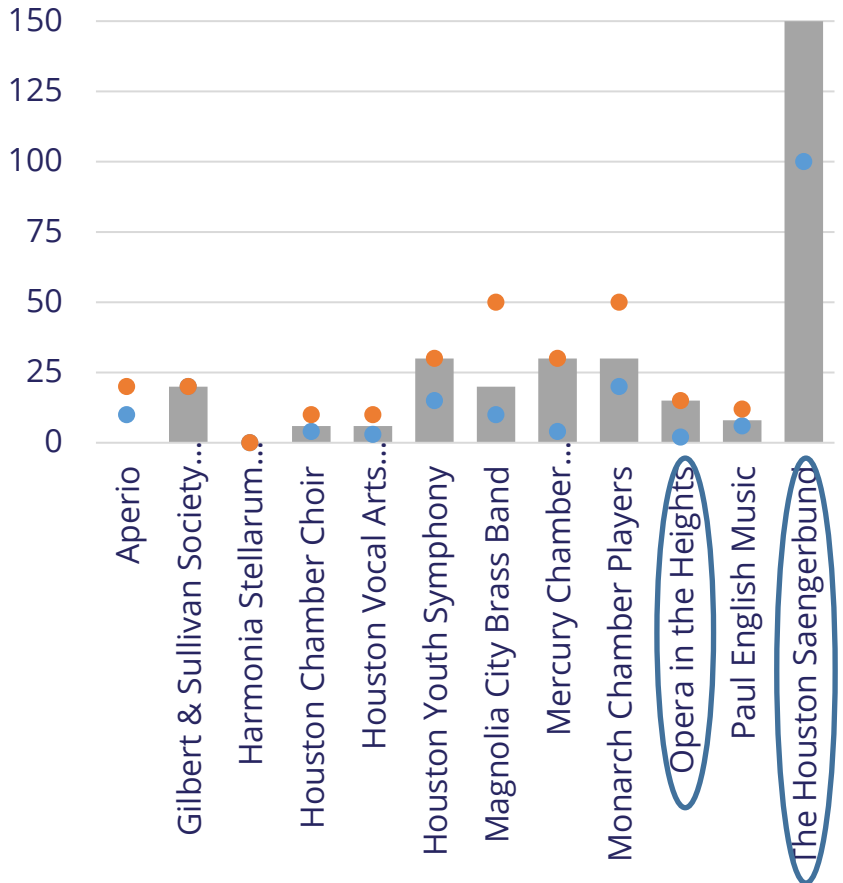


POTENTIAL USER SURVEY

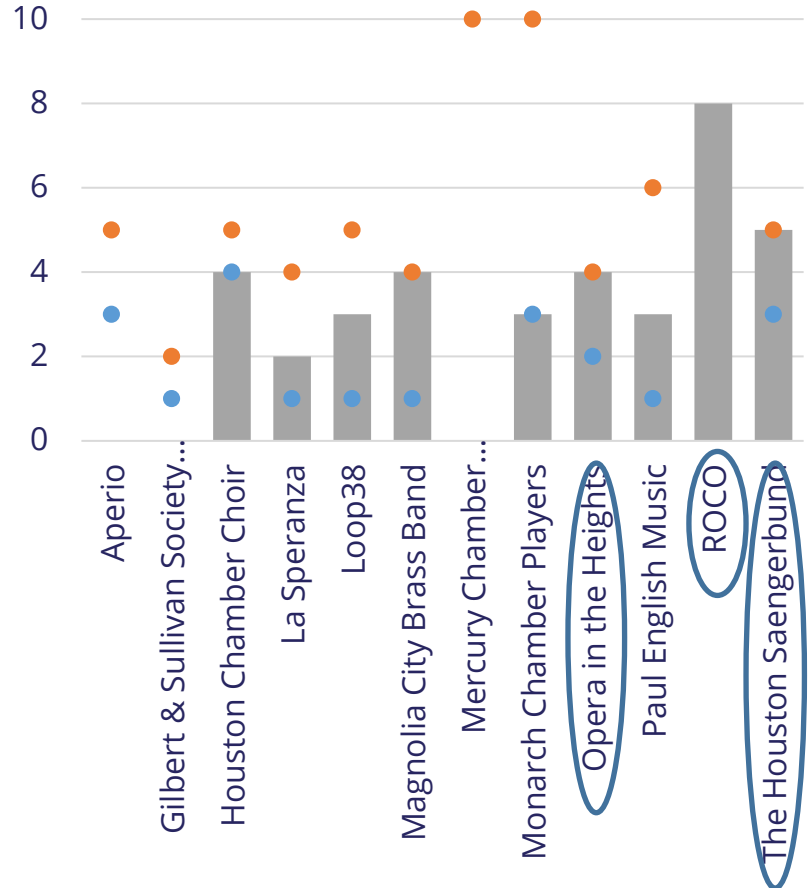
Ancillary Spaces: What is the desired capacity?

There is notable interest in ancillary spaces

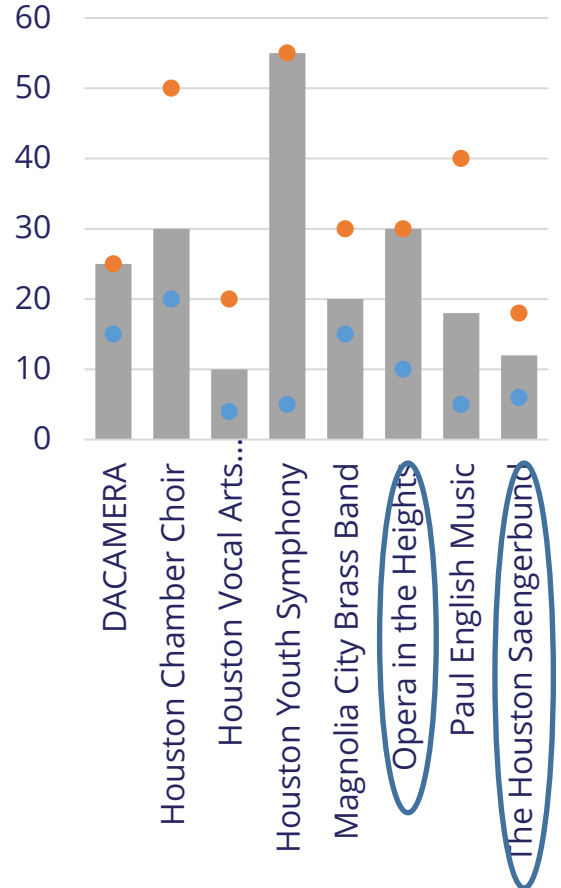
Meeting space (number of participants)



Office space (number of employees)



Classroom (number of students)



User Survey (Round 2)

What is the size of your ensemble?

Avg Instrumentalists (Max = 30) ; Avg Vocal (Max = 35)

	Instrumentalists			Vocal		
	Min	Max	Avg	Min	Max	Avg
Kinetic Ensemble	4	16	16			
Kinder High School for the Performing and Visual	20	85	30	15	70	35
Houston Chamber Choir	0	16	3	24	26	24
Musiqa	1	20	6			
La Speranza	2	6	4			
Axium Quartet	4	4	4			
Harmonia Stellarum Houston	2	12		1	16	
DACAMERA	2	8	4			
H-Town Strings	20	35	25			
Ars Lyrica Houston	1	30	20	1	40	4
Houston Vocal Arts Academy						20
APERIO	1	35	8	1	3	1
SASS	4	5	4	3	3	3
Mercury Chamber Orchestra	1	65	20	4	40	20
Loop38	1	20	5	0		
Bach Society Houston	2	20		12	16	
Paul English Musi	1	18	5	0	24	4

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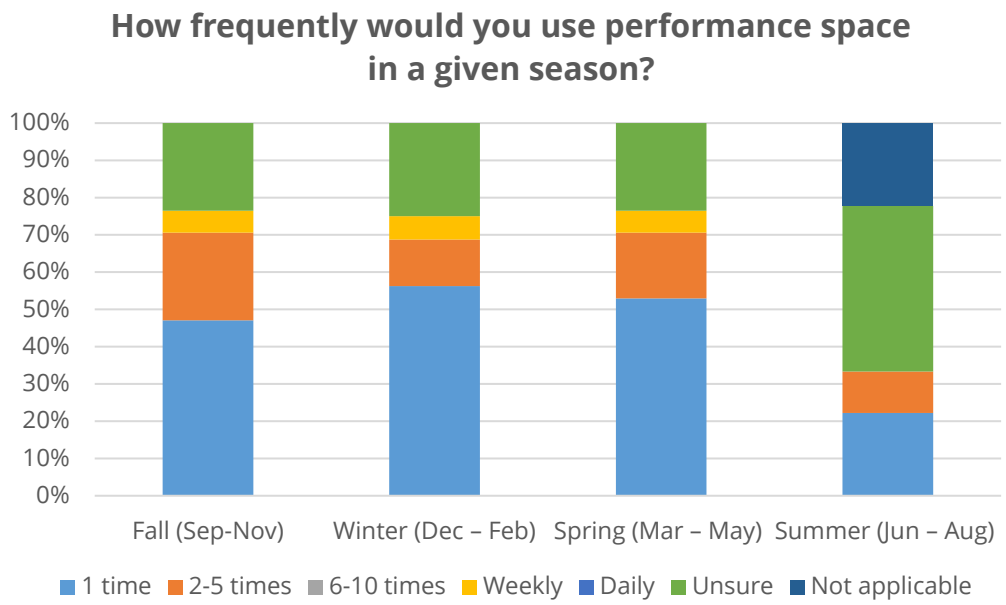
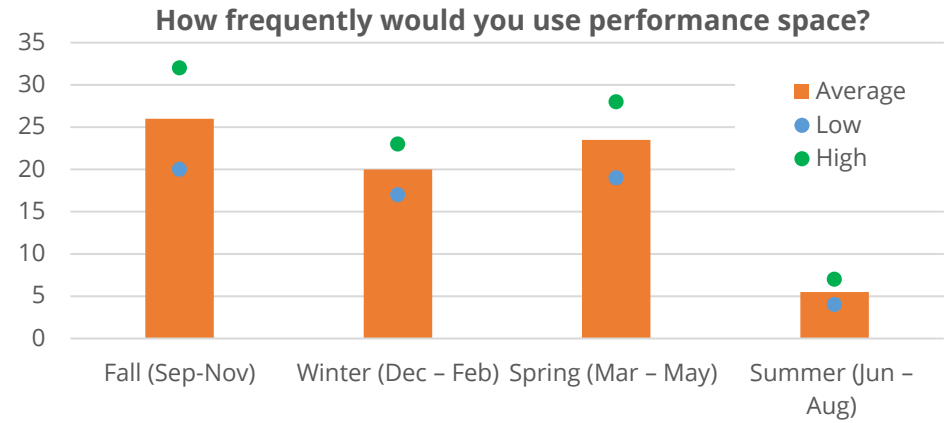
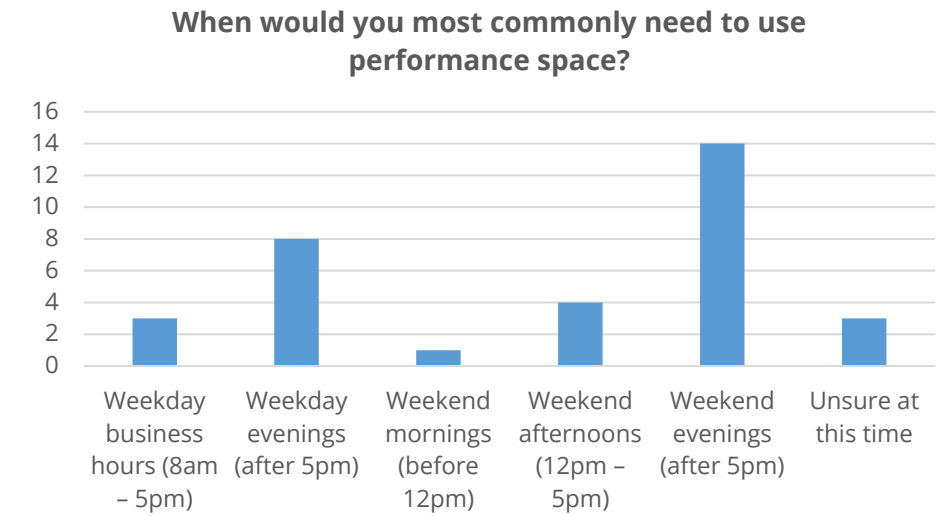
Seasonal performance use: 1 time/season is most common

Most performance demand is in fall and spring on weekend evenings







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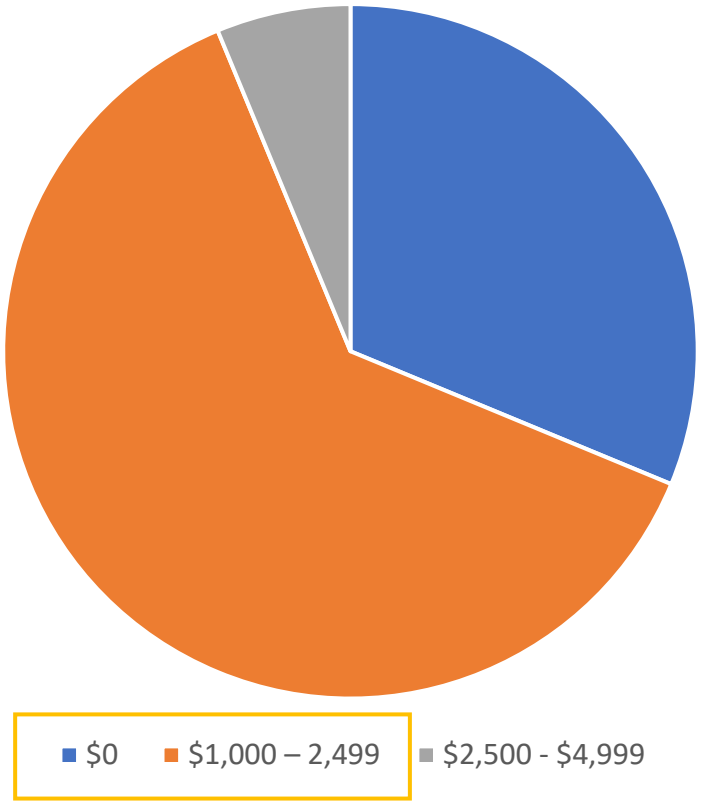
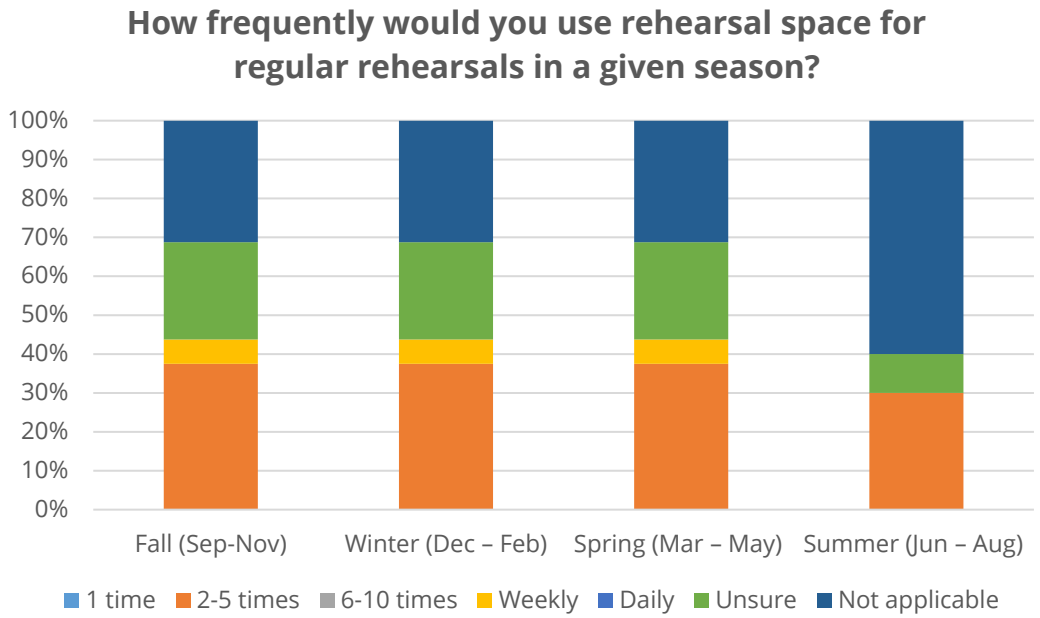
What rental cost would you be willing to pay per performance?

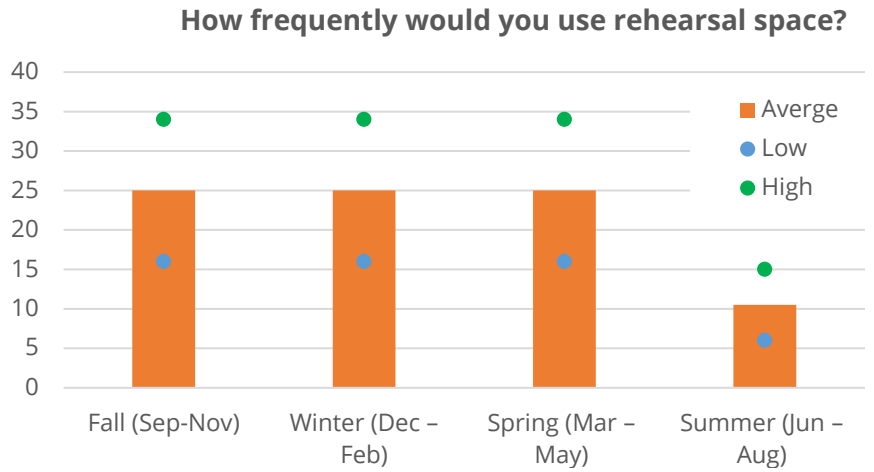
Performance engagements are on average 2 – 3 days

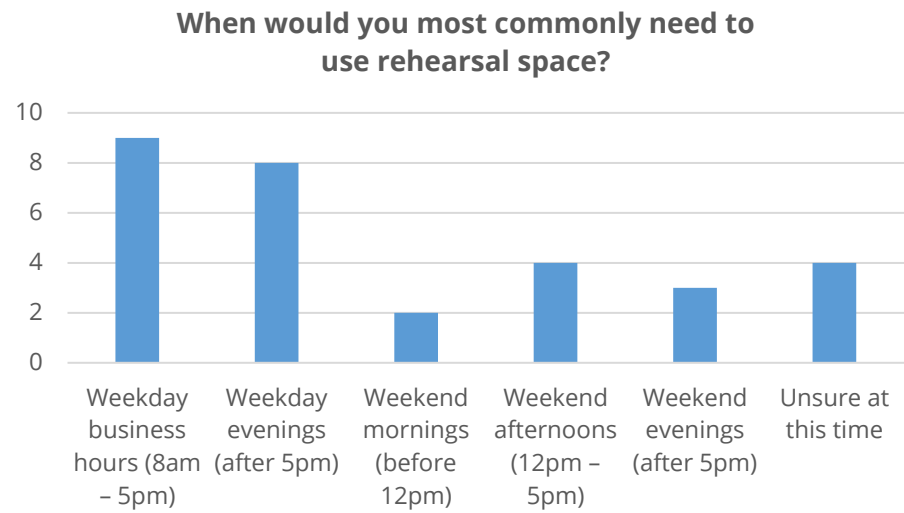


Seasonal rehearsal use: 2-5 times/season is most common

Rehearsal demand is consistent fall, winter, and spring, on weekdays



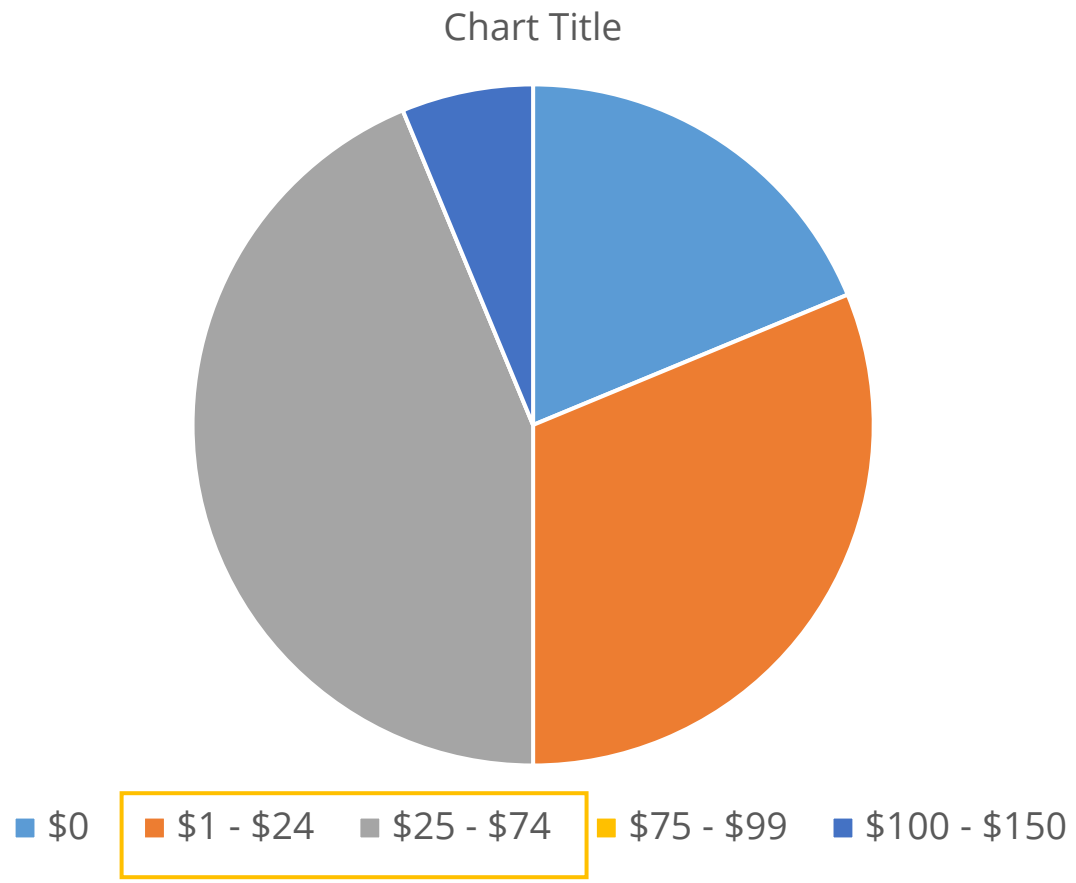




AMS PLANNING & RESEARCH

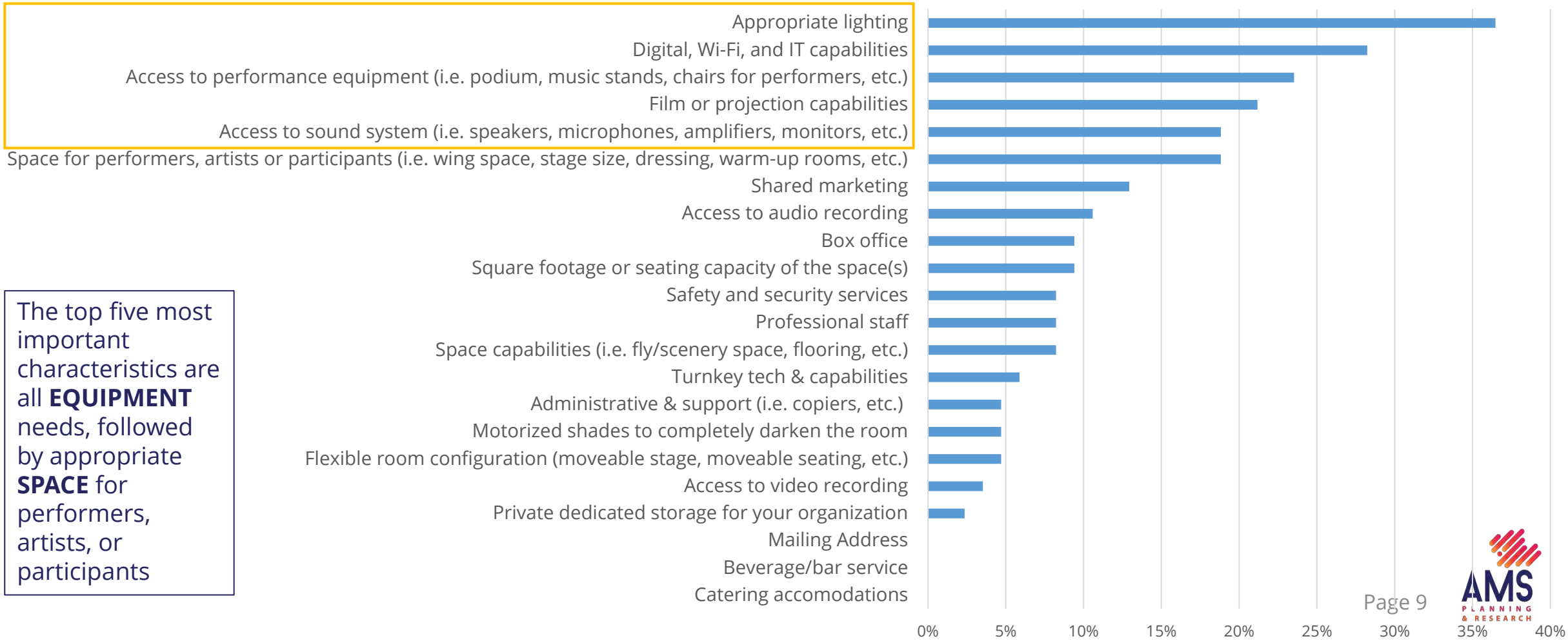
What rental cost would you be willing to pay per rehearsal hour?

Rehearsals are on average 2 – 3 hours



Of the Space, Equipment, and Available Services Rated Important…

… please rank the top five most important characteristics



The top five most important characteristics are all **EQUIPMENT** needs, followed by appropriate **SPACE** for performers, artists, or participants

APPENDIX B

COMPARABLES

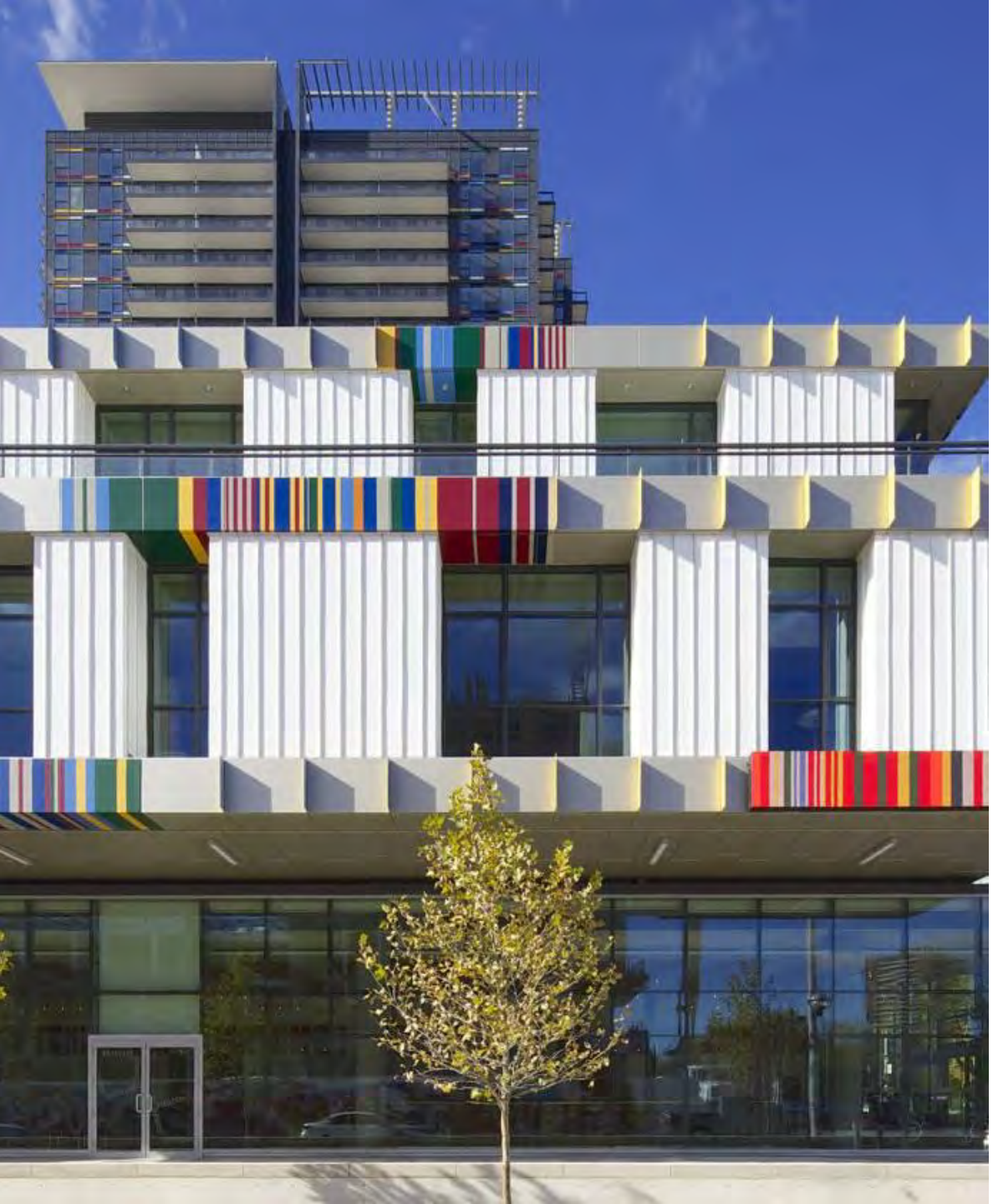
Five case studies selected for research

COMPARABLES

Summary of comparable organizations

Comps have a range of structures, assets, and objectives

Facility name	*Location*	# of venues (cap.)	Year opened	Operator	Good to know
Daniels Spectrum	*Toronto, ON*	Ada Slaight Hall (up to 600) Artscape Lounge (up to 175) Courtyard (4K-sq. ft.)	2012 (new build)	Artscape (NFP)	10+ resident organizations program and rent out space at-risk. A Community Manager ensures cohesion across primary users.
National Sawdust	*Brooklyn, NY*	Main Hall (up to 320) Wine Bar (up to 50)	2015 (a preserved century-old sawdust factory)	National Sawdust (NFP)	Artist co-founded by Paola Prestini, Composer. Acoustic partnership with Meyer Sound – Constellation system
Riverside Revival	*Nashville, TN*	Main Hall (up to 360) Larger surrounding campus	2020 (a former 1951 church)	The Boedecker Foundation (NFP)	A foundation directly operates the campus-based venue. The campus is home to a dozen nonprofit tenants.
Epiphany Center for the Arts	*Chicago, IL*	Epiphany Hall (up to 1050) The Sanctuary The Catacombs	2020 (a former 1885 Episcopal church)	Individuals (commercial)	It engaged a new leader with local art leadership experience and impacts: an artist-in-residence and artistic director.
Mr. Smalls	*Pittsburgh, PA*	The Theatre (up to 800) The Funhouse (up to 175) Mr. Smalls Café The Sanctuary (up to 400) The Recording Studio	2002 (a former 18th-century Catholic church)	Mr. Smalls (commercial)	It has a non-profit arm that provides learning, artist career development, and professional opportunities through a fiscal sponsorship.



COMPARABLES

Daniels Spectrum

Daniels Spectrum is a community cultural hub in Toronto's Regent Park neighborhood. It is home to many outstanding arts-based and community-focused organizations and contains several events, performance, and exhibition spaces that host tens of thousands of visitors and hundreds of arts and cultural events each year.

Snapshot	
Location	Toronto, ON
Population	2,794,356
Owner	Regent Park Arts Non-Profit Development Corporation
Operator	Artscape Toronto
Year Opened	2012
Square Footage	60,000 sf
Project Cost	$25 million

CASE STUDY

Daniels Spectrum: Venues & Activity

Ada Slaight Hall

- This ground-floor 5,834-square-foot performance and events hall features a 300-seat retractable bleacher system and retractable partition walls for maximum flexibility of setups and capacities.
- It has a flexible capacity of Theatre (425), Banquet (400), Classroom (250), and Reception Programming (600).
- It is equipped with a complete sound and theatrical lighting system.

Artscape Lounge

- With a capacity of Reception (175) and Theatre (125), this 2,048-square-foot space is located at the main entrance of the building.
- The bright and colorful space functions as the “living room” of the building and can host performances, meetings, and receptions, and may also act as a spillover space for events in Ada Slaight Hall.

Courtyard

- This 4,000-square-foot outdoor courtyard features a raised wooden stage and can host a range of events, acting as its own independent programming space or as a spillover space for events inside the hall.
- It also functions as a casual community gathering space. The Courtyard is capable of supporting sound and lighting systems.

CASE STUDY

Daniels Spectrum: Up-close

Programs, Partners, and Activity

- **Primary programming**: exhibitions, Teen Book Bank, educational programs, community engagement, mentorship & training, workshops, family programs
- **Primary rentals:** multiple arts-based and community-focused organizations
- **Resident Organizations**: The Children's Book Bank, Centennial College Performing Arts Common, Center for Social Innovation, Artscape, Native Earth Performing Arts, Regent Park Film Festival, ArtHeart Community Art Center, Pathways to Education, Regent Park School of Music
- **Financial Drivers:** rentals
- **Major expenses:** space operations

Governance

- **Operating model**: not for profit
- **Staffing:** a lean core team is assigned by Artscape Toronto with a community manager who is responsible for ensuring tenants communicate and collaborate.
- **Scheduling:** Daniels Spectrum has a comprehensive online calendar of events hosted by the resident organizations.
- **Lessons Learned:** the community manager role has evolved since DS opened. While originally an operational role, the incumbent now brings a long understanding of Regent Park's communities and history, and is positioned to help tenants collaborate and engage the community.

AMS PLANNING & RESEARCH

COMPARABLES

National Sawdust

National Sawdust is a non-profit performing arts organization and music venue in the heart of Williamsburg, Brooklyn.

National Sawdust's mission is rooted in music discovery that is open, inclusive, and based in active mentorship of emerging artists, while building new audiences and communities of music devotees.

National Sawdust engages artists in an ecosystem of incubation to dissemination, programming groundbreaking new music in the state-of-the-art Williamsburg venue, and developing and touring new, collaborative music-driven projects.

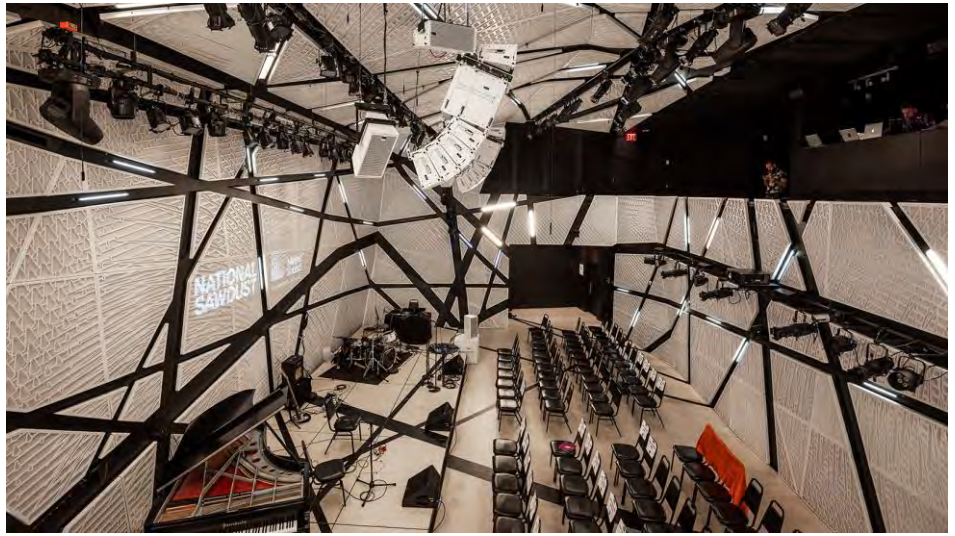
Snapshot	
Location	Brooklyn, NY
Population	2,641,052
Owner	National Sawdust
Operator	National Sawdust
Year Opened	2015
Square Footage	13,000 sf
Project Cost	$16 million

CASE STUDY

National Sawdust: Venues & Activity

Main Hall

- This 2,200-square-foot hall has a flexible capacity of standing (320), theatre seating (169), and Cabaret seating (105).
- It has balconies on three sides.
- Architecturally and acoustically designed to provide excellent visual and auditory experiences.
- Audiences and clients demonstrate their loyalty by returning for 300+ concerts and special events every year.
- Previous client partners of the space include Spotify. Rolex, Samsung, Hermès, HBO, AT&T, Arc'teryx, etc.



Wine Bar: Disco Tacos & Comparti Catering

- The bar is available for rental for a separate fee.
- The first floor has capacities of standing (50) and seated (30)
- The private room has capacities of standing (50) and seated (35).
- National Sawdust offers full-service catering through their in-house caterer, Comparti.
- In-house caterer only for event rentals.

CASE STUDY

National Sawdust: Up-close

Programs, Partners, and Activity

- **Primary programming**: live music performances (Classical, Electronic, Hip-Hop, Indie, Jazz, Movement, New Music, Opera, R&B, Traditional); Mentorship & Education (Fellowships, Student Colab, Artists in Residence, Hildegard Commission)
- **Primary rentals:** private concerts, seated dinners and performances, conferences, and receptions
- **Resident Companies**: N/A
- **Financial Drivers:** ticket sales, venue rentals, contributed revenue (organizational philanthropy)
- **Major expenses:** compensation, space operations

Governance

- **Operating model**: not for profit
- **Staffing:** 21 staff.
  Leadership includes Director of Marketing & Design, Director of Development, Director of Partnerships & Special Events, Artistic Director, Senior Director, CFO, Music Director NS Ensemble, Director of Sound and Technical Design, and Managing Director.
- **Scheduling:** National Sawdust's performance programming takes precedence.
- **Lessons Learned:** 100% rental revenues support their artistic programming as well as non-profit initiatives (e.g., artist mentorship).

COMPARABLES

Riverside Revival

Riverside Revival is an event space with supreme sound, on-site parking, natural light, and exquisite interiors located in the heart of East Nashville. The space was previously a church and has been revived as a state-of-the-art venue for concerts, weddings, corporate functions, and other private events.

It's part of the Boedecker Foundation Collaborative Campus, which provides meeting and office space for nonprofit organizations as they advance their missions and serve the community.

Snapshot	
Location	Nashville, TN
Population	678,845
Owner	The Boedecker Foundation
Operator	The Boedecker Foundation
Year Opened	2020
Square Footage	Main auditorium: 3,177 sf The Boedecker Foundation Collaborative Campus: 2.5 acres

CASE STUDY

Riverside Revival: Venues & Activity

Main Hall

- The original 1951 church construction provides classic accents to the contemporary feel of this completely renovated space.
- The venue can hold up to 200 seated guests. It can accommodate 360 for receptions, plus the balcony has space for 40 guests.
- The venue's built-in stage, lighting, and projectors make the space suitable for live music events.
- Rental revenue drives support to nonprofit tenants elsewhere on the Boedecker Foundation Collaborative Campus; the foundation offers below-market rent to many of the nonprofit organizations it supports.

AMS PLANNING & RESEARCH

CASE STUDY

Riverside Revival: Up-close

Programs, Partners, and Activity

- **Primary programming**: theatre, music performances
- **Primary rentals:** concerts, corporate events, nonprofit fundraising events, and weddings.
- **Users**: The Theatre Bug (nonprofit theatre), Sam Grisman Project (Dawg music group)
- **Financial Drivers:** venue rentals, foundation resources
- **Major expenses:** compensation, space operations

Governance

- **Operating model**: not for profit
- **Staffing:** undisclosed
- **Scheduling:** the calendar of events is publicly available on the website
- **Lessons Learned:** a campus-based venue operated directly by a foundation: the Boedecker Foundation Collaborative Campus is home to a dozen not-for-profit tenants who pay a reduced fee. While none of the tenant organizations are primarily arts entities, many have roots in the arts and engage arts programming to fulfill their mission.

COMPARABLES

Epiphany Center for the Arts

The historic Church of the Epiphany has been preserved and adapted into an iconic cultural hub ‘For the Good of Art, Entertainment and Events’. This campus boasts three distinct venues and a stunning array of amenities, including art studios, classroom, exhibit space and gallery, a commercial and catering kitchen, café, VIP suite and outdoor spaces, a quarter-acre courtyard, a spacious terrace and stunning patio.

With its mission “to instill an artistic, cultural experience in all patrons who cross our threshold with the hope that each will be inspired to realize their own Epiphany”, Epiphany’s diverse and inclusive art programming serves to unite community and artists alike while ‘Bringing Chicago Together’.

Snapshot	
Location	Chicago, IL
Population	2,696,561
Owner	David Chase & Kimberly Rachal
Operator	Epiphany Center for the Arts
Year Opened	2020
Square Footage	42,000 sf
Project Cost	$14.7 million

CASE STUDY

Epiphany Center for the Arts: Venues & Activity

Epiphany Hall
- The largest room reception capacity is 1050 and the banquet capacity is 460.
- Combining acoustics with a state-of-the-art sound and lighting system, Epiphany Hall is well suited for various types of entertainment – from solo artists and Jazz ensembles to complex theatrical productions and curated dance and concert series.

The Sanctuary
- A grand staircase leading to a vintage room with vaulted ceilings, stained glass windows, vintage chandeliers, a built-in stage, and complemented by a private Niche Bar and Lounge.
- Suited for cabaret-styled music productions, literary arts, comedy, and magic shows.

The Catacombs
- Underground beneath Epiphany Hall, guests will find themselves surrounded by vintage 1885 charm, original stone walls, wood beams, and rustic columns adorned with ambient light.
- Ideal for wedding celebrations

CASE STUDY

Epiphany Center for the Arts: Up-close

Programs, Partners, and Activity

- **Primary programming**: exhibitions, Jazz performances, Blues performances, House events, Dance events, Chamber performances, World Music shows
- **Primary rentals:** artists, ensembles, bands, weddings, corporate events
- **Resident Companies**: N/A
- **Financial Drivers:** events, space rentals
- **Major expenses:** undisclosed

Governance

- **Operating model**: owned by individuals, operated by Epiphany Center for the Arts
- **Staffing:** Director of Arts & Programming, Artist Relations Manager, Artistic Director, Entertainment Marketing Manager, graphic designer
- **Scheduling:** event booking and rental inquiries can be sent through online forms; there are open calls offering opportunities to show artwork and win a prize
- **Lessons Learned:** shortly after opening, the Epiphany Center engaged a new leader: an artist-in-residence and artistic director. The incumbent brings long experience in Chicago's music festival scene and is also Executive Director of a respected chamber music group.

COMPARABLES

Mr. Smalls

Mr. Smalls is a live-music venue in the Millvale neighborhood of Pittsburgh, Pennsylvania. It was converted from an 18th-century Catholic church.

It has multiple interior event spaces (including four stages, a recording studio, multiple bars, and a restaurant). It has hosted thousands of national, regional, and local artists since its inception as a venue.

Mr. Smalls has a non-profit arm - Creative.Life.Support, providing learning, artist career development, and professional opportunities for Pittsburgh area youth.

Snapshot	
Location	Millvale, PA
Population	300,454
Owner	Mike Speranzo & Liz Berlin
Operator	Mr. Smalls
Year Opened	2002
Square Footage	Information not available

CASE STUDY

Mr. Smalls: Venues & Activity

The Theatre

- Has an 800-guest capacity, 40ft high ceilings, hardwood floors, custom acoustic reinforcements for superb sound, a spacious monitor room/staging area for artists, a 25x26x3 stage, and professional standard PA and lighting systems.
- The VIP balcony provides a different kind of concert experience where patrons can enjoy the show with a unique birds-eye view of all the action.

The Funhouse

- A cozy club and model performance space (3,000 sf) located just upstairs from Mr. Smalls Theatre. Designed for patrons 21+, The Funhouse is equipped with a full bar, an intimate setting, and the ability to house 175 patrons.
- Connects the Great Hall, the Funhouse restaurant, and the Courtyard.

Mr. Smalls Café

- Offers a lively alternative atmosphere with local art on the walls, pinball, and vintage video games.

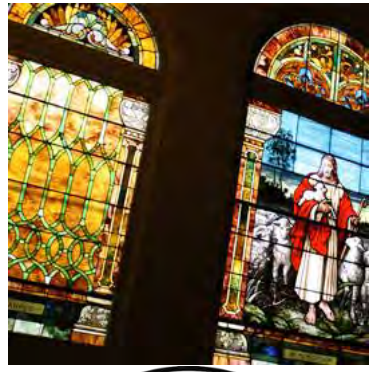
AMS PLANNING & RESEARCH

CASE STUDY

Mr. Smalls: Venues & Activity

The Sanctuary

- With a capacity of 400, hosting regular performances from local, regional and national musicians, as well as Creative.Life.Support students.
- Houses a used-gear swap shop, offering a variety of secondhand music instruments and equipment as well as a unique selection of vintage and skate apparel

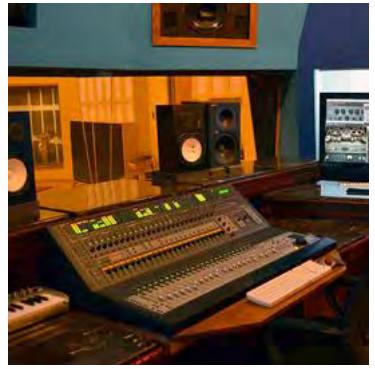


Creative.Life.Support - the Non-Profit Arm of Mr. Smalls

- Provides learning, artist career development and professional opportunities for Pittsburgh area youth: music camps, Creative.Life.Support Center, educational programs (We Rock Workshop, Real Life Music Camp), College Internship Program, sponsored performance opportunities, Creative.Life.Support Records

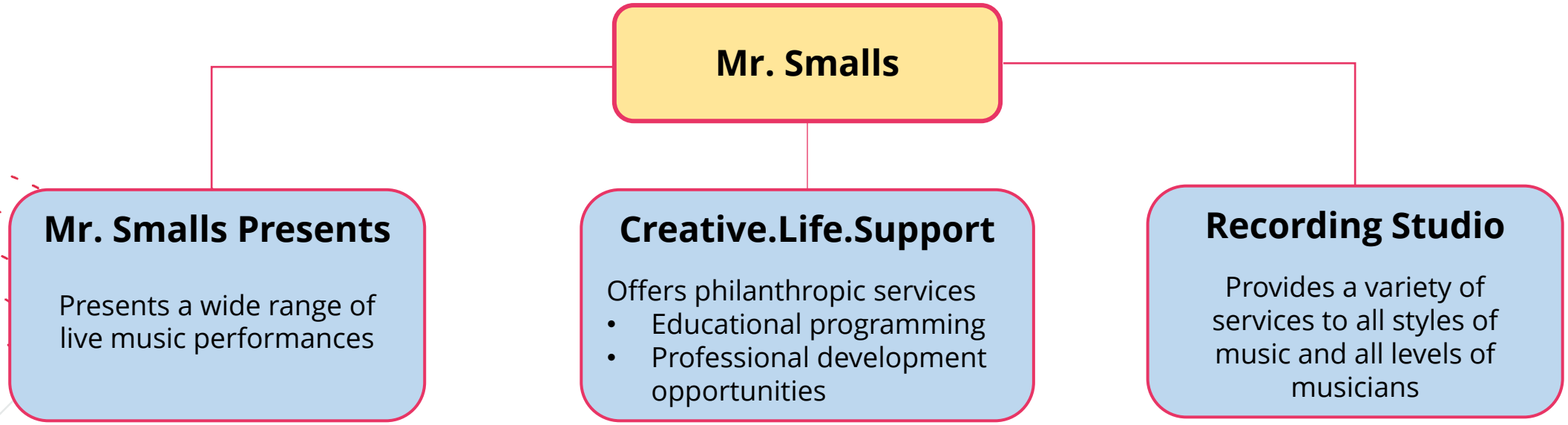
The Recording Studio

- Located on Pittsburgh's historic North Side
- The area's largest and best-sounding tracking room
- Services include recording, mixing, mastering, production, voiceovers, studio musicians, live recording, format transfers, original music and beats, and commercial ad production.



CASE STUDY

Mr. Smalls: Up-close



Programs, Partners, and Activity

- **Primary programming**: live music performances
- **Primary rentals:** weddings, anniversaries, Bat/Bar Mitzvahs, and other special parties
- **Resident Companies**: N/A
- **Financial Drivers:** ticket sales, rentals
- **Major expenses:** undisclosed

Governance

- **Operating model**: owned by individuals, operated by Mr. Smalls
- **Staffing:** Operations, Events, Mr. Smalls Presents, Catering, Sound, Creative.Life.Support
- **Scheduling:** the calendar of events is publicly available on the website
- **Lessons Learned:** the non-profit arm provides learning, artist career development, and professional opportunities through a fiscal sponsorship

AMS PLANNING & RESEARCH

APPENDIX C

Sängerhalle Activity Profile

 # Use: 242 Days

September						
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- Tech/Load-In
- Houston Saengerbund
- Houston Saengerbund Rehearsals
- Heights Rotary
- ROCO Chamber
- Other Potential Users
- Other Users' Large Regular Rehearsal

AMS PLANNING & RESEARCH

HCMA

Lambert Hall Activity Profile

 # Use: 196 Days

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Tech/Load In

ROCO Orchestra

Opera in the Heights

Other Potential Users

Community Rentals

H C M A

Rehearsal Hall Activity Profile

 # Use: 205 Days

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S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

April						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

May						
S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

June						
S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

July						
S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

August						
S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Tech/Load-In

Houston Saengerbund Rehearsals

Other Users Medium-Small Regular Rehearsals

Private Event Rentals

APPENDIX D

Houston Center for Musical Arts

Pro Forma Operating Statement

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Houston Center for Musical Arts

Operating Pro Forma

SCHEDULE 1: KEY ASSUMPTIONS	
Operating Assumptions	
Base Year is the third year of operations in the new Performing Arts & Events Center	
Space Assumptions	
HCMA Total Gross Square Feet	40,685
Lambert Hall Capacity - Fixed Seats Performance	290
Saengerhalle Capacity - Seated Performance	190 - 215
Saengerhalle Capacity - Dining	120
Saengerhalle Capacity - Standing Reception	400
Rehearsal Hall Capacity - Seated Performance	70
Rehearsal Hall Capacity - Dining	40
Rehearsal Hall Capacity - Standing Reception	150
Economic Assumptions (2023$)	
Fringe Taxes and Benefits	25.00%
Expense Contingency	5%
Concessions Capture Rate	35%
Concessions Cost of Goods Sold	20%
Concessions Average Purchase	$7.00
Annual Fundraising Target	$300,000
Modeling Assumptions	
Rounding	-2

HCMA

SCHEDULE 2: SUMMARY
BASE PRO FORMA

Earned Revenues	**Base Year**
Facility Rentals	$543,300
Chargebacks	$33,000
Ancillary	$51,500
Subtotal, Earned Revenues	*$627,800*
Contributed Revenues	
Contributed Revenue or Income from Endowment TBD	$300,000
Subtotal, Contributed Revenues	*$300,000*
TOTAL OPERATING REVENUES	**$927,800**
Operating Expenses	
Personnel	$407,000
Overhead	$81,700
Operations & Occupancy	$390,600
Subtotal, Operating Expenses	*$879,300*
Expense Contingency (5%)	$44,000
TOTAL OPERATING EXPENSES	**$923,300**
TOTAL ANNUAL RESULT	**$4,500**
Earned Revenue as % of Expenses	68%
% Contributed of Total Revenue	32%

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HCMA	
SCHEDULE 3: REVENUE SUMMARY	
Earned Revenues	**Base Year**
Facility Rentals	$543,300
Chargebacks	$33,000
Ancillary	$51,548
Subtotal, Earned Revenues	*$627,848*
Contributed Revenues	
Contributed Revenue or Income from Endowment TBD	$300,000
Subtotal, Contributed Revenues	*$300,000*
TOTAL OPERATING REVENUES	**$927,848**

HCMA	
SCHEDULE 4: EXPENSE SUMMARY	
Operating Expenses	**Base Year**
Personnel	$407,300
Overhead	$81,747
Operations & Occupancy	$390,576
Subtotal, Operating Expenses	*$879,623*
Expense Contingency (5%)	$43,981
TOTAL OPERATING EXPENSES	**$923,604**

SCHEDULE 5A: ACTIVITY SUMMARY	Base Year	Average Attendance	Base Year
USAGE BY SPACE & ENSEMBLE			
Saengerhalle			
Houston Saengerbund Performance	12	*200*	2,400
Houston Saengerbund Tech/Load In	24		
Houston Saengerbund Regular Rehearsals	48		
Heights Rotary Weekly Meetings	48		
ROCO Chamber Performance	4	*200*	800
ROCO Chamber Tech/Load In	16		
Other Users Performance	23	*200*	4,600
Other Users Tech/Load In	22		
Other Users Large Regular Rehearsal	45		
Total Saengerhalle	**242**		
Lambert Hall			
ROCO Orchestra Performance	4	*275*	1,100
ROCO Orchestra Tech/Load In	16		
Opera In the Heights Performance	16	*275*	4,400
Opera In the Heights Tech/Load In	32		
Other Users Performance	52	*250*	13,000
Other Users Tech/Load In	16		
Community Rentals	60		
Total Lambert Hall	**196**		
Rehearsal Room #1			
Houston Saengerbund Rehearsals	52		
Other Users Medium-Small Regular Rehearsals	133		
Private Event Rentals	20		
Total Rehearsal Room #1	**205**		
Other			
Total Other			**26,300**

SCHEDULE 6A: RENTAL REVENUE SUMMARY	Base	
USAGE BY SPACE & ENSEMBLE		
Saengerhalle		
Houston Saengerbund Performance	$	14,880
Houston Saengerbund Tech/Load In	$	21,720
ROCO Chamber Performance	$	4,960
ROCO Chamber Tech/Load In	$	13,100
Other Users Performance	$	28,520
Other Users Tech/Load In	$	22,440
Other Users Large Regular Rehearsal	$	35,550
Total Saengerhalle	**$**	**141,170**
Lambert Hall		
ROCO Orchestra Performance	$	5,840
ROCO Orchestra Tech/Load In	$	15,960
Opera In the Heights Performance	$	23,360
Opera In the Heights Tech/Load In	$	30,840
Other Users Performance	$	71,600
Other Users Tech/Load In	$	18,120
Community Rentals	$	74,640
Total Lambert Hall	**$**	**240,360**
Rehearsal Room #1		
Other Users Medium-Small Regular Rehearsals	$	38,570
Private Event Rentals	$	42,400
Total Rehearsal Room #1	**$**	**80,970**
Other		
Saengerbound Annual Lease	$	30,000
Rotary Annual Lease	$	20,800
Opera in the Heights Annual Lease	$	30,000
Total Other	**$**	**80,800**

	Base Year	
Total Saengerhalle	$	141,170
Total Lambert Hall	$	240,360
Total Rehearsal Room #1	$	80,970
Total Other	$	80,800
TOTAL ALL SPACES	**$**	**543,300**

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SCHEDULE 6B: RENTAL RATES

Saengerhalle

	Nonprofit	
Performance/Public Event	**1/2 day (4-hour)**	**1 day (8-hour)**
Monday-Thursday	$ 505	$ 1,010
Friday-Sunday	$ 619	$ 1,240
Rehearsal	**1/2 day (4-hour)**	**1 day (8-hour)**
Monday-Thursday	$ 392	$ 790
Friday-Sunday	$ 506	$ 1,020

Lambert Hall

	Nonprofit	
Performance/Public Event	**1/2 day (4-hour)**	**1 day (8-hour)**
Monday-Thursday	$ 594	$ 1,190
Friday-Sunday	$ 728	$ 1,460
Rehearsal	**1/2 day (4-hour)**	**1 day (8-hour)**
Monday-Thursday	$ 461	$ 930
Friday-Sunday	$ 595	$ 1,200

Rehearsal Hall

	Nonprofit	
Rehearsal	**1/2 Day**	**Daily Rate**
Monday-Thursday	$ 145	$ 290
Friday-Sunday	$ 175	$ 350

SCHEDULE 6B: RENTAL RATES			
HCMA Commercial/Private			
Daily Rate (6-hour)	**Saengerhalle**	**Lambert Hall**	**Rehearsal Hall**
Monday-Thursday	$ 3,600	$ 4,300	$ 1,700
Friday-Sunday	$ 5,100	$ 5,900	$ 2,400

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SCHEDULE 7: RENTAL CHARGEBACKS

Box Office	Fee	Frequency	# of Performance&Events	Amount
Ticket Set-up Fee - Nonprofit Users	$200	50%	75	$7,500
Ticket Set-up Fee - Commercial Users	$200	100%	0	$-
Subtotal, Box Office				**$7,500**

Performance Labor & Equipment	Avg Per Event	Frequency	# of Events	Amount
Events Set Up	$120.00	75%	75	$6,750
Custodial	$200.00	100%	75	$15,000
Equipment Rental	$200.00	25%	75	$3,750
Subtotal, PerforLabor & Equipment				**$25,500**
TOTAL CHARGEBACKS				**$33,000**

SCHEDULE 8: ANCILLARY REVENUE

			Total Attendees
All attendance			26,300
Subtotal, Commercial Rentals			0
Total Tickets Sold			**26,300**
Concessions (Gross Sales)	Per Capita	Captured Attendance	Gross Sales
average purchase	$7.00		
percent capture	35%		$64,435
cost of goods sold	20%		($12,887)
Concessions Net		**Total**	**$51,548**
Total Net Ancillary Revenue			**$51,548**

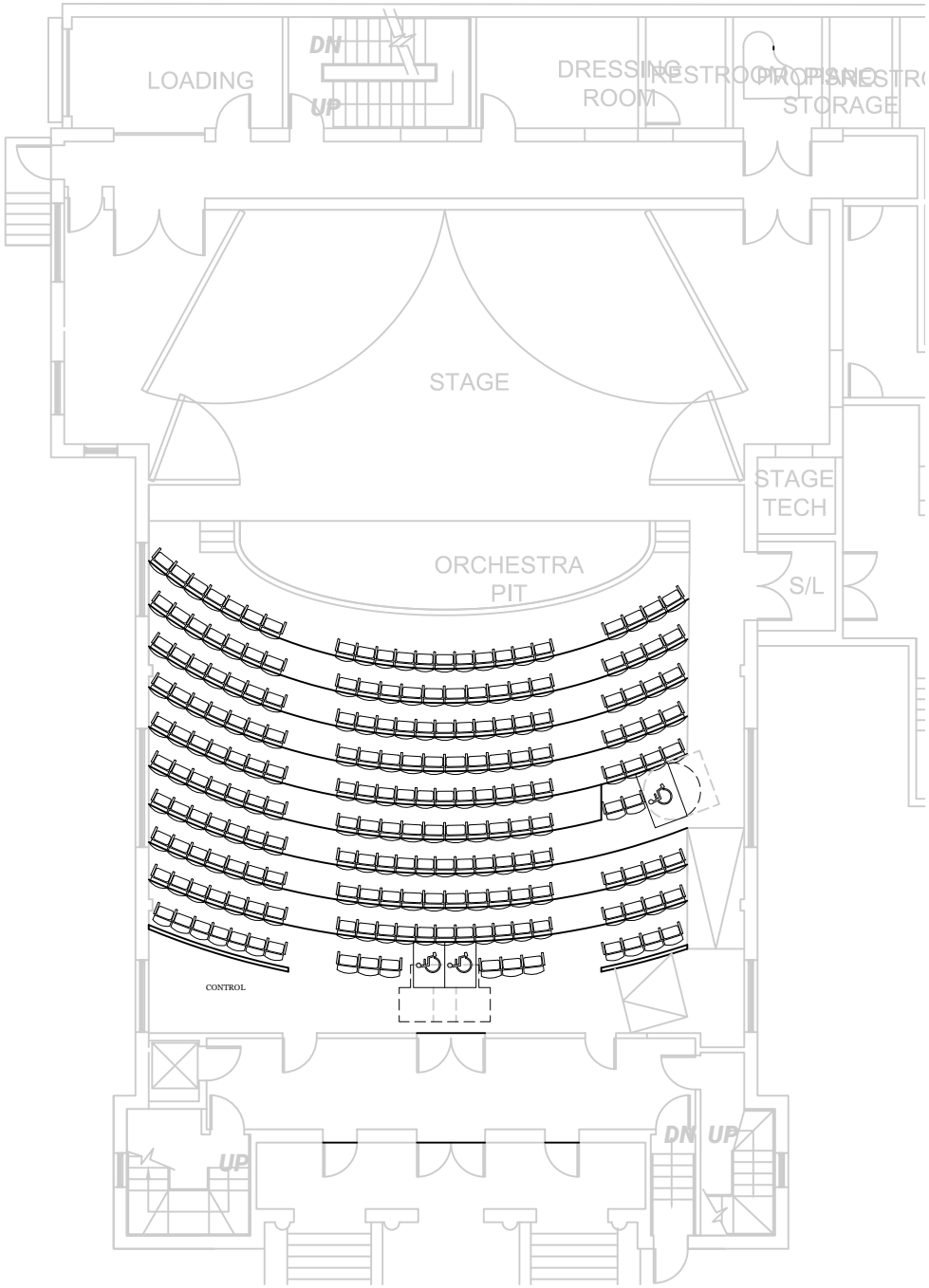
SCHEDULE 9A: GENERAL AND ADMINISTRATIVE EXPENSES	
Personnel	
Compensation	$407,300
Subtotal, Personnel	*$407,300*
Overhead	
Telephone/Internet	$4,440
Administrative Expenses (inc. postage, mailing)	$2,400
Marketing/Advertising	
Professional Fees (auditing, legal, etc.)	$10,000
Accounting	$25,000
Development Expenses	$6,000
Equipment (office)	$9,900
Other administrative expenses	$2,887
Credit Card Fees	$21,120
Subtotal, Overhead	*$81,747*
TOTAL GENERAL AND ADMINISTRATIVE EXPENSE	**$489,000**

SCHEDULE 9B: STAFFING				
Item	**Salary**		**Benefits & Taxes**	
Director	$	95,000	$	23,750
Administrative Assistant	$	55,000	$	13,750
Booking Coordinator	$	65,000	$	16,250
Production Manager	$	75,000	$	18,750
Grant Writer (part-time role)	$	40,000	$	4,800
	$	**330,000**	**$**	**77,300**
Total	**$**			**407,300**

SCHEDULE 10: OCCUPANCY EXPENSE		
Building Operations	**Per sf**	**Total**
Utilities	$2.46	$100,085
Annual Maintenance & Repairs	$1.88	$76,488
Insurance	$1.46	$59,400
Security	$1.15	$46,788
Regular Cleaning and Maintenance	$2.65	$107,815
Subtotal, Overhead	**$9.60**	$390,576
TOTAL BUILDING EXPENSES		**$390,576**

APPENDIX E

Room ID	SPACE	Full Build NSF		COMMENTS (Full Build)	LOCATION (Full Build)
	Houston Center for Musical Arts Space Program Planner August 11, 2023			**Expanded Build-out Program with Side Lobbies v.5**	
A	**LAMBERT HALL**	**15,252**			
	PATRON AMENITIES	**5,574**			
A.1	Lobby	3,800			**Lambert & Connector**
A.2	Coats/Hearing Impaired Check-out	0		+/- 1/3 audience checking coats at .5 sf/person	
A.3	Concierge/Ticketing Area	86			**Connector 1st**
A.4	Concessions	106			**Connector 1st**
A.5	Concessions Support	60			**Connector 1st**
A.6	Women's Restrooms	541		provide 1:25	**Bm, Connector 1st & 2nd**
A.7	Men's Restrooms	401		provide 1:35	**Bm, Connector 1st & 2nd**
A.8	Family Restrooms	186			**Connector 1st & 2nd**
A.9	Ushers Room	184			**Lambert Bm**
A.10	House/Facility Manager's Offices	210			**Lambert Bm**
	AUDITORIUM	**3,764**			
A.11	Fixed Seating - Orchestra	2,290		Seat Count: 200	**Lambert 1st**
A.12	Fixed & Box Seating - Balcony	1,279		Seat Count: 90	**Lambert 2nd**
A.13	Sound and Light Locks	115			**Lambert**
A.14	In House Mix	80			**Lambert 1st**
	STAGE & TECHNICAL AREAS	**5,914**			
A.15	Stage & Apron	1,740		existing at full width	**Lambert 1st**
A.16	Crossover	350			**Lambert 1st**
A.17	Orchestra Pit/Thrust	453		Sized for 24 musicians	**Lambert Bm**
A.18	Orchestra Pit Storage	111			**Lambert Bm**
A.19	Piano Storage	76			**Lambert 1st**
A.20	Loading/Staging	181			**Lambert 1st**
A.21	"Dimmer" Room	88			**Lambert 2nd**
A.22	Amplifier Room	88			**Lambert 2nd**
A.23	Media Control Suite	244		Live broadcast and post production	**Lambert Bm**
A.24	Followspot/Projection Room	0			
A.25	Backstage Restrooms	171			**Lambert Bm & 1st**
A.26	(3) Principals' Room, 4 persons (12 total)	669		Incl. WC/showers	**Lambert Bm & 1st**
A.27	(2) 10-person Chorus rooms (20 total)	902		Incl. WC/showers; overflow to other rooms	**Lambert Bm**
A.28	Green Room	427		Production/artists meeting and lounge/overflow dressing	**Lambert Bm**
A.29	Laundry/Wardrobe	187		Wash/dry/steam/racks	**Lambert Bm**
A.30	Scenery/User Storage	0			
A.31	Prop Room	54			**Lambert 1st**
A.32	Tool	46			**Lambert 1st**
A.33	Backstage Storage	127			**Lambert Bm**
A.34	Break Room	0			**Lambert Bm**
B	**SANCTUARY BUILDING**	**7,001**			
	PATRON AMENITIES	**521**			
B.1	Lobby	434			**Sanctuary**
B.2	Concessions	0			**Connector - Shared**
B.3	Concessions Storage	0			**Connector - Shared**
B.4	Single Restroom	87			**Sanctuary**
B.5	Restrooms	0			**Connector - Shared**
	SANCTUARY	**3,937**			
B.6	Sanctuary Space	2,738		(e) lower level, portable platform stage, 200 audience	**Sanctuary 1st**
B.7	Fixed Presentation Platform	390		50 standing choir; can extend with portable platforms	**Sanctuary 1st**
B.8	Sound and Light Locks	155			**Sanctuary 1st**
B.9	Control Position/Balcony	654		Other functions as determined	**Sanctuary 2nd**
	BOH SUPPORT (Exist. + Addition)	**2,543**			
B.10	Wardrobe	152			**Sanctuary 1st**
B.11	Backstage Restrooms	268			**Sanctuary 1st**
B.12	Bierstube/Lounge/Green Room	915		Includes bar	**Connector 2nd**
B.13	Warm-up	304			**Sanctuary 1st**
B.14	Storage	220		Includes piano	**Sanctuary 1st**
B.15	Production Equipment	118			**Connector 2nd**
B.16	Mezz Rehearsal	566			**Sanctuary 2nd**
C	**OTHER FACILITIES**	**2,964**			
C.1	Rehearsal Room - Large	904		Also serves as warm-up/childcare and hosts dining and event	**Connector Bm**
C.2	Rehearsal Room Storage/Sm Reh.	122			**Connector Bm**
C.3	Rehearsal/Warm-up Rooms - 2 Medium	441			**Connector 2nd**
C.4	Catering & Pantry	393			**Connector 1st**
C.5	Admin, Work Room & Meeting Rooms	702		(4) desks for staff, mail area, conference	**Connector 2nd**
C.6	Donor Lounge	402			**Connector 2nd**
	Total NET Area, Sq. Ft.	***25,217***			
	Total GROSS Area, Sq. Ft. (NSFx1.6)	***40,347***			



1 FLOOR PLAN AT ORCHESTRA LEVEL

1/16"=1'-0"

SEAT COUNT:

ORCHESTRA LEVEL: 200
BALCONY LEVEL: 90
TOTAL: 290

Title: HCMA Seating Plan & Section
Date: 2023-06-21
Scale: 1/16"=1'-0"
Drawn By: AmS/ECC

Drawing Number:
SK-1a

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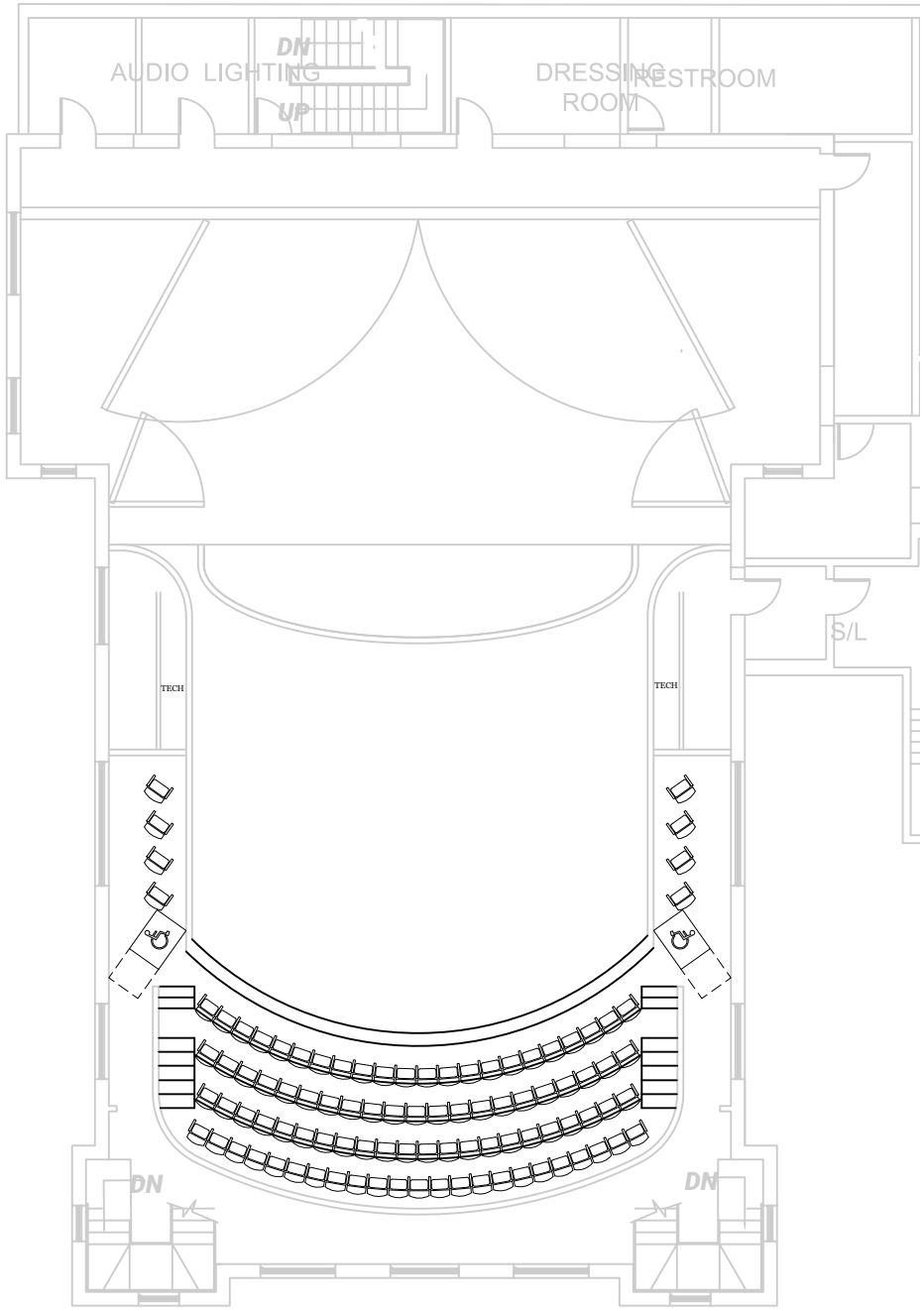

1 FLOOR PLAN AT BALCONY LEVEL

1/16"=1'-0"

SEAT COUNT:

ORCHESTRA LEVEL: 200
BALCONY LEVEL: 90
TOTAL: 290

Title: HCMA Seating Plan & Section
Date: 2023-06-21
Scale: 1/16"=1'-0"
Drawn By: AmS/ECC

Drawing Number:
SK-1b

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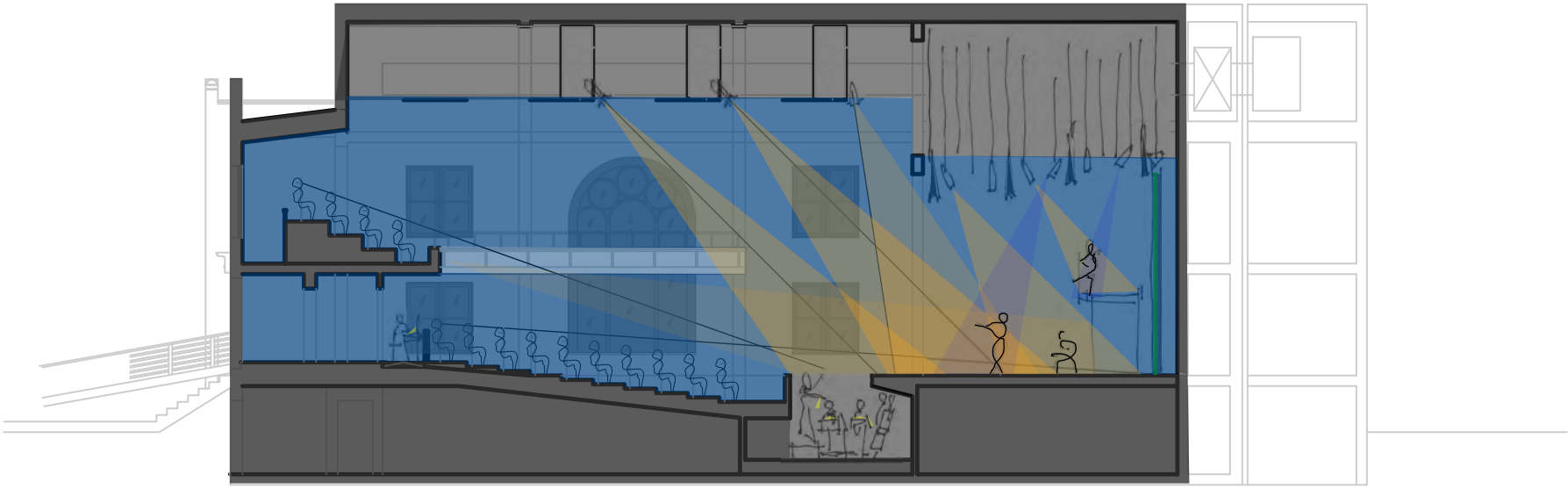

Title: HCMA Lambert Hall Section
Date: 2023-06-21
Drawing Number:
SK-1c

Drawn By: AmS/ECC

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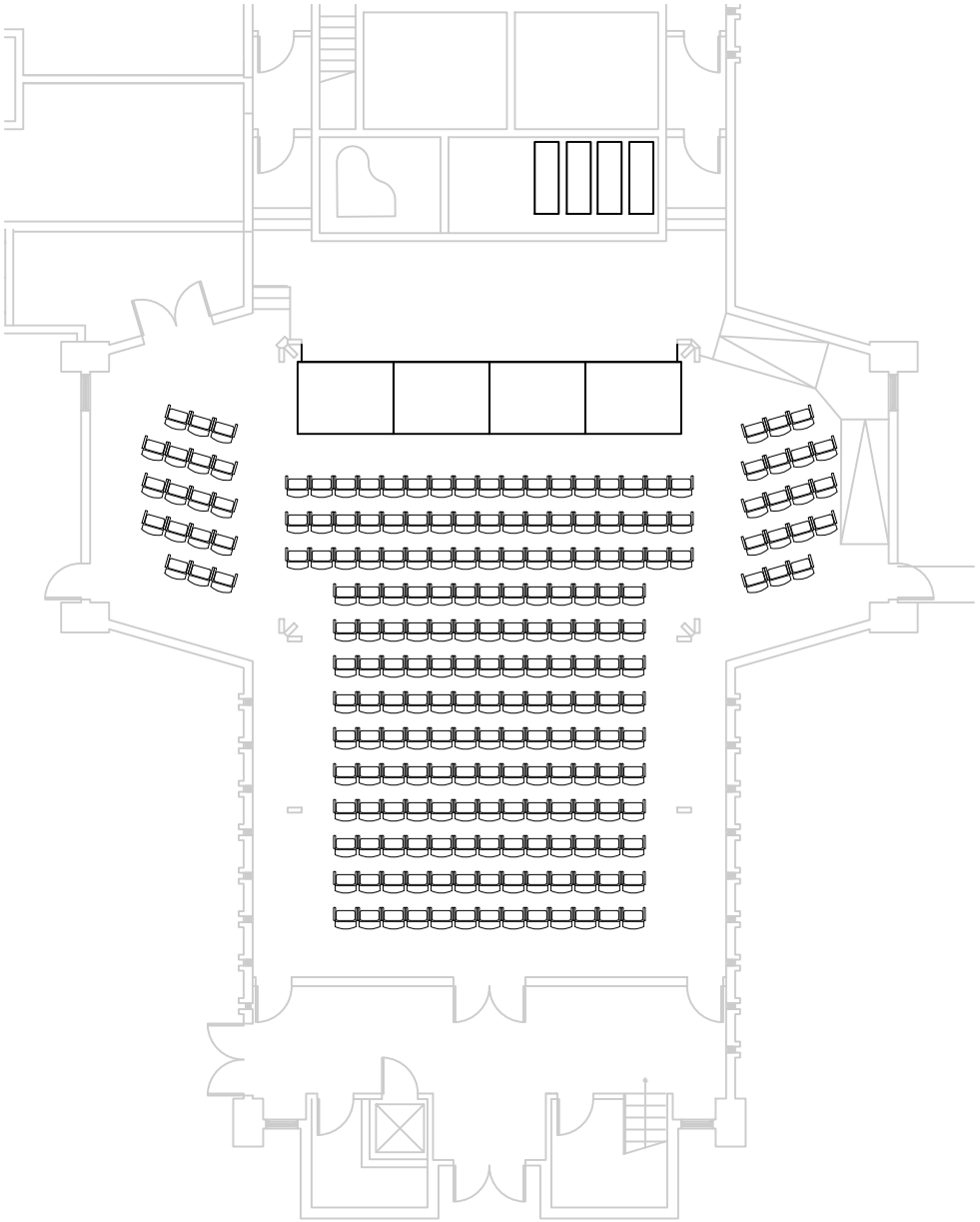

1 FLOOR PLAN AT MAIN LEVEL

1/16"=1'-0"

SEAT COUNT:

TOTAL: 217

Title: Sanctuary Building Seating Layouts
Date: 2023-06-27
Scale: 1/16"=1'-0"
Drawn By: AmS/ECC

Drawing Number:
SK-2a

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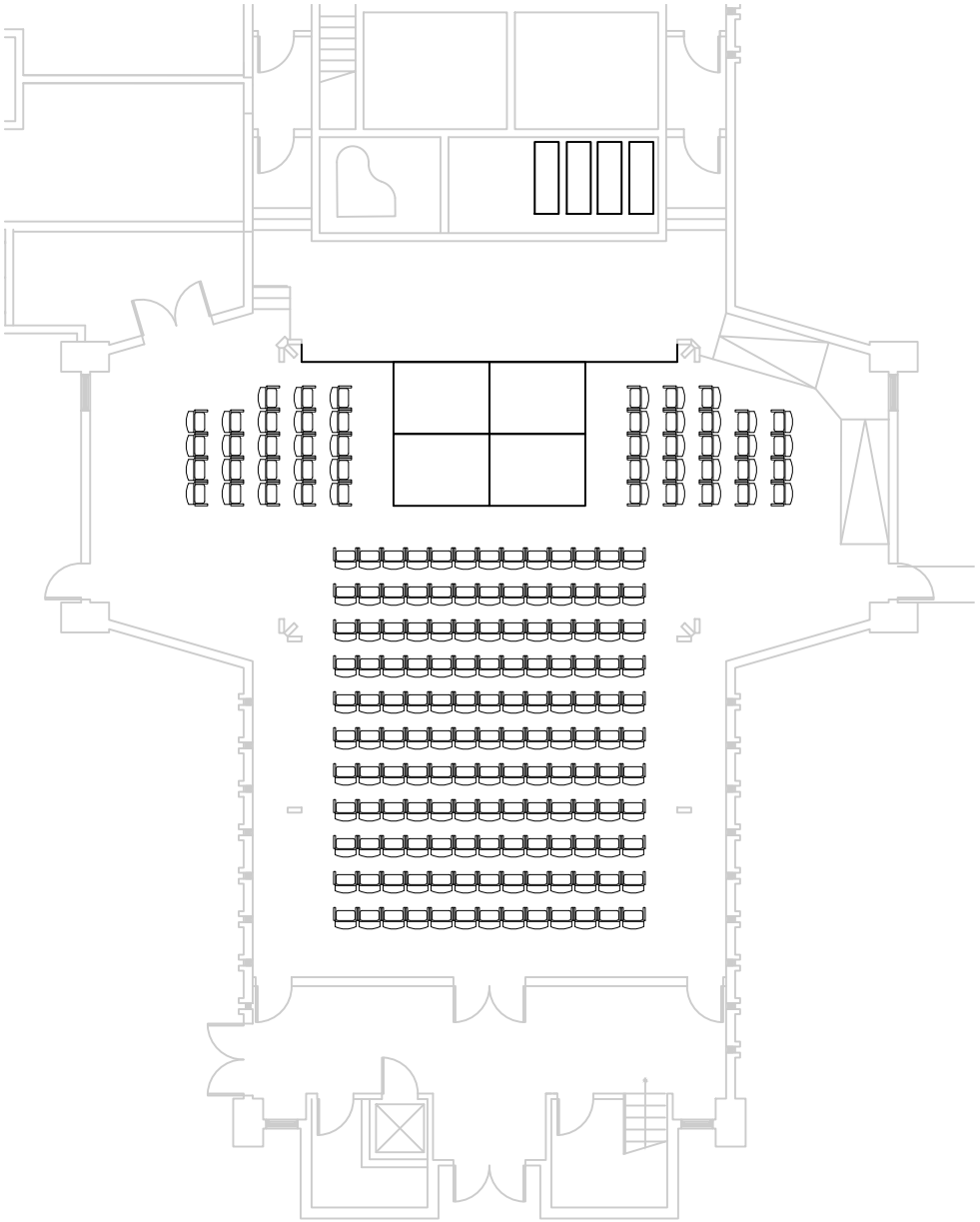

1 FLOOR PLAN AT MAIN LEVEL

1/16"=1'-0"

SEAT COUNT:

TOTAL: 189

Title: Sanctuary Building Seating Layouts
Date: 2023-06-27
Scale: 1/16"=1'-0"
Drawn By: AmS/ECC

Drawing Number:
SK-2b

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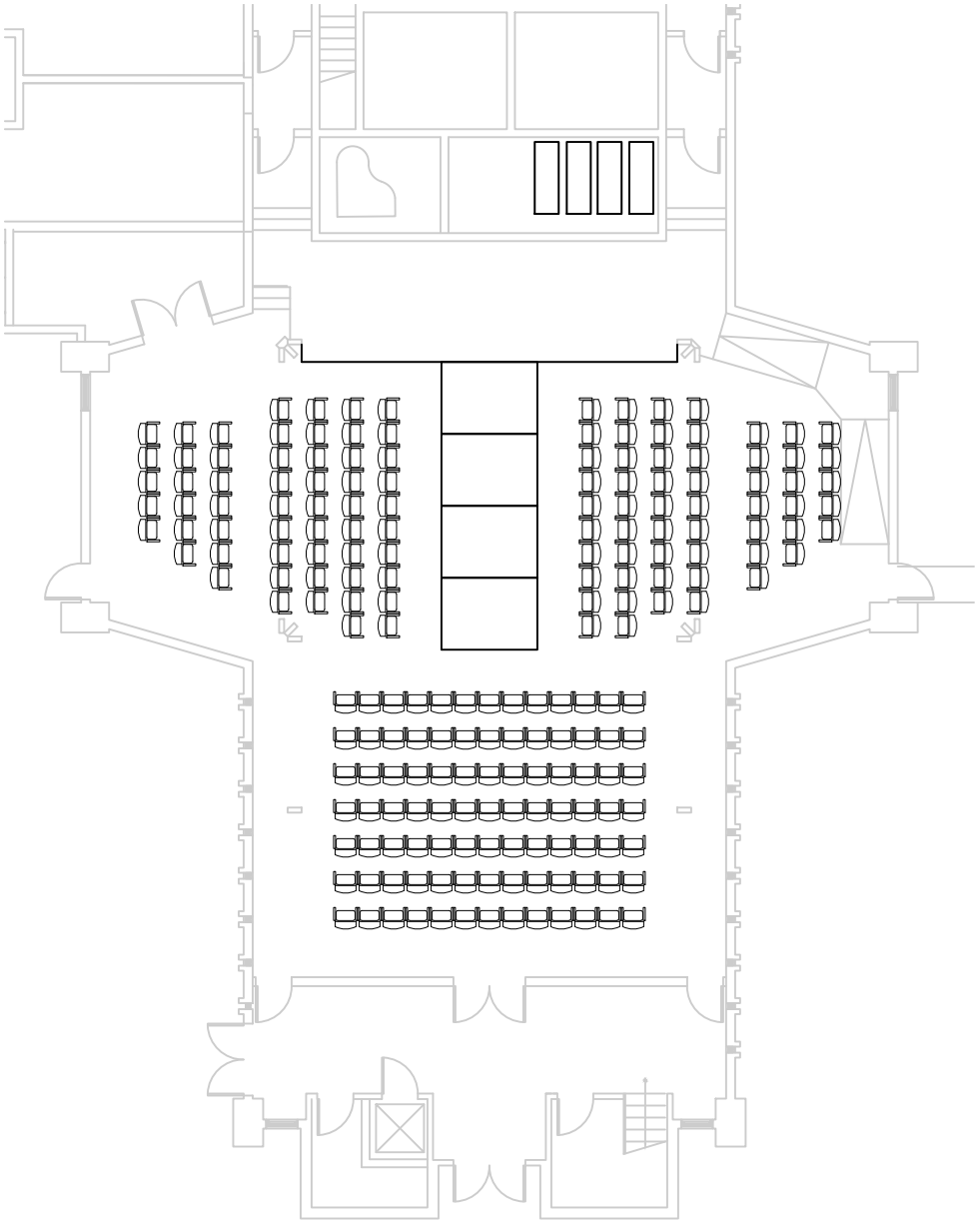

1 FLOOR PLAN AT MAIN LEVEL

1/16"=1'-0"

SEAT COUNT:

TOTAL: 203

Title: Sanctuary Building Seating Layouts
Date: 2023-06-27
Scale: 1/16"=1'-0"
Drawn By: AmS/ECC

Drawing Number:
SK-2c

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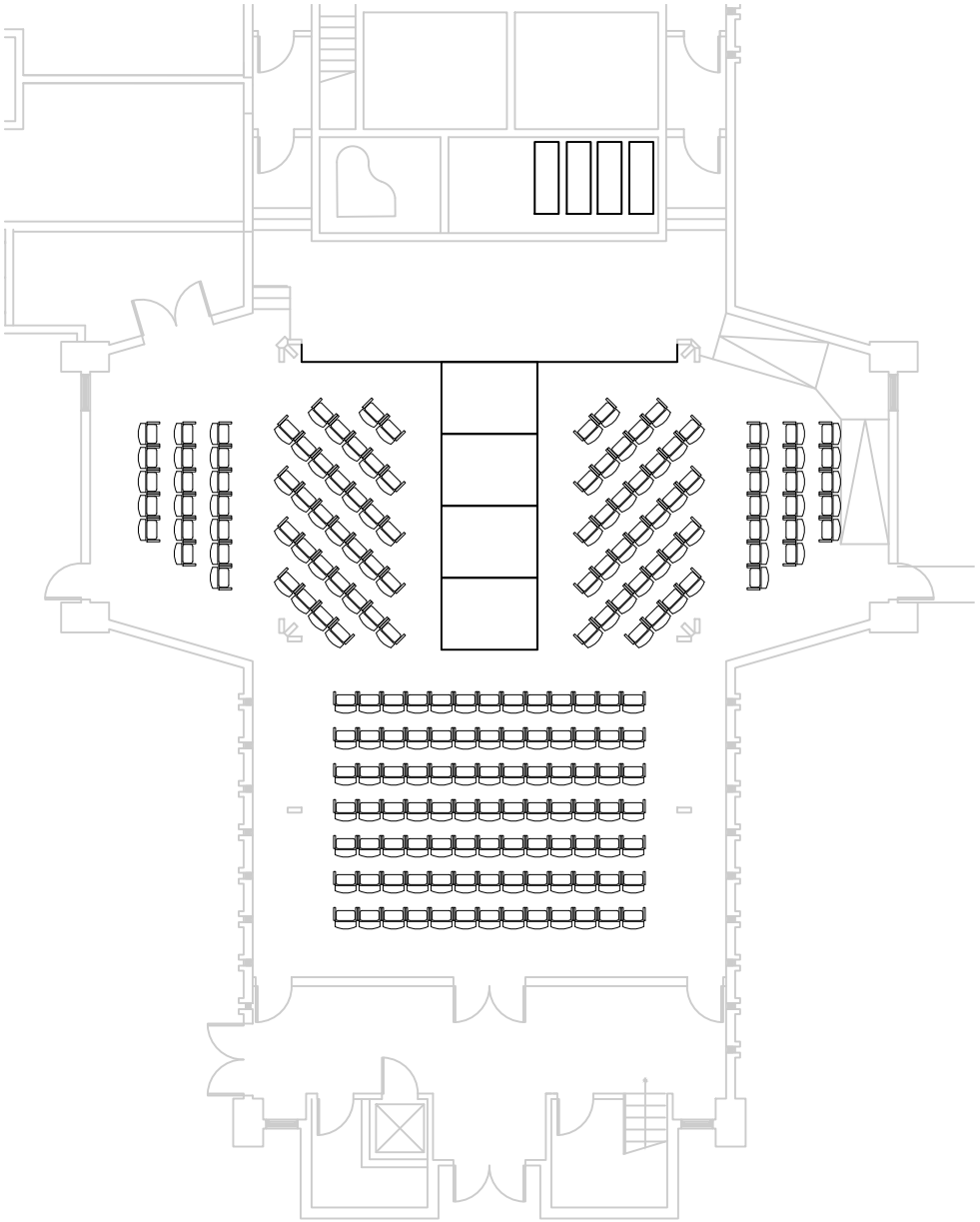

1 FLOOR PLAN AT MAIN LEVEL

1/16"=1'-0"

SEAT COUNT:

TOTAL: 191

Title: Sanctuary Building Seating Layouts
Date: 2023-06-27
Scale: 1/16"=1'-0"
Drawn By: AmS/ECC

Drawing Number:
SK-2d

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Houston Center for Musical Arts

Production Systems Engineering Report – Programming Phase, rev. 2

August 11, 2023

The following report outlines the anticipated theatrical productions systems electrical and mechanical requirements for the performance facilities at the Houston Center for Musical Arts project. It is intended to inform the cost planning of the building by recommending the required capacities and other considerations for electrical and mechanical systems.

Electrical Engineering Criteria

Transformer

	Transformer "PL-1" - Dedicated 120/208VAC 3-phase, K-13 rated transformer, or equivalent HMT model
Size:	**225 KVA** (assuming power factor of 0.9)
Feeds:	Lambert Theatre: (1) Production Lighting Relay Panel (1) Architectural Relay Panel (1) Company Switch Sanctuary: (1) Production / Architectural Lighting Relay Panel (1) Company Switch

Production Lighting Relay Panels (Qty: 2)

Load:	**57.6 kW each** - peak anticipated (50% diversity)
Fed from:	Transformer "PL-1"
Feeders:	Copper, Provide feeders for each panel.
Breakers:	(2) 200A, 120/208VAC 3-phase at shared dimmer room (Main breakers are integrated into panel)
Space required:	Each panel requires 20"w x 6"d (+3' clearance) x 6'-0" high. Rear access not required; run feeders into bottom of panel and branch loads into top. We recommend providing an enclosed gutter, pull box or wireway above panels to land branch conduits, then stub down into panel with large conduits.
Location:	Lambert and Sanctuary "dimmer" rooms
Product:	ETC Sensor IQ Panel (48-ckt w/ Mains Breaker)

Production Lighting Company Switch - 200A (Lambert)

Temporary device load:	**36.0 kW** total – 50% simultaneous with relay load above.
Feed:	On lighting transformer "PL-1".
Feeders:	Copper, with neutrals 2x oversized as current carrying conductor.
Device:	Provide theatre industry UL listed standard company switch which includes one 200A, 120/208VAC 3-Ø cam-lock safety connection panel. This would be specified in Div. 16 with products recommended by The SC.
Space required:	30" wide x 12" deep x 48" tall each, mounted 2'-0" a.f.f.
Location:	Surface mounted at stage

Production Lighting Company Switch – 100A (Sanctuary)

Temporary device load:	**18.0 kW** total –50% simultaneous with theatrical relay loads above.
Feed:	Transformer "PL-1".
Feeders:	Copper, with neutrals 2x oversized as current carrying conductor.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety "pin and sleeve" connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10" wide x 10" deep x 21" tall each, mounted 3'-0" a.f.f.
Location:	Surface mounted at rear side wall.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch

Production Lighting Company Switch – 100A (Courtyard)

Temporary device load:	**18.0 kW** total (Diversity: 50%)
Feed:	Standard building power
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety "pin and sleeve" connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10" wide x 10" deep x 21" tall each, mounted 3'-0" a.f.f.
Location:	Surface mounted at outdoor performance area.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch
Rating:	NEMA 4x Rated for outdoor use.

Architectural and Work Light Relay Panel (Qty: 1)

Load:	**28.8 kW** peak anticipated in Lambert (50% diversity)
Fed from:	Transformer "PL-1".
Feeders:	Copper, Provide feeders for each panel.
Breakers:	(1) 100A, 120/208VAC 3-phase panel at Dimmer Room (Main breakers are integrated into panel)
Space required:	Each panel requires 20"w x 6"d (+3' clearance) x 6'-0" high. Rear access not required; run feeders into bottom of panel and branch loads into top. We recommend providing an enclosed gutter, pull box or wireway above panels to land branch conduits, then stub down into panel with large conduits.
Location:	Lambert "dimmer" room
Product:	ETC Echo Panel (24-ckt w/ Mains Breaker)
Purpose:	To consolidate and integrate architectural lighting circuits onto a cohesive network using typical production lighting control system protocol.

Branch Loads

Wiring devices:	Production lighting wiring devices are to be provided under Div. 11 and installed by Electrical. Devices come prewired with labeled terminal strips for branch wiring to the relay panels. Circuits are numbered at the device with a corresponding relay number. Theatrical Consultant's drawings will show production lighting device locations, details and circuit numbers. Circuit numbers should not be repeated on the electrical drawings. Electrical drawings would show conduit and wire required. Provide 20A full load wiring that limits voltage drop to 3% at 1,000w (minimum #10 unless runs are very long). We anticipate a total of approximately (48) branch circuits for production lighting in the Lambert and (24) branch circuits for production lighting in the Sanctuary. Relay modules are 80% rated; wire should be sized for a full 20A load.
Architectural lighting:	DMX-controlled house lights will be connected to a low voltage relay panel, Architectural and Work Light Relay Panel above, provided by Div 11 and installed by electrical. Architectural loads will be circuited and scheduled by the Electrical Engineer with input from The SC. DMX control addressing will be provided by The SC. Recommended fixtures are listed below under Misc. Electrical Requirements/ Lighting Controls.
Emergency lighting:	Should the emergency egress lighting plan call for the transfer of DMX-controlled LED house lighting, a UL 1008 transfer device and UL rated DMX driver will be required. This would be specified by the Electrical Engineer with products recommended by The SC.

PRODUCTION RIGGING AND MACHINERY SYSTEMS

Motorized Rigging Systems - Lambert

Motor load:	(3) 2.0 HP motors above stage
Motor feed:	Standard building power other than transformer "PL-1"
Required power:	208 VAC, 3-Ø.
Control system:	Minimal 120V power.
Disconnect:	(1) At each motor unit. Units include on board starters and control.
Control devices:	The motorized rigging safety and control devices to be furnished and installed under Div. 11. Devices will come prewired for connection to electrical service. The SC's drawings will show device locations, details, point-to-point connection and wire type for control systems only. Electrical drawings would show conduit, line voltage wiring, and cross reference Production Systems documents for control wiring required. Provision of wire and complete electrical interconnection and termination by Div. 26.
Device Locations:	At counterweight operator position, stage deck.

Variable Acoustic Drapery and Lift Systems – Sanctuary

Motor loads:	(9) 1/4 HP motors.
Feed:	Standard building power *other than* transformer "PL-1".
Required power:	120 VAC, 1-Ø.
Locations:	(8) at ceiling; (1) at floor level
Notes:	The acoustic drapery banners and lift table (with onboard motors) are provided under Div. 11. Low voltage control panel will be located at stage level. Conduit, back boxes, wire and wire pull are provided under Division 26.
Products:	"acouRoll" by acouStaCorp/Texas Scenic or similar by Wenger Electro-mechanical lift "table" style, scissor braced by Serapid or Gala

PRODUCTION AV SYSTEMS

Scope

The Shalleck Collaborative will design and specify the AV system equipment and devices in dedicated drawings and in Division 27 specifications. The system will be installed in its entirety under Div. 27. The Electrical Engineer is responsible for designing and documenting all power related systems including specifying the conduit size and route, back boxes, and all junction boxes etc. The Shalleck Collaborative will provide CAD layers of devices to facilitate the Electrical Engineers documentation and will review and coordinate the AV power systems with the electrical documents.

All power to AV systems must be on a dedicated K-13 rated or HMT-style transformer, combined with an isolated ground system. AV power will be identified with orange outlets throughout the facility.

Isolated Ground Systems

The AV systems isolated ground (IG) system is of paramount importance in providing a clean power source for AV equipment. Care is required to ensure the IG system is designed correctly. We will require a star isolated ground system, meaning that all AV power system grounds ultimately reference the building ground at only one point, typically located in the main electrical service room.

The main branches for the IG system (from main electrical room to branch AV power panels) will be fed with #3/0 AWG insulated ground cable. From these main points, branch load circuits connect to an IG busbar using standard-size (12 or 14 AWG) conductors. In addition, a #3/0 AWG IG conductor must be brought to the AV equipment racks, for termination to an equipment rack busbar, provided by the AV contractor.

AV System Power Requirements

Main Panel AV-1

Panel Location:	Main Electrical Room
Electrical load:	**65.0 kW** (100% of supply to sub panels & company switches)
Feed:	Dedicated 120/208VAC 3-Ø from K-13 rated Delta-Wye transformer with dual electrostatic shield or equivalent HMT type.
Transformer:	75 KVA (assumed 0.9 power factor)
Distribution:	Feeds panel sub panels and AV company switches.
Configuration:	Single breaker or disconnect.
Ground:	Isolated Ground busbar, located in separate NEMA enclosure with #3/0 AWG lugs. Label front of box "TECHNICAL GROUND" with screw-on lamicoid label. See IG section of this report for further information.

Sub-panel AV-1A

Panel Location:	Shared Amp Room
Electrical load:	**36.2 kW** (50% of supply, plus 10% spare)
Feed:	Dedicated 120/208VAC 3-Ø.
Configuration:	Motorized breakers with sequencer-controlled load center with internal IG busbar. Lyntec Mfg RPC Series. #3/0 cable & lug from main technical ground panel.

Branch Loads:

Phase A:
- 2- 120V, 20A circuits to Lambert control area
- 4- 120V, 20A circuits to Lambert stage outlets
- 2- 120V, 20A circuits to Lambert catwalks & grid outlets

Phase B:
- 2- 120V, 20A circuits to Sanctuary control area
- 2- 120V, 20A circuits to Sanctuary stage outlets
- 4- 120V, 20A circuits to Production Control Room outlets

Phase C:
- 8- 120V, 20A circuits to shared amplifier racks

Phase B+C:
- (2) - 208V, 30A, 1Ø circuit to video projectors
  Configuration: NEMA L6-30

Production AV Company Switch: Lambert/Sanctuary - 100A (Qty: 2)

Temporary device load:	**28.8 kW** total (Diversity: 40%)
Feed:	Main AV transformer.
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety "pin and sleeve" connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10" wide x 10" deep x 21" tall each, mounted 3'-0" a.f.f.
Location:	Surface mounted at stage in each theatre.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch
Rating:	NEMA 1 for indoor use

Production AV Company Switch: Courtyard - 100A (Qty: 1)

Temporary device load:	**18.0 kW** total (Diversity: 50%)
Feed:	Standard building power
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety "pin and sleeve" connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10" wide x 10" deep x 21" tall each, mounted 3'-0" a.f.f.
Location:	Surface mounted at outdoor performance area.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch
Rating:	NEMA 4x Rated for outdoor use.

AV Low-Voltage Conduit

All AV low-voltage wiring shall be in dedicated metal raceway to provide EMI/RFI and mechanical isolation. This includes conduit run within concrete slabs. The SC will size the low-voltage conduit and show conduit requirements on a single-line diagram. Division 26 is required to install the conduit and back boxes, per our drawings and specifications. We typically ask that a drawing note is placed on the electrical sheets to indicate to the electrical contractor that they are also responsible for the low-voltage AV conduit work.

The low-voltage portion of the AV system will comprise a significant amount of EMT conduit. The AV system is divided into five signal groups, which EACH requires its own conduit raceway:
A: Mic, B: Line, C: Video & Communications, D: Loudspeaker, E: Empty

As becomes clear, the amount of conduit becomes a significant cost factor, and should be accounted for accordingly. See AV drawings for exact sizes/locations.

Additional AV Requirements

IT/Data Connections

- Provide (4) dedicated TEL/DATA drops to each AV equipment rack from IDF/MDF.
- Provide (4-pair) single or multimode fiber (match building standard) to each AV equipment rack from IDF/MDF.
- Provide (2) data drops to all other locations shown on the drawings.

Fire Alarm Interconnection

A connection to the fire alarm system must be provided to all AV equipment racks. The interface will be used to mute the AV system upon contact closure. Per NFPA.

MISC. ELECTRICAL REQUIREMENTS (PROVIDED UNDER ELECTRICAL)

Loading Dock Shore Power - 50A

Temporary device load:	**6.0 kW** total
Feed:	Other building transformer
Feeders:	Copper.
Device:	Provide UL-listed 50A split-phase 120/240 VAC (or 120/208 if 3-Ø) connection for shore power with local disconnect. NEMA 14-50. Provide in cabinet rated for outdoor use (same as type used at RV parks.)
Space required:	12" x 12" x 12".
Locations:	Loading dock

Lambert & Sanctuary

Misc. production power:	Miscellaneous 120VAC 1-Ø outlets will be required for general, shop and special purpose uses. Locations to be laid out by The SC. Assume a maximum of (25) outlets with minimal loads. Approximately (2) dedicated 20A, 120/208VAC, 3-Ø, L21-20 receptacles for followspot lights.
Dressing rooms:	Dressing stations require plug mold or quad outlets above the countertop - assume (1) dedicated 20A circuit for every two stations (30" of counter space each). Per NEC, requirements these outlets are required to be switched at the entry doorways and are to have indicators visible in the adjacent corridor. Provide general purpose power below the countertop at +/-10'-0" o.c.
Laundry/Wardrobe:	At wardrobe rooms, provide power for (1) washer and (1) clothes dryer. Provide (2) each dedicated receptacles for sewing machines and steamers.
Lighting Controls:	Lighting in the Lambert and Sanctuary stages, support spaces, vestibules and lobby will all be on a centralized control system provided by Div. 11. All circuits shall route back to the architectural relay panel and should be assigned as appropriate by load type with input from The SC. Electrical engineer shall show circuit assignments and panels schedule for all attached loads. Theatrical drawings will show DMX patch assignment schedules only. All other portions of the building, including some areas with theatrical production lighting, will have lighting controls managed by the electrical systems controller. Lighting control systems shall be designed and documented by the project electrical engineer and installed under electrical work. *Lobby:* The lobby lighting will be controlled separately from the theatrical systems.

Work lighting:	Work lighting controls shall be low voltage with local and central controls. Control stations will be provided by Division 11 and installed by electrical. Stage run lights: the perimeter of the stage will have 3 circuits of relay controlled grey duplex receptacles, with engraved faceplates labeled "runlights" Stage work lighting: LED industrial fixtures surface mounted on the underside of the stage roof, and sufficient to illuminate stage below. Theatrical lighting battens may also include work lighting. Circulation lighting: Non-audience circulation areas that immediately connect to the Stage and Audience chamber, such as stairwells, halls and vestibules, shall have two systems of lighting, both controlled via low voltage relay. One system of overhead or wall mounted LED light and general activity and a second system of dimmable LED with blue filters, either overhead or louvered step lights for low lighting levels during performances.
Emergency Egress lighting:	Code-required emergency exit lighting system. If desired, an emergency transfer switch can be implemented as part of the house lighting system to allow house lighting fixtures to provide "double-duty." However, due to the complexity of emergency system management on LED house lighting systems, we strongly recommend that a secondary emergency lighting system be implemented utilizing dedicated and discreetly located fixtures.
Fire protection:	Standard smoke detectors, beam detectors and other particulate detectors may be falsely triggered by theatrical effects smoke. We recommend using rate or rise detectors, multiple parameter or air sampling systems in the stage and audience chamber. If air sampling system is chosen, the vacuum unit must be located outside of the stage or audience area, due to noise.
Exit Signage:	Exit signage should *not* be direct view LED or edge-lit type, as the lighting spill tends to be problematic. We prefer RED backlit exit fixtures, as they are least visually obtrusive in a dark theatre. If allowable, we prefer Tritium type exit signs at all backstage locations and in the audience chamber.

House lighting:

We anticipate the use of LED house lighting. The LED fixtures selected will need to look good and offer pleasing color temperature, color rendering and lighting quality. A theatre is a special environment with a lower-than-normal tolerance for poor light quality. Audiences expect a warm incandescent light. The dimming curve and quality of the selected fixture(s) should not have any perceivable stepping or jitter and should dim smoothly to a complete dark state. Fixtures that dim down to a low percentage and then snap off are not acceptable in a performing arts environment.

We recommend a fixture with a color temperature of ~3000K degrees and CRI of 90 minimum. We would further recommend a fixture which is capable of amber shift in the low dimming ranges. Lighting levels shall be capable of a low theatrical level of ~15fc as well as at a higher utility level of ~30-40fc. Fixtures shall dim smoothly in unison to and from zero, and be sized to generate 35-40 foot candles.

The owner should be consulted regarding any required minimum levels for specialty use.

All LED lighting in view of the audience in the audience chamber shall be dimmed via DMX control, 0-10V, or DALI. Line voltage dimming options are not acceptable. Dimmed architectural lighting in other areas, such as vestibules and lobby spaces, may be 0-10V or other dimming. Note: The Sensor IQ Relay panel is capable of outputting 0-10v control signal natively.

DMX-controlled dimmable LED fixtures from theatrical systems manufacturers tend to work best as house lights. Recommended fixtures include:

- Gotham Incitio,
- The Light Source LED Fresnel,
- Altman Chalice,
- Axceleron by Aquarii,
- GDS by ETC
- Symphony or similar by Kirlin Lighting
- Ovation H-605FC by Chauvet Professional

DMX wiring and conduit infrastructure must be documented on the electrical drawings for Div 26 install.

Aisle lighting:

Theatre seating aisles are required to have egress lighting at all times when the theatre is occupied. These lights are controlled by the production control system. If the emergency lighting is adequate, they may also not be required to be on an emergency circuit. Aisle lighting method and control is to be determined. Provide (4) dedicated 20A circuits. The transformers supplied by the seating contractor shall be shown on the electrical drawings for installation by div 26.

Aisle lights

General:	Linear LED strips or round fixtures mounted to armrest or end panel
Wire leads:	48” whips in metal conduit or jacketed sleeves provided at each seat.
Load:	<100w (max. 1.5w each – QTY. ~50)
Voltage:	120v to 12v or 24v transformers provided with seating contract.
Dimmers:	Can be provided with line voltage dimmers for intensity level setting or with 0-10v or DMX. Should never be allowed to be off for emergency.
Branch wiring:	provide #12 min for voltage drop. #10 on ling runs.
Connections:	Provided junction box in floor or on riser beneath each end seat. To be coordinated in to floor or riser surface per details on seating drawings and per manufacturer’s direction during submittals.
Fed from:	Standard building Power.
Product:	Versaline by Tivoli Lighting.

Mechanical Engineering Criteria

PRODUCTION LIGHTING SYSTEMS

Production Lighting Fixtures – Lambert

Audience chamber load:	**10.0 kW** average
Source location:	Technical positions overhead at +/-24'-0" a.f.f.
Design temperature:	Comfortable room temperature
Stage area load:	**20.0 kW** average
Source location:	Technical positions overhead at +/-24'-0" a.f.f.
Design temperature:	75◦F average
Stage air:	Air movement shall be planned to minimize the movement of stage draperies and scenery. There shall be no pressure differential across the Proscenium. Air on stage should either be dropped from above or be supplied from the side and returned at the side(s) in order to provide movement stage sideways across the draperies and scenery.

Production Lighting Fixtures - Sanctuary

Room load:	**8.0 kW** maximum
Source location:	Technical positions overhead at +/-12'-0" a.f.f.
Design temperature:	Normal comfortable room temperature

Relay Room:

Equipment load:	**1.0 kW** average in dimmer room for long durations
Maximum temperature:	80◦F

PRODUCTION AV SYSTEMS

Amplifier Room (Shared):

Equipment load:	**6.0 kW** average for long durations
Maximum temperature:	80◦F

RELATED ROOMS

Production Control Room - Lambert

Typical Load:	**4.0 kW**
Maximum temperature:	Normal comfortable room temperature.
Average Occupancy Load:	Six

Dressing Rooms

Dressing stations:	Assume **0.36 kW** per station (30" of counter space) from vanity lighting, plus room lighting and occupancy load

Structural Engineering Criteria

PRODUCTION RIGGING AND MACHINERY SYSYTEMS

Scope

We will design and specify the rigging systems in dedicated drawings and in Division 11 specifications. The system will be installed in its entirety under Div. 11. Our documents will be oriented to show/specify the equipment and devices only. The infrastructure for the system such as attachment backing or steel must be assessed and designed by the Structural Engineer and shown within their documents. We will provide CAD layers of devices and review and coordinate with the structural documents. For rigging systems, our documents will include mounting details. The specifications will require that the rigging shop drawings bear the stamp of a Structural Engineer licensed in the state of the project.

Stage

Stage Floor description:	We anticipate that the stage floor will be an assembly of wood over a depressed concrete slab.
Stage Floor Load:	We would expect that the code required live loading for the stage floor would be satisfactory at the code-stipulated amounts.

Catwalks

System description:	Lighting catwalks and side lighting pipes are located in the audience chamber and over the stage in the Theatre.
Loads:	The railings at the catwalk and the side pipes should be designed to support 30#/linear foot of pipe, in addition to catwalk loading as required by code (40#/sf -verify.) OSHA standards for catwalks and railings should be accommodated.

Lighting Pipes in Lambert Hall & Sanctuary

System description:	Lighting rails on catwalks, balcony front, side lighting positions and onstage galleries to be 1-1/2” schedule 40 pipe for use as an attachment armature for stage lighting and scenery.
Loads:	The pipes and attachments of the grid should be designed to support 25#/linear foot along pipes, with 300# point loads possible at any point along the pipes. Typical hangers should be at 10’ on center maximum.

Fire Detection/Prevention System Criteria

Fire protection:	Standard smoke detectors, beam detectors and other particulate detectors may be falsely triggered by theatrical effects smoke. We recommend using rate or rise detectors, multiple parameter or air sampling systems in the stage and audience chamber. If air sampling system is chosen, the vacuum unit must be located outside of the stage or audience area, due to noise.
	Smoke detector and alarm indicators must be placed with care. Avoid placing them in locations in which they will be covered by curtain or scenery. Likewise, please do not place horn/strobe devices on the face of the proscenium wall and require that all boxes for fire alarm devices in the audience chamber be custom colored. Verify all device placement in the stage and audience chamber with The SC.
Smoke vents	Smoke vents must be provided equivalent to 5% of the stage area for each stage. The Smoke vents will require electrical emergency release buttons on emergency power sources. Buttons located at stage level will trigger devices located at the smoke vent at the ceiling level.
Sprinkler	Sprinkler pipes must be carefully planned and meticulously routed to avoid conflict with rigging and lighting systems. What may appear as open space or chase space may in fact be a critical area for moving scenery or rigging equipment or a zone which must be kept clear for lighting projection or stage effects. All routing must be verified by The SC.
Fire Hose Cabinet	Stage requires 2 fire hose cabinets separated on each side of the stage. These should be placed where they will not be blocked by scenery.
Fire Alarm Interconnection	A connection to the fire alarm system must be provided to all AV equipment racks. The interface will be used to mute the AV system upon contact closure. Per NFPA.

END OF REPORT

The Shalleck Collaborative Inc.
Planning and Design of Theatres | Production Systems | AV

TRANSMITTAL / MEMO

Project:	Houston Center for Musical Arts		
Date:	August 11, 2023	*Via:*	e-mail
To:	Paul Vaivoda, AIA & Tom Hains, AIA Wilson Butler Architects		
From:	Adam Shalleck, FAIA Ian Hunter, CTS-D		
Re:	Production Systems Budget Recommendations Programming Phase, rev. 2	*# of pgs. including cover:*	5

Paul & Tom,

Below are listed the budget recommendations for production systems within the Houston Center for Musical Arts project.

Please forward this to the Cost Estimator for the project for inclusion in the total estimate. It is important to note that not all sections represent a complete and installed cost. In particular, the Cost Estimator(s) who is/are responsible for structural and electrical costs will need to include production systems infrastructure and installation (in the case of electrical) that normally falls under Divisions 5 and 26. Those major needs are described below and in our "Production Engineering Report."

The recommendations below are listed in 2023 dollars and do not include General Contractors mark-up and general conditions or overall contingencies.

BASE SYSTEMS

1. Lambert Hall - Theatre

Rigging System - Section 11 61 33 **$200,000**
Rigging system to include (3) motorized hoists for stage electrics battens, (10) dead-hung battens, (3) bi-part drape tracks, installed. Rigging points over stage to accommodate LED wall or other portable equipment.
Related Exclusions: Structural accommodation as needed for rigging system, motorized fire/smoke roof vents equal to 5% of stage area.

Onstage Orchestra Screens - Section 11 61 33 **$300,000**
Allowance includes 4 sections of 12' tall hinged, castered, stressed skin panels of 3/8" MDF skins over + 3" honeycomb ready to accept architectural finish and motorized drive system, installed.
Related Exclusions: Structural accommodation as needed for heavy hinged panels, electrical connections for motor drive.

Orchestra Pit Filler/Stage Extension Platforms– Section 11 61 23 **$80,000**
Budget includes a system of platforms and understructures to fill the orchestra pit area, and orchestra pit safety net.
Related Exclusions: Structural accommodations as needed.

Production Lighting Control – Section 11 61 83 **$140,000**
Budget includes (48) 20A, DMX controlled relay circuits for production lighting and (24) 20A, DMX controlled relay circuits for architectural lighting. Control console w/ RFU, architectural button stations, architectural control processor and network components, control and circuit wiring devices, cable package, equipment only.
Related Exclusions: Electrical work including constant power receptacles, distribution and control wire, conduit, and complete installation. Emergency lighting system. See electrical report for further information. Requires use of LED lighting fixtures for house light.

Fixed Theatre Seating – Section 12 61 00 **$195,000**
Budget allowance of $650/seat x 300 seats: includes fixed, upholstered theatre chairs with gravity uplift, aisle lights and donor plates, installed.
Does not include cup holders, tablet arms, or electrical power at seats.
Related Exclusions: Electrical connection for aisle lighting.

Production AV Systems – Section 27 41 16 **$450,000**
Comprehensive system to include wiring infrastructure, motorized roll-down projection screen with fixed HD laser projector and video switcher/transport, digital audio mixing console, wireless mics, loudspeaker system suitable for live music, touchpanel control, production intercom, monitoring to all technical and public areas, mixing in booth and in-house, FM assistive listening. Cabling infrastructure only to accommodate portable audio/video recording/streaming equipment and portable LED video wall. Wire, pull, and complete system integration and installation.
Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system, as well as specialty electrical systems noted in the engineering report.

2. Sanctuary Building

Variable Acoustics – Section 11 61 33 **$100,000**
Budget includes (8) motorized banners with simple control system, as required by the project acoustician, installed.
Related Exclusions: Structural support as needed, electrical connections as needed.

Integrated Piano Lift– Section 11 61 33 **$20,000**
Budget includes (1) 8' x 7' short travel electro-mechanical lift integrated into the fixed portion of the presentation platform to convey pianos between the audience level and platform level, installed.
Related Exclusions: Structural support as needed, electrical connections as needed.

Stage Extension Platforms– Section 11 61 23 **$25,000**
Budget includes ~200 sf portable stage extension platforms and accessories. Installed.
Related Exclusions: Structural accommodations as needed.

Production Lighting Control – Section 11 61 83 **$100,000**
Budget includes (48) 20A, DMX controlled relay circuits for production and architectural lighting. Control console w/ RFU, architectural button stations, architectural control processor and network components, control and circuit wiring devices, cable package, equipment only.

Related Exclusions: Electrical work including constant power receptacles, distribution and control wire, conduit, and complete installation. Emergency lighting system. See electrical report for further information. Requires use of LED lighting fixtures for house light.

Production AV Systems – Section 27 41 16 **$250,000**
Comprehensive system to include wiring infrastructure, motorized roll-down projection screen with fixed HD laser projector and video switcher/transport, digital audio mixing console, wireless mics, loudspeaker system, touchpanel control, production intercom, monitoring to all technical and public areas, mixing in-house, FM assistive listening. Wire, pull, and complete system integration and installation.
Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system, as well as specialty electrical systems noted in the engineering report.

3. Rehearsal Room (Medium)

AV Systems - Section 27 41 16 **$30,000**
Simple rehearsal and instructional system to include projector and screen, enhanced playback and voice amplification audio system with wireless mics and playback devices, touchpanel control system. Wire, pull and system integration and installation.
Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system, as well as specialty electrical systems noted in the engineering report.

4. Rehearsal /Warm Up Room– Qty: 4

AV Systems - Section 27 41 16 **$15,000/ea x 4 = $60,000**
Simple rehearsal and instructional system to include flat panel display, enhanced playback audio system with playback devices, touchpanel control system. Wire, pull and system integration and installation.
Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system, as well as specialty electrical systems noted in the engineering report.

5. Conference Room

AV Systems - Section 27 41 16 **$10,000**
Standard conference system with laptop and video connections at wall or in floor box, Flat Panel display, soundbar with integrated camera/microphones/speakers, simple control system, audio playback. Wire, pull and system integration and installation.
Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system, as well as specialty electrical systems noted in the engineering report.

6. Donor Lounge

AV Systems - Section 27 41 16 **$10,000**
Standard conference system with laptop and video connections at wall or in floor box, Flat Panel display, soundbar with integrated camera/microphones/speakers, simple control system, audio playback. Wire, pull and system integration and installation.

Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system, as well as specialty electrical systems noted in the engineering report.

7. Lobby / Digital Signage

AV Systems – Section 27 41 16 **$5,000/ea x 3 = $15,000**
Flat panel monitor, mount and digital signage player with latecomer monitoring.
Related Exclusions: Electrical work including all line voltage connections (complete), and providing and installing all low-voltage conduit and backboxes required by the AV system.

FF&E SYSTEMS – To be Included in Base Building Cost Estimate

Lambert Hall

Stage Draperies **$75,000**
Allowance to include main curtain, legs/borders, stage travelers, scrim and cyclorama, installed.

Production Lighting Fixtures **$175,000**
Allowance to include LED stage lighting fixtures, follow spots, cable and accessories.

Portable AV Equipment **$50,000**
Allowance to include loose/portable AV equipment such as mics, stands, cables, production intercom.

Portable Video Wall Equipment **$250,000**
Demountable, scenery backdrop-oriented, input, suspension rigging, storage/transport cases, 40' wide x 20' high, initial installation.

Sanctuary Building

Production Lighting Fixtures **$50,000**
Allowance to include LED stage lighting fixtures, follow spots, cable and accessories.

Portable AV Equipment **$25,000**
Allowance to include loose/portable AV equipment such as mics, stands, cables, production intercom.

NON-THEATRE TRADES

Miscellaneous Aspects To Be Included In Other Base Bldg. Sections

Electrical & Mechanical Accommodations
As indicated in the engineering report

Specialty Architectural Lighting
As indicated by the project architectural lighting designer
LED fixture with DMX dimming capability required for theatre house lighting

Structural:
Lambert Hall - rigging steel at stage and ante-pro on 10' centers upstage-downstage.

Technical Circulation:
Lambert Hall - Catwalks and railings, approximately 350 LF of 3' wide catwalks with railings both sides, comprised of (2) runs of 1-1/2" schedule 40 steel pipe, 4" toe kick, and vertical supports on 4' to 8' centers with adjustable lighting pipe accommodations.

Millwork: allowance for cabinets
Dressing Rooms - counters, mirrors, shelves, laundry
Control Areas

Specialty Floors – Lamber Hall:
Stage Floors – "resilient" floor assembly of:
¾" dropped tongue and groove plain sawn hardwood T&G, blind nailed over
Asphalt paper over
2 layers ¾" A/C plywood over
2x4 treated sleepers at 16" o.c. over
4" square x ¾" thick Mason Industries "Super W" resilient pads and shims over concrete
5" depression depth required

Portable/Temporary Cable Paths:
8" pipe connecting the stage, orchestra pit, AV mix location, basement recording room.

END OF REPORT

Houston Center for Musical Arts
Production Systems Engineering Report – Programming Phase, rev. 2
August 11, 2023

The following report outlines the anticipated theatrical productions systems electrical and mechanical requirements for the performance facilities at the Houston Center for Musical Arts project. It is intended to inform the cost planning of the building by recommending the required capacities and other considerations for electrical and mechanical systems.

Rev 2 changes in blue

Electrical Engineering Criteria

Transformer

Transformer "PL-1" - Dedicated 120/208VAC 3-phase, K-13 rated transformer, or equivalent HMT model

Size: **225 KVA** (assuming power factor of 0.9)

Feeds: Lambert Theatre:
- (1) Production Lighting Relay Panel
- (1) Architectural Relay Panel
- (1) Company Switch

Sanctuary:
- (1) Production / Architectural Lighting Relay Panel
- (1) Company Switch

Production Lighting Relay Panels (Qty: 2)

Load: **57.6 kW each** - peak anticipated (50% diversity)

Fed from: Transformer "PL-1"

Feeders: Copper, Provide feeders for each panel.

Breakers: (2) 200A, 120/208VAC 3-phase at shared dimmer room (Main breakers are integrated into panel)

Space required: Each panel requires 20"w x 6"d (+3' clearance) x 6'-0" high. Rear access not required; run feeders into bottom of panel and branch loads into top. We recommend providing an enclosed gutter, pull box or wireway above panels to land branch conduits, then stub down into panel with large conduits.

Location: Lambert and Sanctuary "dimmer" rooms

Product: ETC Sensor IQ Panel (48-ckt w/ Mains Breaker)

Production Lighting Company Switch - 200A (Lambert)

Temporary device load: **36.0 kW** total – 50% simultaneous with relay load above.

Feed: On lighting transformer "PL-1".

Feeders: Copper, with neutrals 2x oversized as current carrying conductor.

Device: Provide theatre industry UL listed standard company switch which includes one 200A, 120/208VAC 3-Ø cam-lock safety connection panel. This would be specified in Div. 16 with products recommended by The SC.

Space required:	30” wide x 12” deep x 48” tall each, mounted 2’-0” a.f.f.
Location:	Surface mounted at stage

Production Lighting Company Switch – 100A (Sanctuary)

Temporary device load:	**18.0 kW** total –50% simultaneous with theatrical relay loads above.
Feed:	Transformer “PL-1”.
Feeders:	Copper, with neutrals 2x oversized as current carrying conductor.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety “pin and sleeve” connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10” wide x 10” deep x 21” tall each, mounted 3’-0” a.f.f.
Location:	Surface mounted at rear side wall.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch

Production Lighting Company Switch – 100A (Courtyard)

Temporary device load:	**18.0 kW** total (Diversity: 50%)
Feed:	Standard building power
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety “pin and sleeve” connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10” wide x 10” deep x 21” tall each, mounted 3’-0” a.f.f.
Location:	Surface mounted at outdoor performance area.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch
Rating:	NEMA 4x Rated for outdoor use.

Architectural and Work Light Relay Panel (Qty: 1)

Load:	**28.8 kW** peak anticipated in Lambert (50% diversity)
Fed from:	Transformer “PL-1”.
Feeders:	Copper, Provide feeders for each panel.
Breakers:	(1) 100A, 120/208VAC 3-phase panel at Dimmer Room (Main breakers are integrated into panel)
Space required:	Each panel requires 20”w x 6”d (+3’ clearance) x 6’-0” high. Rear access not required; run feeders into bottom of panel and branch loads into top. We recommend providing an enclosed gutter, pull box or wireway above panels to land branch conduits, then stub down into panel with large conduits.
Location:	Lambert “dimmer” room
Product:	ETC Echo Panel (24-ckt w/ Mains Breaker)
Purpose:	To consolidate and integrate architectural lighting circuits onto a cohesive network using typical production lighting control system protocol.

Branch Loads

Wiring devices:	Production lighting wiring devices are to be provided under Div. 11 and installed by Electrical. Devices come prewired with labeled terminal strips for branch wiring to the relay panels. Circuits are numbered at the device with a corresponding relay number. Theatrical Consultant's drawings will show production lighting device locations, details and circuit numbers. Circuit numbers should not be repeated on the electrical drawings. Electrical drawings would show conduit and wire required. Provide 20A full load wiring that limits voltage drop to 3% at 1,000w (minimum #10 unless runs are very long). We anticipate a total of approximately (48) branch circuits for production lighting in the Lambert and (24) branch circuits for production lighting in the Sanctuary. Relay modules are 80% rated; wire should be sized for a full 20A load.
Architectural lighting:	DMX-controlled house lights will be connected to a low voltage relay panel, Architectural and Work Light Relay Panel above, provided by Div 11 and installed by electrical. Architectural loads will be circuited and scheduled by the Electrical Engineer with input from The SC. DMX control addressing will be provided by The SC. Recommended fixtures are listed below under Misc. Electrical Requirements/ Lighting Controls.
Emergency lighting:	Should the emergency egress lighting plan call for the transfer of DMX-controlled LED house lighting, a UL 1008 transfer device and UL rated DMX driver will be required. This would be specified by the Electrical Engineer with products recommended by The SC.

PRODUCTION RIGGING AND MACHINERY SYSTEMS

Motorized Rigging Systems - Lambert

Motor load:	(3) 2.0 HP motors above stage
Motor feed:	Standard building power other than transformer "PL-1"
Required power:	208 VAC, 3-Ø.
Control system:	Minimal 120V power.
Disconnect:	(1) At each motor unit. Units include on board starters and control.
Control devices:	The motorized rigging safety and control devices to be furnished and installed under Div. 11. Devices will come prewired for connection to electrical service. The SC's drawings will show device locations, details, point-to-point connection and wire type for control systems only. Electrical drawings would show conduit, line voltage wiring, and cross reference Production Systems documents for control wiring required. Provision of wire and complete electrical interconnection and termination by Div. 26.
Device Locations:	At counterweight operator position, stage deck.

Variable Acoustic Drapery and Lift Systems – Sanctuary

Motor loads:	(9) 1/4 HP motors.
Feed:	Standard building power *other than* transformer "PL-1".
Required power:	120 VAC, 1-Ø.
Locations:	(8) at ceiling; (1) at floor level
Notes:	The acoustic drapery banners and lift table (with onboard motors) are provided under Div. 11. Low voltage control panel will be located at stage level. Conduit, back boxes, wire and wire pull are provided under Division 26.
Products:	"acouRoll" by acouStaCorp/Texas Scenic or similar by Wenger Electro-mechanical lift "table" style, scissor braced by Serapid or Gala

PRODUCTION AV SYSTEMS

Scope

The Shalleck Collaborative will design and specify the AV system equipment and devices in dedicated drawings and in Division 27 specifications. The system will be installed in its entirety under Div. 27. The Electrical Engineer is responsible for designing and documenting all power related systems including specifying the conduit size and route, back boxes, and all junction boxes etc. The Shalleck Collaborative will provide CAD layers of devices to facilitate the Electrical Engineers documentation and will review and coordinate the AV power systems with the electrical documents.

All power to AV systems must be on a dedicated K-13 rated or HMT-style transformer, combined with an isolated ground system. AV power will be identified with orange outlets throughout the facility.

Isolated Ground Systems

The AV systems isolated ground (IG) system is of paramount importance in providing a clean power source for AV equipment. Care is required to ensure the IG system is designed correctly. We will require a star isolated ground system, meaning that all AV power system grounds ultimately reference the building ground at only one point, typically located in the main electrical service room.

The main branches for the IG system (from main electrical room to branch AV power panels) will be fed with #3/0 AWG insulated ground cable. From these main points, branch load circuits connect to an IG busbar using standard-size (12 or 14 AWG) conductors. In addition, a #3/0 AWG IG conductor must be brought to the AV equipment racks, for termination to an equipment rack busbar, provided by the AV contractor.

AV System Power Requirements

Main Panel AV-1

Panel Location:	Main Electrical Room
Electrical load:	**65.0 kW** (100% of supply to sub panels & company switches)
Feed:	Dedicated 120/208VAC 3-Ø from K-13 rated Delta-Wye transformer with dual electrostatic shield or equivalent HMT type.
Transformer:	75 KVA (assumed 0.9 power factor)
Distribution:	Feeds panel sub panels and AV company switches.
Configuration:	Single breaker or disconnect.
Ground:	Isolated Ground busbar, located in separate NEMA enclosure with #3/0 AWG lugs. Label front of box "TECHNICAL GROUND" with screw-on lamicoid label. See IG section of this report for further information.

Sub-panel AV-1A

Panel Location:	Shared Amp Room
Electrical load:	**36.2 kW** (50% of supply, plus 10% spare)
Feed:	Dedicated 120/208VAC 3-Ø.
Configuration:	Motorized breakers with sequencer-controlled load center with internal IG busbar. Lyntec Mfg RPC Series. #3/0 cable & lug from main technical ground panel.

Branch Loads:

Phase A:
- 2- 120V, 20A circuits to Lambert control area
- 4- 120V, 20A circuits to Lambert stage outlets
- 2- 120V, 20A circuits to Lambert catwalks & grid outlets

Phase B:
- 2- 120V, 20A circuits to Sanctuary control area
- 2- 120V, 20A circuits to Sanctuary stage outlets
- 4- 120V, 20A circuits to Production Control Room outlets

Phase C:
- 8- 120V, 20A circuits to shared amplifier racks

Phase B+C:
- (2) - 208V, 30A, 1Ø circuit to video projectors
  Configuration: NEMA L6-30

Production AV Company Switch: Lambert/Sanctuary - 100A (Qty: 2)

Temporary device load:	**28.8 kW** total (Diversity: 40%)
Feed:	Main AV transformer.
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety "pin and sleeve" connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10" wide x 10" deep x 21" tall each, mounted 3'-0" a.f.f.
Location:	Surface mounted at stage in each theatre.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch
Rating:	NEMA 1 for indoor use

Production AV Company Switch: Courtyard - 100A (Qty: 1)

Temporary device load:	**18.0 kW** total (Diversity: 50%)
Feed:	Standard building power
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switches which include a 100A, 120/208VAC 3-Ø safety "pin and sleeve" connection panel. This would be specified in Div. 26 with products recommended by The SC.
Space required:	10" wide x 10" deep x 21" tall each, mounted 3'-0" a.f.f.
Location:	Surface mounted at outdoor performance area.
Product:	ESL Power Model #3361-00, Pin & Sleeve Company Switch
Rating:	NEMA 4x Rated for outdoor use.

AV Low-Voltage Conduit

All AV low-voltage wiring shall be in dedicated metal raceway to provide EMI/RFI and mechanical isolation. This includes conduit run within concrete slabs. The SC will size the low-voltage conduit and show conduit requirements on a single-line diagram. Division 26 is required to install the conduit and back boxes, per our drawings and specifications. We typically ask that a drawing note is placed on the electrical sheets to indicate to the electrical contractor that they are also responsible for the low-voltage AV conduit work.

The low-voltage portion of the AV system will comprise a significant amount of EMT conduit. The AV system is divided into five signal groups, which EACH requires its own conduit raceway:

A: Mic, B: Line, C: Video & Communications, D: Loudspeaker, E: Empty

As becomes clear, the amount of conduit becomes a significant cost factor, and should be accounted for accordingly. See AV drawings for exact sizes/locations.

Additional AV Requirements

IT/Data Connections

- Provide (4) dedicated TEL/DATA drops to each AV equipment rack from IDF/MDF.
- Provide (4-pair) single or multimode fiber (match building standard) to each AV equipment rack from IDF/MDF.
- Provide (2) data drops to all other locations shown on the drawings.

Fire Alarm Interconnection

A connection to the fire alarm system must be provided to all AV equipment racks. The interface will be used to mute the AV system upon contact closure. Per NFPA.

MISC. ELECTRICAL REQUIREMENTS (PROVIDED UNDER ELECTRICAL)

Loading Dock Shore Power - 50A

Temporary device load:	**6.0 kW** total
Feed:	Other building transformer
Feeders:	Copper.
Device:	Provide UL-listed 50A split-phase 120/240 VAC (or 120/208 if 3-Ø) connection for shore power with local disconnect. NEMA 14-50. Provide in cabinet rated for outdoor use (same as type used at RV parks.)
Space required:	12" x 12" x 12".
Locations:	Loading dock

Lambert & Sanctuary

Misc. production power:	Miscellaneous 120VAC 1-Ø outlets will be required for general, shop and special purpose uses. Locations to be laid out by The SC. Assume a maximum of (25) outlets with minimal loads. Approximately (2) dedicated 20A, 120/208VAC, 3-Ø, L21-20 receptacles for followspot lights.
Dressing rooms:	Dressing stations require plug mold or quad outlets above the countertop - assume (1) dedicated 20A circuit for every two stations (30" of counter space each). Per NEC, requirements these outlets are required to be switched at the entry doorways and are to have indicators visible in the adjacent corridor. Provide general purpose power below the countertop at +/-10'-0" o.c.
Laundry/Wardrobe:	At wardrobe rooms, provide power for (1) washer and (1) clothes dryer. Provide (2) each dedicated receptacles for sewing machines and steamers.
Lighting Controls:	Lighting in the Lambert and Sanctuary stages, support spaces, vestibules and lobby will all be on a centralized control system provided by Div. 11. All circuits shall route back to the architectural relay panel and should be assigned as appropriate by load type with input from The SC. Electrical engineer shall show circuit assignments and panels schedule for all attached loads. Theatrical drawings will show DMX patch assignment schedules only. All other portions of the building, including some areas with theatrical production lighting, will have lighting controls managed by the electrical systems controller. Lighting control systems shall be designed and documented by the project electrical engineer and installed under electrical work. *Lobby:* The lobby lighting will be controlled separately from the theatrical systems.

Work lighting:	Work lighting controls shall be low voltage with local and central controls. Control stations will be provided by Division 11 and installed by electrical. Stage run lights: the perimeter of the stage will have 3 circuits of relay controlled grey duplex receptacles, with engraved faceplates labeled "runlights" Stage work lighting: LED industrial fixtures surface mounted on the underside of the stage roof, and sufficient to illuminate stage below. Theatrical lighting battens may also include work lighting. Circulation lighting: Non-audience circulation areas that immediately connect to the Stage and Audience chamber, such as stairwells, halls and vestibules, shall have two systems of lighting, both controlled via low voltage relay. One system of overhead or wall mounted LED light and general activity and a second system of dimmable LED with blue filters, either overhead or louvered step lights for low lighting levels during performances.
Emergency Egress lighting:	Code-required emergency exit lighting system. If desired, an emergency transfer switch can be implemented as part of the house lighting system to allow house lighting fixtures to provide "double-duty." However, due to the complexity of emergency system management on LED house lighting systems, we strongly recommend that a secondary emergency lighting system be implemented utilizing dedicated and discreetly located fixtures.
Fire protection:	Standard smoke detectors, beam detectors and other particulate detectors may be falsely triggered by theatrical effects smoke. We recommend using rate or rise detectors, multiple parameter or air sampling systems in the stage and audience chamber. If air sampling system is chosen, the vacuum unit must be located outside of the stage or audience area, due to noise.
Exit Signage:	Exit signage should *not* be direct view LED or edge-lit type, as the lighting spill tends to be problematic. We prefer RED backlit exit fixtures, as they are least visually obtrusive in a dark theatre. If allowable, we prefer Tritium type exit signs at all backstage locations and in the audience chamber.

House lighting:

We anticipate the use of LED house lighting. The LED fixtures selected will need to look good and offer pleasing color temperature, color rendering and lighting quality. A theatre is a special environment with a lower-than-normal tolerance for poor light quality. Audiences expect a warm incandescent light. The dimming curve and quality of the selected fixture(s) should not have any perceivable stepping or jitter and should dim smoothly to a complete dark state. Fixtures that dim down to a low percentage and then snap off are not acceptable in a performing arts environment.

We recommend a fixture with a color temperature of ~3000K degrees and CRI of 90 minimum. We would further recommend a fixture which is capable of amber shift in the low dimming ranges. Lighting levels shall be capable of a low theatrical level of ~15fc as well as at a higher utility level of ~30-40fc. Fixtures shall dim smoothly in unison to and from zero, and be sized to generate 35-40 foot candles.

The owner should be consulted regarding any required minimum levels for specialty use.

All LED lighting in view of the audience in the audience chamber shall be dimmed via DMX control, 0-10V, or DALI. Line voltage dimming options are not acceptable. Dimmed architectural lighting in other areas, such as vestibules and lobby spaces, may be 0-10V or other dimming. Note: The Sensor IQ Relay panel is capable of outputting 0-10v control signal natively.

DMX-controlled dimmable LED fixtures from theatrical systems manufacturers tend to work best as house lights. Recommended fixtures include:

- Gotham Incitio,
- The Light Source LED Fresnel,
- Altman Chalice,
- Axceleron by Aquarii,
- GDS by ETC
- Symphony or similar by Kirlin Lighting
- Ovation H-605FC by Chauvet Professional

DMX wiring and conduit infrastructure must be documented on the electrical drawings for Div 26 install.

Aisle lighting:

Theatre seating aisles are required to have egress lighting at all times when the theatre is occupied. These lights are controlled by the production control system. If the emergency lighting is adequate, they may also not be required to be on an emergency circuit. Aisle lighting method and control is to be determined. Provide (4) dedicated 20A circuits. The transformers supplied by the seating contractor shall be shown on the electrical drawings for installation by div 26.

Aisle lights

General:	Linear LED strips or round fixtures mounted to armrest or end panel
Wire leads:	48” whips in metal conduit or jacketed sleeves provided at each seat.
Load:	<100w (max. 1.5w each – QTY. ~50)
Voltage:	120v to 12v or 24v transformers provided with seating contract.
Dimmers:	Can be provided with line voltage dimmers for intensity level setting or with 0-10v or DMX. Should never be allowed to be off for emergency.
Branch wiring:	provide #12 min for voltage drop. #10 on ling runs.
Connections:	Provided junction box in floor or on riser beneath each end seat. To be coordinated in to floor or riser surface per details on seating drawings and per manufacturer’s direction during submittals.
Fed from:	Standard building Power.
Product:	Versaline by Tivoli Lighting.

Mechanical Engineering Criteria

PRODUCTION LIGHTING SYSTEMS

Production Lighting Fixtures – Lambert

Audience chamber load:	**10.0 kW** average
Source location:	Technical positions overhead at +/-24'-0" a.f.f.
Design temperature:	Comfortable room temperature
Stage area load:	**20.0 kW** average
Source location:	Technical positions overhead at +/-24'-0" a.f.f.
Design temperature:	75◦F average
Stage air:	Air movement shall be planned to minimize the movement of stage draperies and scenery. There shall be no pressure differential across the Proscenium. Air on stage should either be dropped from above or be supplied from the side and returned at the side(s) in order to provide movement stage sideways across the draperies and scenery.

Production Lighting Fixtures - Sanctuary

Room load:	**8.0 kW** maximum
Source location:	Technical positions overhead at +/-12'-0" a.f.f.
Design temperature:	Normal comfortable room temperature

Relay Room:

Equipment load:	**1.0 kW** average in dimmer room for long durations
Maximum temperature:	80◦F

PRODUCTION AV SYSTEMS

Amplifier Room (Shared):

Equipment load:	**6.0 kW** average for long durations
Maximum temperature:	80◦F

RELATED ROOMS

Production Control Room - Lambert

Typical Load:	**4.0 kW**
Maximum temperature:	Normal comfortable room temperature.
Average Occupancy Load:	Six

Dressing Rooms

Dressing stations:	Assume **0.36 kW** per station (30" of counter space) from vanity lighting, plus room lighting and occupancy load

Structural Engineering Criteria

PRODUCTION RIGGING AND MACHINERY SYSYTEMS

Scope

We will design and specify the rigging systems in dedicated drawings and in Division 11 specifications. The system will be installed in its entirety under Div. 11. Our documents will be oriented to show/specify the equipment and devices only. The infrastructure for the system such as attachment backing or steel must be assessed and designed by the Structural Engineer and shown within their documents. We will provide CAD layers of devices and review and coordinate with the structural documents. For rigging systems, our documents will include mounting details. The specifications will require that the rigging shop drawings bear the stamp of a Structural Engineer licensed in the state of the project.

Stage

Stage Floor description:	We anticipate that the stage floor will be an assembly of wood over a depressed concrete slab.
Stage Floor Load:	We would expect that the code required live loading for the stage floor would be satisfactory at the code-stipulated amounts.

Catwalks

System description:	Lighting catwalks and side lighting pipes are located in the audience chamber and over the stage in the Theatre.
Loads:	The railings at the catwalk and the side pipes should be designed to support 30#/linear foot of pipe, in addition to catwalk loading as required by code (40#/sf -verify.) OSHA standards for catwalks and railings should be accommodated.

Lighting Pipes in Lambert Hall & Sanctuary

System description:	Lighting rails on catwalks, balcony front, side lighting positions and onstage galleries to be 1-1/2" schedule 40 pipe for use as an attachment armature for stage lighting and scenery.
Loads:	The pipes and attachments of the grid should be designed to support 25#/linear foot along pipes, with 300# point loads possible at any point along the pipes. Typical hangers should be at 10' on center maximum.

Fire Detection/Prevention System Criteria

Fire protection:	Standard smoke detectors, beam detectors and other particulate detectors may be falsely triggered by theatrical effects smoke. We recommend using rate or rise detectors, multiple parameter or air sampling systems in the stage and audience chamber. If air sampling system is chosen, the vacuum unit must be located outside of the stage or audience area, due to noise. Smoke detector and alarm indicators must be placed with care. Avoid placing them in locations in which they will be covered by curtain or scenery. Likewise, please do not place horn/strobe devices on the face of the proscenium wall and require that all boxes for fire alarm devices in the audience chamber be custom colored. Verify all device placement in the stage and audience chamber with The SC.
Smoke vents	Smoke vents must be provided equivalent to 5% of the stage area for each stage. The Smoke vents will require electrical emergency release buttons on emergency power sources. Buttons located at stage level will trigger devices located at the smoke vent at the ceiling level.
Sprinkler	Sprinkler pipes must be carefully planned and meticulously routed to avoid conflict with rigging and lighting systems. What may appear as open space or chase space may in fact be a critical area for moving scenery or rigging equipment or a zone which must be kept clear for lighting projection or stage effects. All routing must be verified by The SC.
Fire Hose Cabinet	Stage requires 2 fire hose cabinets separated on each side of the stage. These should be placed where they will not be blocked by scenery.
Fire Alarm Interconnection	A connection to the fire alarm system must be provided to all AV equipment racks. The interface will be used to mute the AV system upon contact closure. Per NFPA.

END OF REPORT

APPENDIX F

Introduction

This report addresses the acoustic and audio/video (AV) design goals for the re-imagined campus for the Houston Center for Musical Arts in Houston, TX. The recommendations summarized in this document describe general requirements for interior room acoustics, sound isolation, and control of noise and vibration from building systems.

The purposes of these recommendations are to confirm the acoustic objectives of the project and design requirements in order to inform costing and future design collaboration.

Acoustic Goals for the project include:

Lambert Hall

- Design a room that is viable and supportive for opera performance, chamber music, and small music ensembles.

- Balance the intensity enjoyed by singers in the existing space with the creation of volume that is required for chamber music.

- Create an orchestra pit to assist in the balancing of voice and orchestral sound. The pit will be large enough to accommodate 24 pit musicians.

- In the creation of additional volume, assure the stage size is large enough to accommodate a 40-member chamber orchestra.

Saengerhalle

- Incorporate overhead reflectors to provide useful reflections to the audience and improve communication between ensemble members.

- Provide variable acoustics in the form of drapes or banners to control loudness.

- This space will be used for music performance of small to large choral ensembles and small to medium sized instrumental ensembles (oompah bands, jazz ensembles, etc). While this space is not planned to accommodate the performance of a larger chamber orchestra, this space will be a viable rehearsal space for those larger ensembles.

- Create new dedicated rehearsal and teaching spaces.

- Existing mechanical systems are excessively loud. New systems will meet the background noise objectives for the project which are supportive of music performance, rehearsal, and gatherings.

- Isolate sound sensitive spaces to limit the transfer of sound between them to allow for simultaneous use. In the existing spaces, the current infiltration of sound from traffic are understood to be acceptable. Additional improvements to the existing windows may be required with additional activity in the courtyard.

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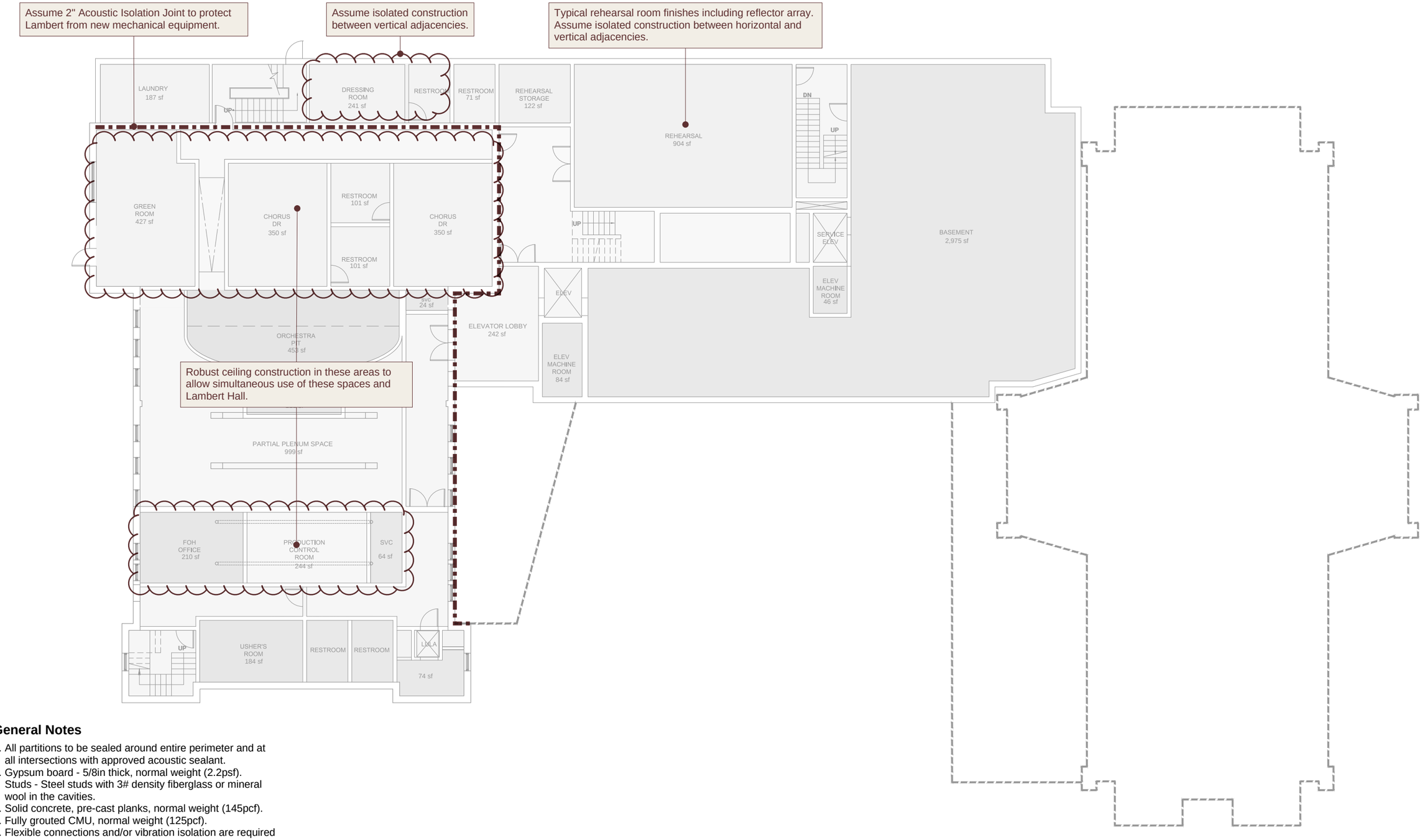

General Notes

1. All partitions to be sealed around entire perimeter and at all intersections with approved acoustic sealant.
2. Gypsum board - 5/8in thick, normal weight (2.2psf). Studs - Steel studs with 3# density fiberglass or mineral wool in the cavities.
3. Solid concrete, pre-cast planks, normal weight (145pcf).
4. Fully grouted CMU, normal weight (125pcf).
5. Flexible connections and/or vibration isolation are required when crossing Acoustically Isolated Construction and Acoustic Isolation Joints.

HOUSTON CENTER FOR MUSICAL ARTS

11 August 2023

ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Acoustic Considerations and Isolation Assumptions - Lower Level

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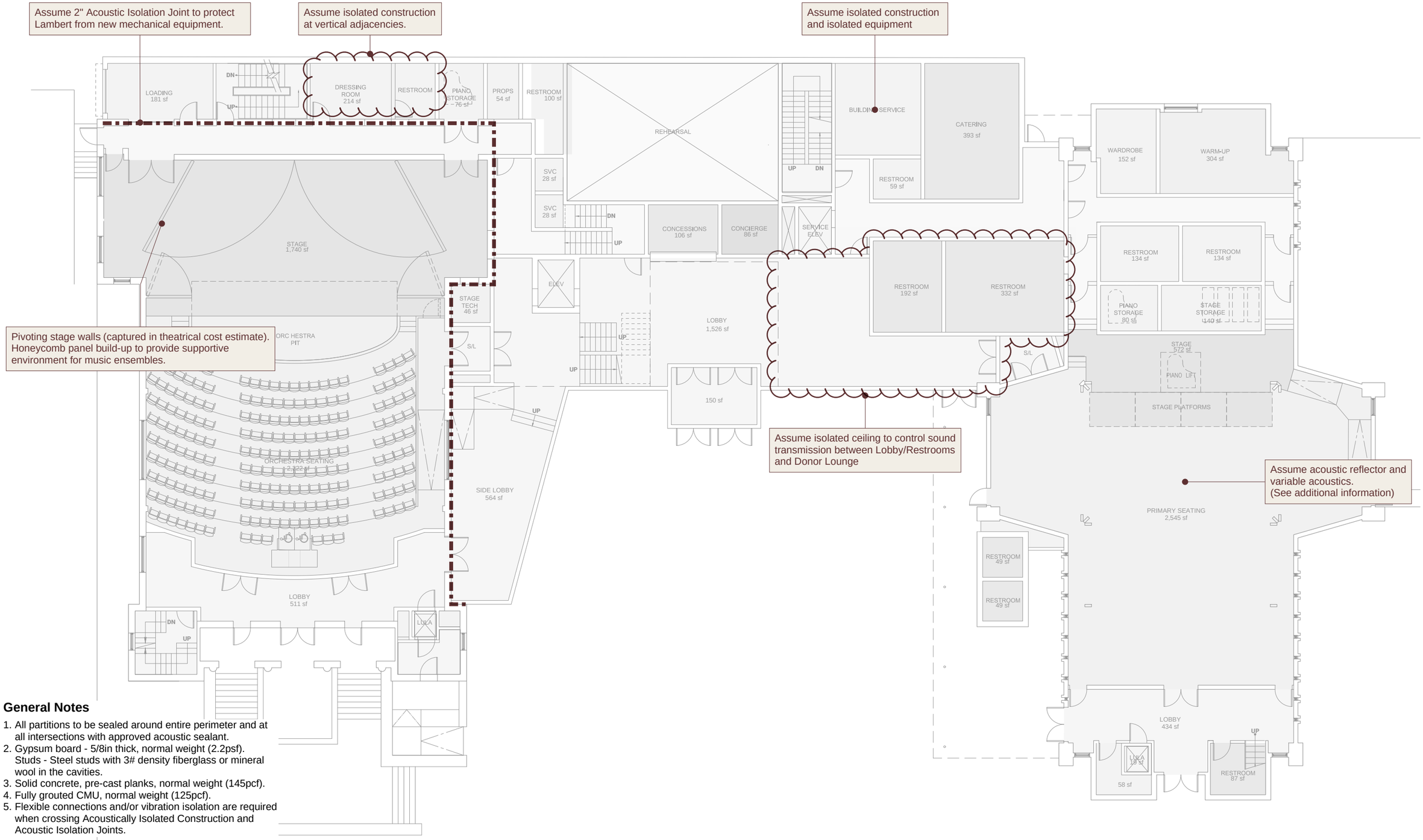

General Notes

1. All partitions to be sealed around entire perimeter and at all intersections with approved acoustic sealant.
2. Gypsum board - 5/8in thick, normal weight (2.2psf). Studs - Steel studs with 3# density fiberglass or mineral wool in the cavities.
3. Solid concrete, pre-cast planks, normal weight (145pcf).
4. Fully grouted CMU, normal weight (125pcf).
5. Flexible connections and/or vibration isolation are required when crossing Acoustically Isolated Construction and Acoustic Isolation Joints.

HOUSTON CENTER FOR MUSICAL ARTS

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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Acoustic Considerations and Isolation Assumptions - Ground Level

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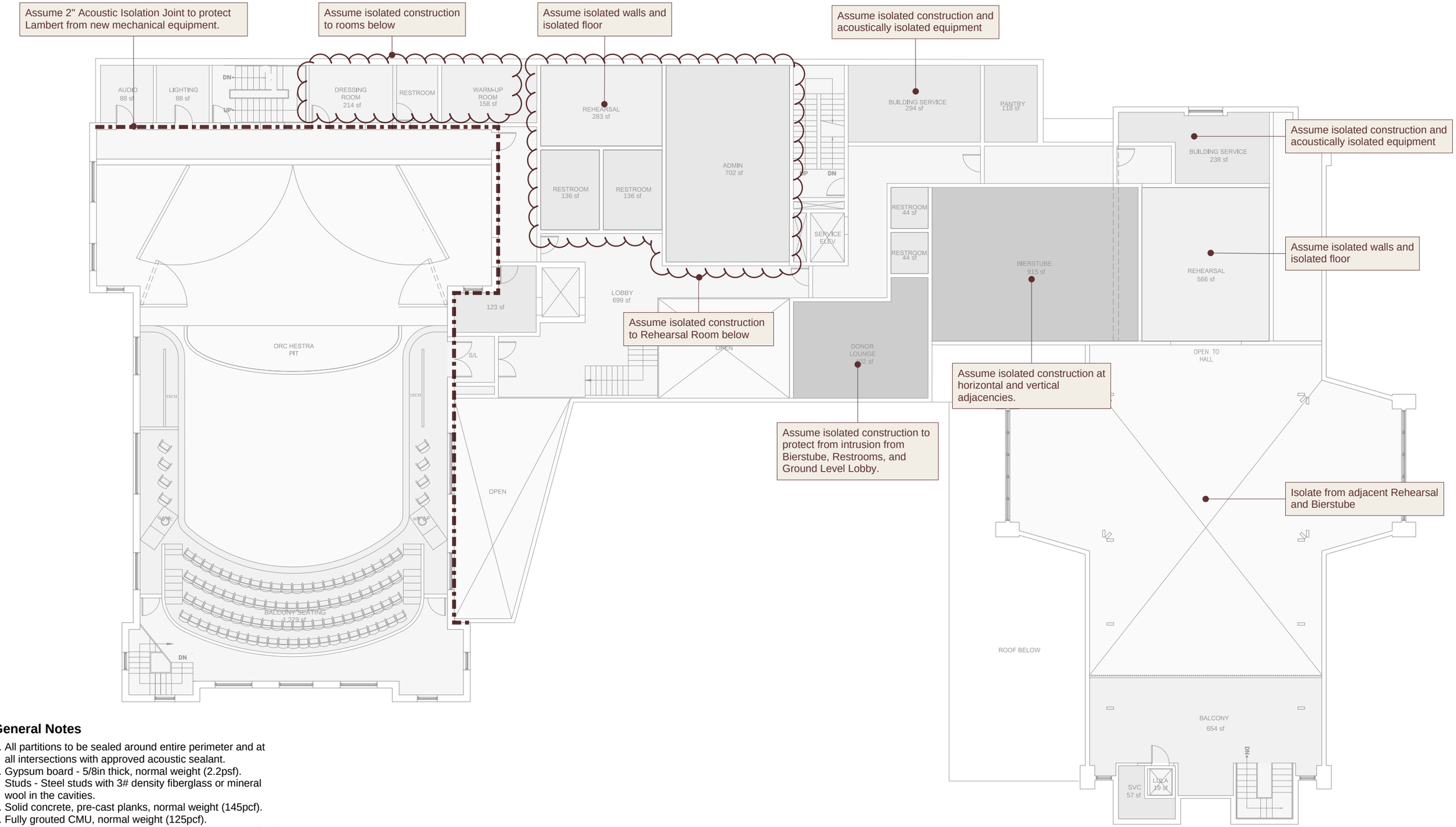

General Notes

1. All partitions to be sealed around entire perimeter and at all intersections with approved acoustic sealant.
2. Gypsum board - 5/8in thick, normal weight (2.2psf). Studs - Steel studs with 3# density fiberglass or mineral wool in the cavities.
3. Solid concrete, pre-cast planks, normal weight (145pcf).
4. Fully grouted CMU, normal weight (125pcf).
5. Flexible connections and/or vibration isolation are required when crossing Acoustically Isolated Construction and Acoustic Isolation Joints.

HOUSTON CENTER FOR MUSICAL ARTS

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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Acoustic Considerations and Isolation Assumptions - Second Level

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threshold

In Saengerhalle, reflectors will be incorporated to provide useful, supportive reflections. The reflectors will very in shape, size, spacing, and height to provide the appropriate acoustic response without affecting sight-lines from the balcony. The reflectors will be most dense above the stage and decrease in density over the audience.

For each reflector, assume a minimum 6pcf surface density. The aesthetic character and layout will be developed during design.

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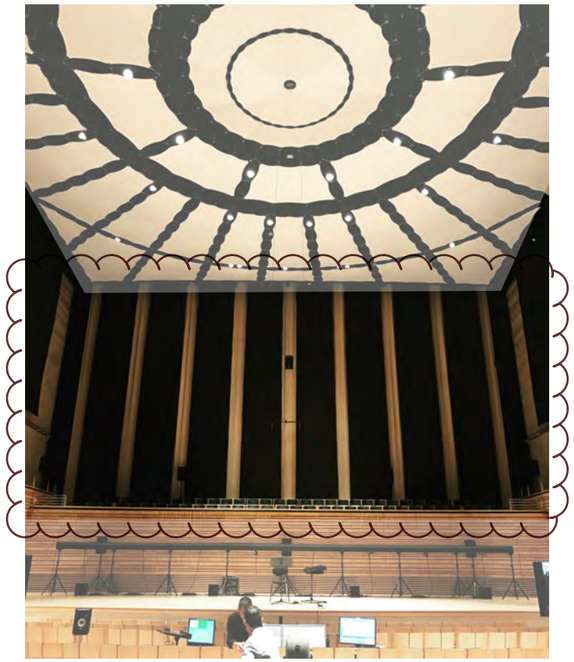
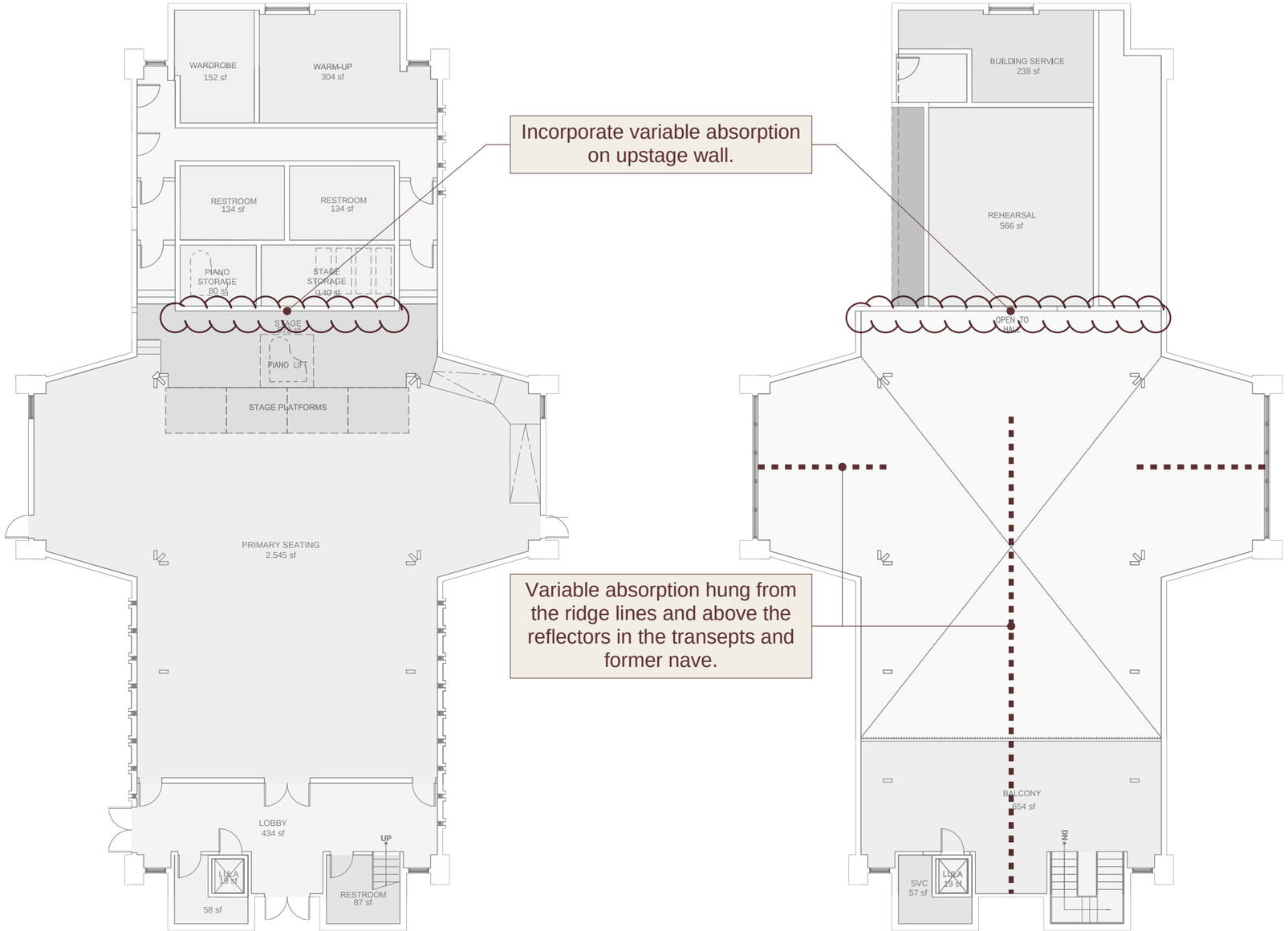


Variable absorption could be banners or could be manual or motorized drapery. Some cost has been captured in the theatrical cost estimate.



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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Saengerhalle - Variable Absorption

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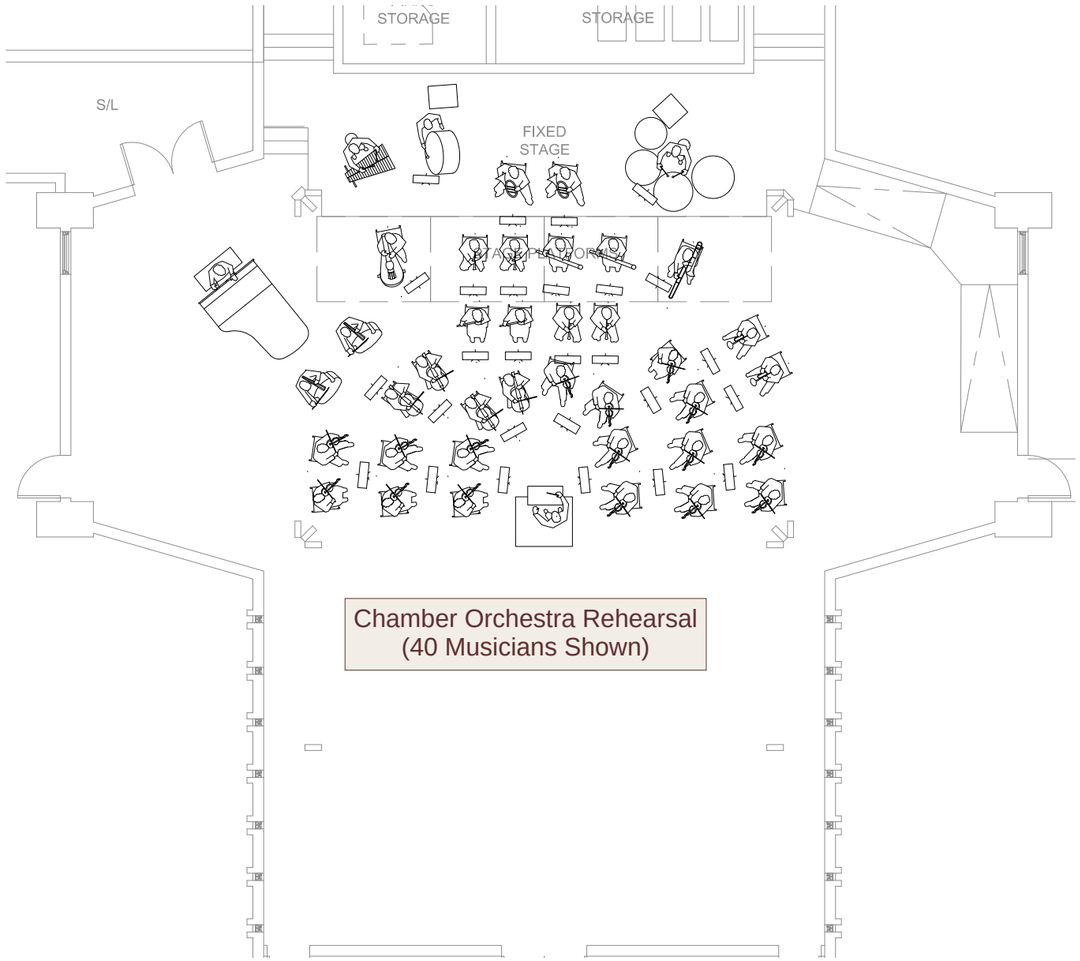
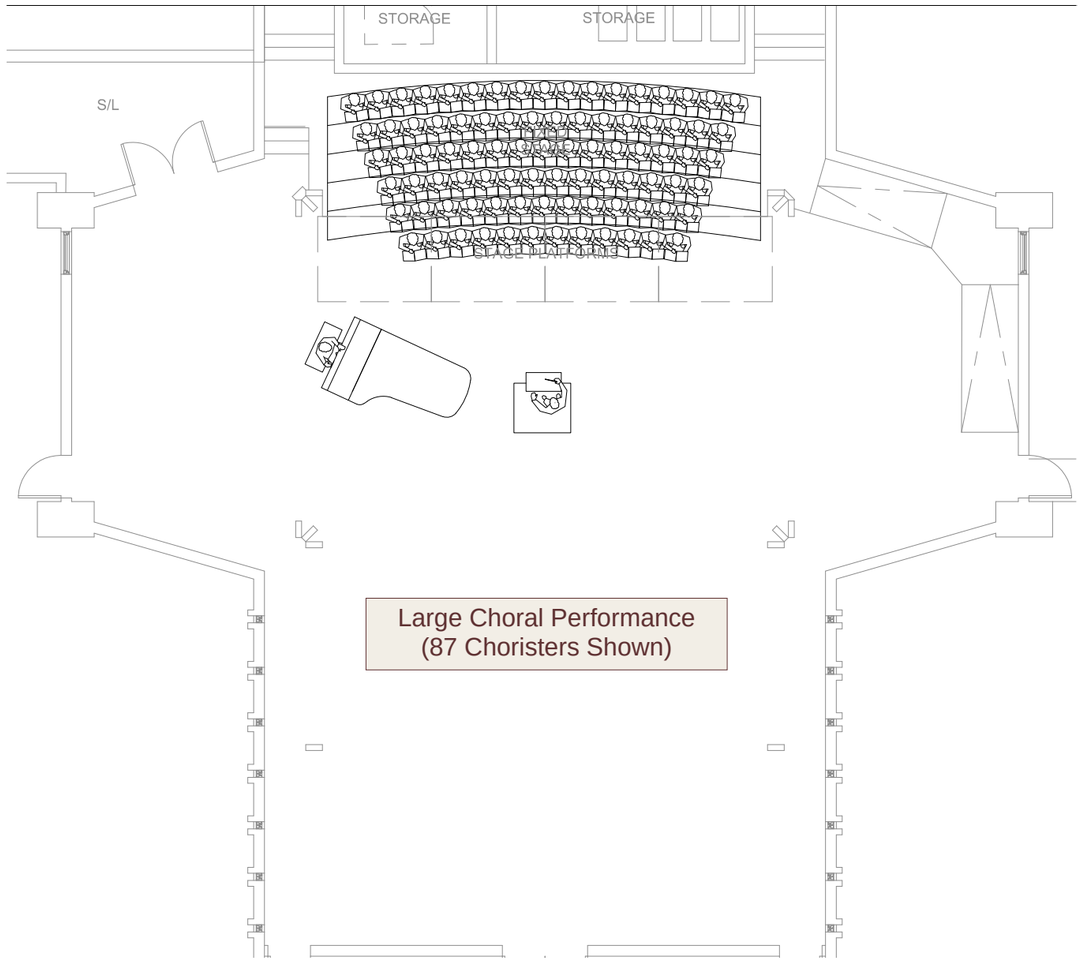


Chamber Orchestra Rehearsal
(40 Musicians Shown)



Large Choral Performance
(87 Choristers Shown)

There is a desire for flexibility in Saengerhalle. This space will support music rehearsal and performance in addition to luncheons and other meetings.

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Saengerhalle - Musician Layouts

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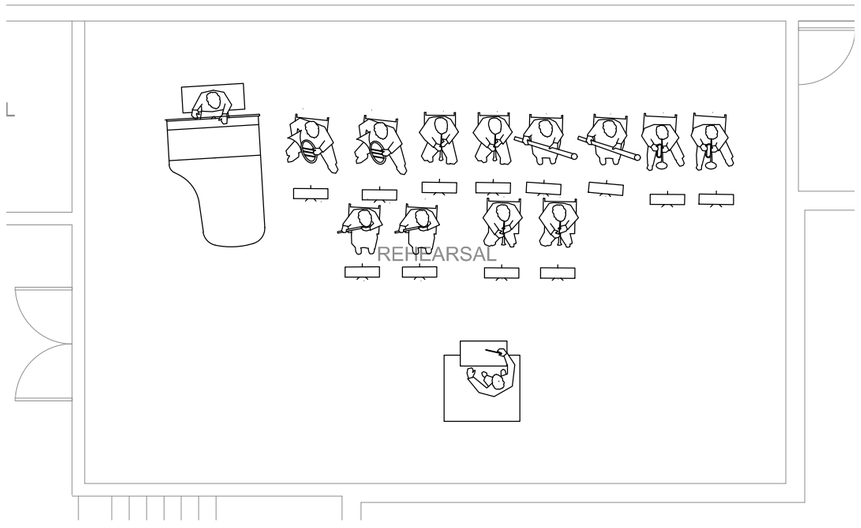
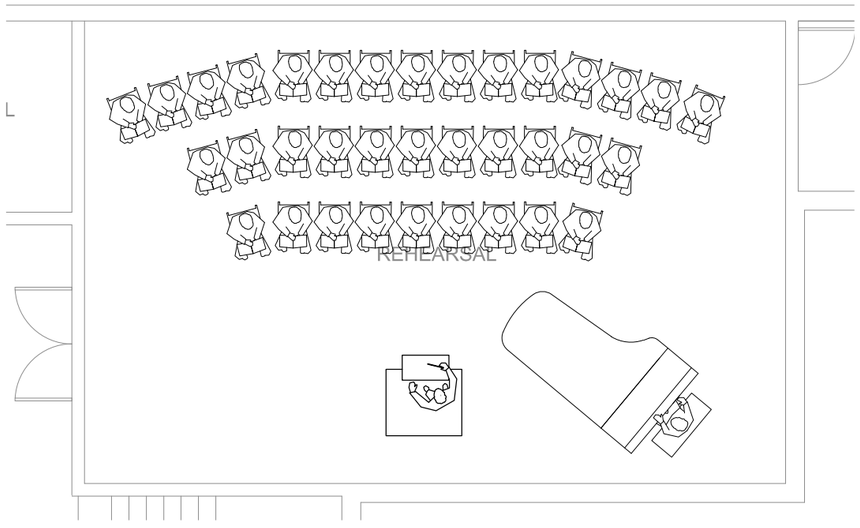
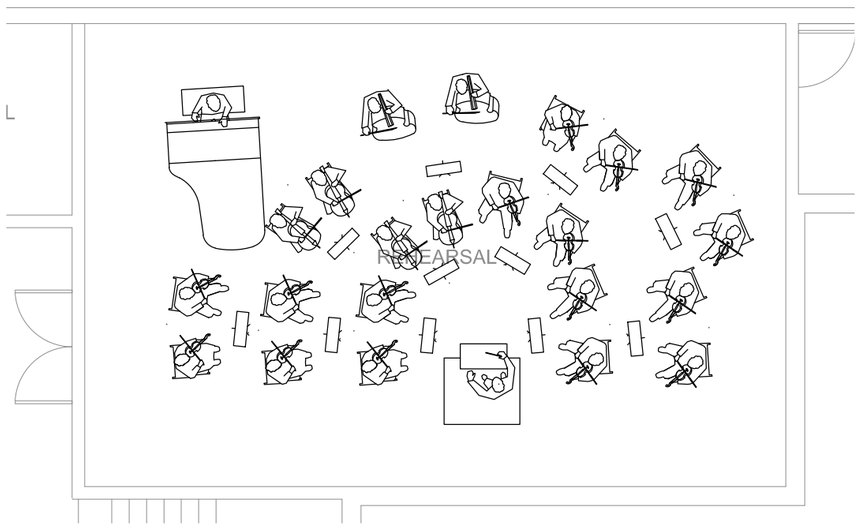
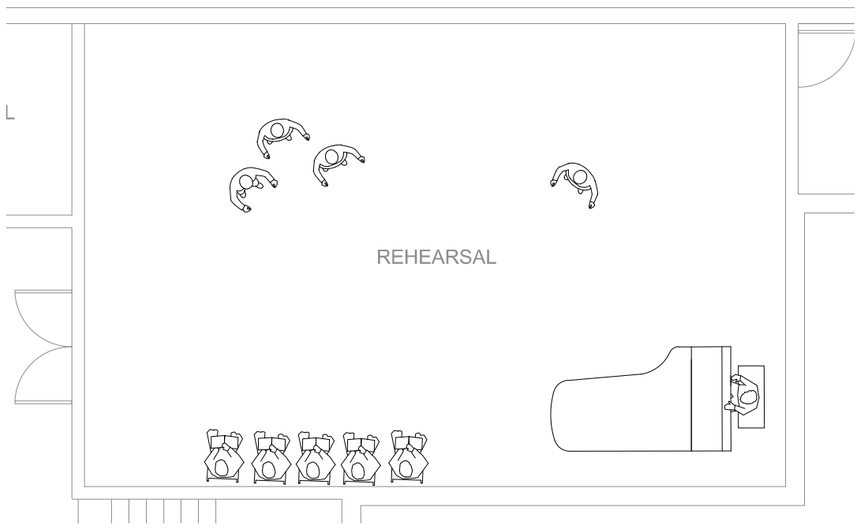




The rehearsal room on the Lower Level will accommodate small to medium sized ensembles as well as provide a space for opera blocking rehearsals as it is a similar size as the stage.





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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Lower Level Rehearsal Room - Musician Layouts

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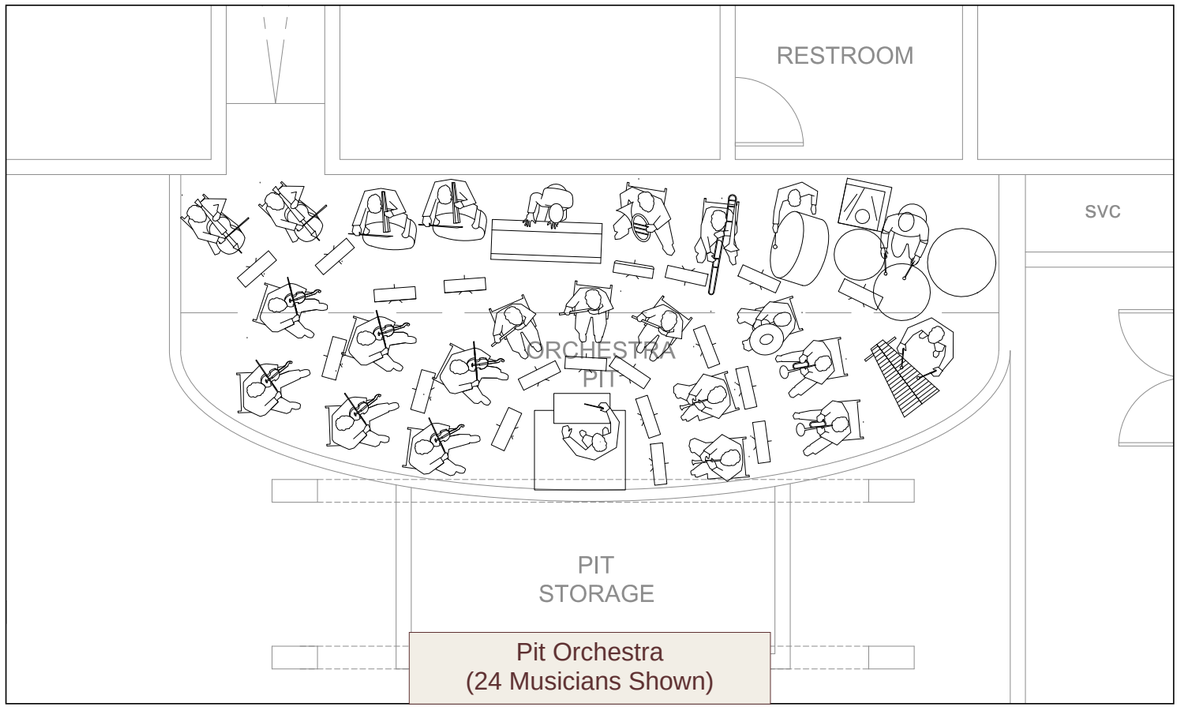
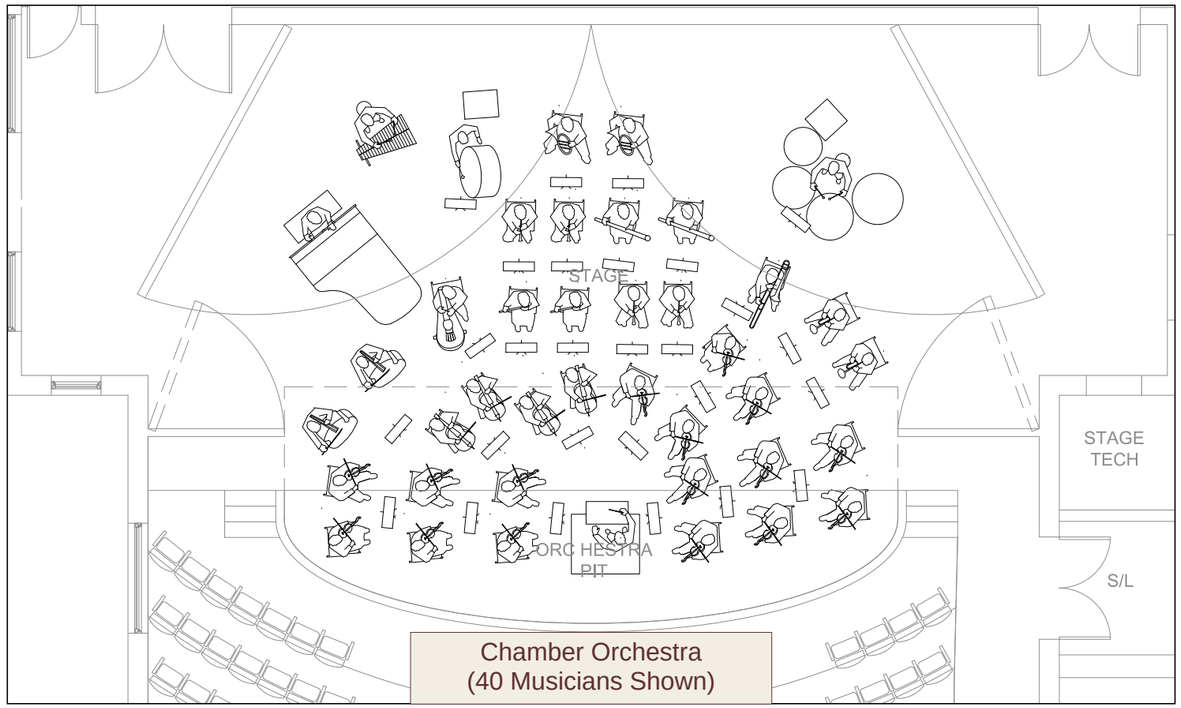


Pit Orchestra
(24 Musicians Shown)



Chamber Orchestra
(40 Musicians Shown)

The rehearsal room on the Lower Level will accommodate small to medium sized ensembles as well as provide a space for opera blocking rehearsals as it is a similar size as the stage.

HOUSTON CENTER FOR MUSICAL ARTS

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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Lambert Hall - Musician Layouts

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Mechanical Guidelines for Acoustics

The following guidelines summarize our preliminary recommendations for the acoustic features of the design of MEPF systems. Absolute silence is not required but the background noise level must be low enough to support the communication of spoken word and music. Criteria are specified in terms of the Room Criteria (RC) system as defined by ASHRAE and assume a neutral and non-tonal spectrum. Initial criteria are indicated on the following plans.

Careful selection of system and unit types, attenuated duct paths, additional enclosures, and careful equipment placement will be required to meet the background noise objectives. Reciprocating equipment, and ductwork, piping, conduit connected to those units, will require vibration isolation to protect the building from vibration induced noise.

Exterior mechanical equipment will require special selection and vibration isolation to minimize sound infiltration into the building in excess of background noise targets. Exterior sound enclosures may be required particularly if equipment is located near windows.

Terminal devices (diffusers, grilles, chilled beams, etc.) are to be selected at a manufacturers' NC-rating that is 10dB lower than the background noise criterion specified for each area. For example, rooms with a background noise criterion of RC 30 should have diffusers specified for NC-20.

Use of internal duct lining and silencers to meet background noise goals is anticipated.

The use of control dampers should be avoided if possible. Where dampers are unavoidable, these should be located outside the footprint of spaces lower than RC-30, or within an acoustic enclosure, and at least 6' upstream of diffusers.

All duct penetrations through walls of rooms should be sleeved and over-sized, packed with glass fiber insulation, and sealed with a non-hardening caulk in a manner consistent with fire ratings and other life safety considerations.

The following velocity guidelines are to be used to size ducts.

VELOCITY GUIDELINES [FPM (M/S)]						
NOISE CRITERIA	AT END OF OPEN SLOT[1]	FACE/NECK OF GRILLE/DIFFUSER[1]	WITHIN 10' (3 M) OF GRILLE/DIFFUSER	WITHIN 20' (6 M) OF GRILLE/DIFFUSER	WITHIN 50' (15 M) OF GRILLE/DIFFUSER	EXPOSED DUCTS IN ROOM[3]
RC 20 supply	500 (2.5)	300 (1.5)	500 (2.5)	550 (2.8)	1,100 (5.6)	800 (4.1)
RC 20 return	500 (2.5)	350 (1.7)	500 (2.5)	650 (3.3)	1,300 (6.6)	800 (4.1)
RC 25 supply	550 (2.8)	350 (1.8)	550 (2.8)	700 (3.6)	1,400 (7.2)	800 (4.1)
RC 25 return	550 (2.8)	425 (2.2)	650 (3.3)	800 (4.1)	1,600 (8.2)	800 (4.1)
RC 30 supply	700 (3.6)	425 (2.2)	700 (3.6)	850 (4.1)	1,700 (8.6)	900 (4.6)
RC 30 return	700 (3.6)	500 (2.5)	800 (4.1)	900 (4.6)	1,800 (9.1)	900 (4.6)
RC 35 supply	800 (4.1)	500 (2.5)	800 (4.1)	1,000 (5.1)	2,000 (10.2)	1,200 (6.1)
RC 35 return	800 (4.1)	600 (3.0)	900 (4.6)	1,100 (5.6)	2,000 (10.2)	1,200 (6.1)

1 – Velocities up to 25% higher may be permissible with smooth transitions to diffusers, slots, or grilles.

2 – Most manufacturers' diffusers will not be suitable for RC 15 spaces. Open slots are preferred for overhead supply, and air pedestals are preferred for underfloor supply.

3 – Ducts exhibiting higher velocities will need to be enclosed in soffits, wrapped in lagging, or be constructed of significantly heavier construction than might otherwise be required.

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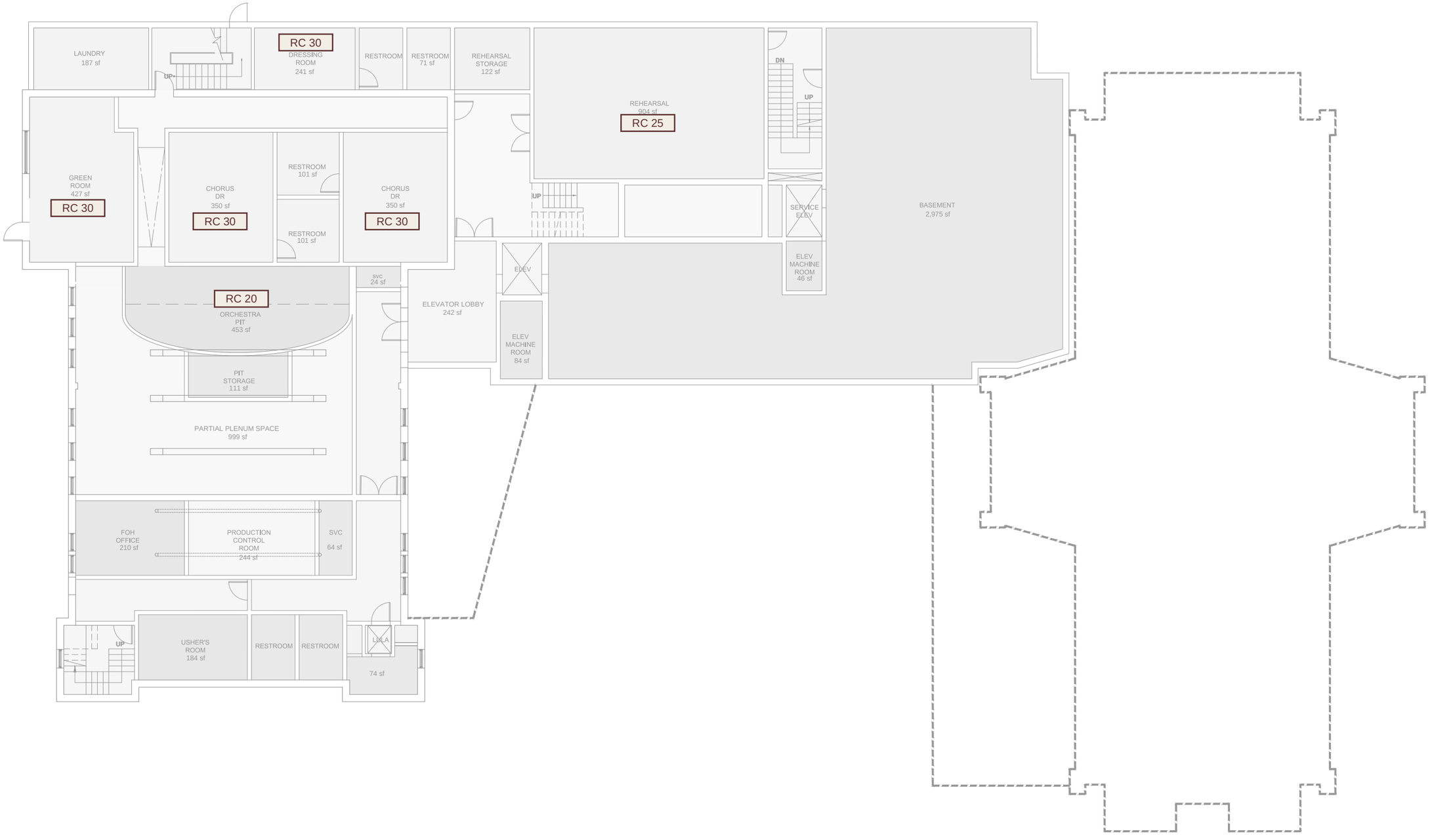

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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Acoustic Background Noise Criteria - Lower Level

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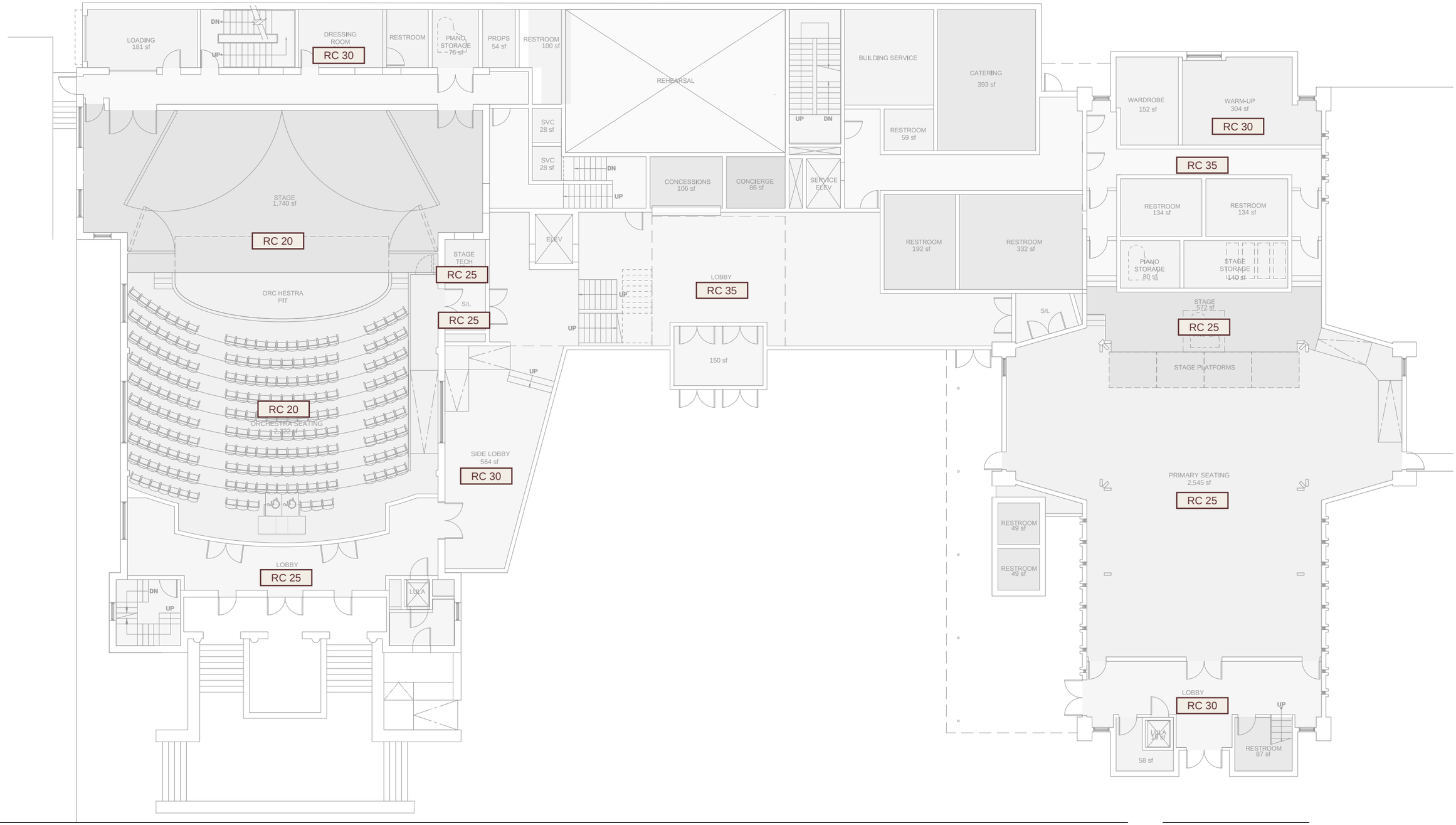

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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Acoustic Background Noise Criteria - Ground Level

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ACOUSTICS RECOMMENDATIONS - PROGRAMMING

Acoustic Background Noise Criteria - Second Level

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APPENDIX G

Wilson Butler Architects

Architectural & Structural Narrative

Introduction
The drawings and documents included in this report represent preliminary investigation of the organization of program space needs to support production and administrative objectives established by HCMA leadership. The follow narrative is intended to provide additional general information relating to systems and construction components to assign approximate construction values used in determining the Preliminary Construction Cost.

Selective & Building Demolition

General
In addition to the preliminary work descriptions below, provide all required selective demolition to support the work of engineering, theatrical, and acoustical/AV disciplines, and the corresponding descriptive documents.

Lambert Hall
Selective demolition to achieve the proposed work including:

- Removal of primary roof & structure above audience chamber & stage for new raised roof
- Removal of wood audience chamber floor and raised stage for new raked audience seating
- Removal of interior finishes, partitions and miscellaneous appurtenances to permit new work
- Removal of audience chamber balcony for rebuilding and house right/left extensions
- Removal of exterior brick at west elevation and prep for BOH addition
- Removal of NE stair and prep for platform/wheelchair lift
- Removal of SE stair and prep for replacement stair

Education/Connector Building
Complete demolition of 2-story brick veneer structure and prep for new 2-story Connector Building with basement.

Saengerhalle
Selective demolition to achieve the proposed work including:

- Partial removal of exterior brick wall and roof where Connector Building joins
- Removal of interior finishes, partitions and miscellaneous appurtenances to permit new BOH work
- Partial removal of balcony floor and prep for platform/wheelchair lift

Sitework

Selective demolition to achieve the proposed work including:

- Removal of wood ADA ramp at Lamber Hall and partial removal masonry/concrete patio
- Removal of all Courtyard sidewalks and canopies
- Removal of Courtyard trees and landscaping
- Removal of Courtyard access stair to Lambert Hall basement
- Removal of circular vehicular drop-off at Heights Blvd
- Earthwork required for BOH addition at Lambert Hall and for Connector Building

Renovations & Additions

70 Federal Street
5th Floor
Boston, MA 02110
P 617.720.7127
wilsonbutler.com

Structural

General
The following descriptions provide an overview of primary structural approaches that are anticipated to be utilized at HCMA. Structural components for Lambert Hall BOH addition and Connector building to be independent and isolated from Lambert Hall.

Structural Load Criteria

RISK CATEGORY	III
SUPERIMPOSED DEAD LOADS:	
ROOFING	10 PSF
MISCELLANEOUS ROOF LOAD	10 PSF
MISCELLANEOUS FLOOR LOAD	10 PSF
LIVE LOADS:	
ROOF	20 PSF
LOBBIES AND PUBLIC CORRIDORS	100 PSF
OFFICES AND PRIVATE CORRIDORS	80 PSF
STAIRS	100 PSF
STAGE, LIFT, AND PIT	150 PSF
SEATING (STATIONARY)	60 PSF
CATWALKS	40 PSF
FORESTAGE GRID, GRID IRON, AND GALLERIES	75 PSF
STORAGE AND MECHANICAL ROOMS	125 PSF*

* OR ACTUAL WEIGHT OF EQUIPMENT, WHICHEVER IS GREATER.

Foundations
- Foundations for Lambert BOH addition and Connector Building to be 14” reinforced cast-in-place concrete on reinforced concrete spread footings, 3,000 psi compressive strength
- 4” masonry shelf at exterior perimeter
- Orchestra pit concrete to utilize integral crystalline concrete waterproofing, 3,000 psi compressive strength

Lambert Hall Raised Roof
- Vertical steel columns from new basement reinforced concrete spread footings with wide-flange beams and trussed roof framing with purlins
- 8” reinforced/grouted CMU perimeter wall back-up
- Roof plane to be 4” normal weight concrete on metal deck, 3,000 psi compressive strength

Lambert Hall Raked Audience Seating & Stage
- Sloping steel framing on columns with reinforced concrete footings
- Stepped, reinforced cast-in-place concrete for seating, 5,000 psi compressive strength
- Structural steel and reinforced/grouted CMU with metal deck and concrete slab for stage and prepped for sprung wood floor

Lambert Hall Balcony
- Cantilevered and sloping structural steel framing coordinated with new raised roof columns with stepped, reinforced cast-in-place concrete for seating, 5,000 psi compressive strength

Lambert Hall Addition & Connector Building
- 5” reinforced concrete slabs on grade, 3,500 psi compressive strength
- Laterally braced structural steel framed with metal deck and 5” elevated reinforced concrete slabs
- Perimeter 8” CMU back-up at exterior masonry

- Dunnage for rooftop mechanical equipment at Connector Building

Sitework

General
The “Courtyard Diagram” drawing depicts the primary site features and hardscape/landscape zones with the following additional information:

Lambert Hall Entrances
- Rebuilding of Lambert Hall Heights Blvd entrance from covered portico to grade utilizing cast-in-place concrete steps with additive limestone treads, perimeter concrete knee walls faced in brick with limestone caps
- Decorative bronze handrails
- Decorative pavers at landings
- ADA ramp, knee walls and decorative bronze railings at north tower entry
- Step, decorative, and egress lighting

Courtyard
- Central turf seating/events area with irrigation system
- Xeriscape, drought resistant, and native landscape plantings in designated planting/landscape zones
- Hardscape zones to utilize a combination of cast-in-place concrete (50%) on grade and decorative pavers (50%)
- Positive slope to a total of three area drains connected to existing storm water system at hardscape locations
- Provide site, walkway, and landscape lighting
- Custom walkway canopy joining Connector Building lobby and Saengerhalle lobby

Architecture

General
The following additional information is intended to supplement organizational drawings for Renovations and Additions at the HCMA.

Exterior Envelope

Lambert Hall
- Allowance for masonry repair over 30% of exterior walls
- Refurbishment of existing double-hung and stained-glass windows to remain in-situ with additional vented, aluminum framed exterior glazing panel at stained glass and audience chamber windows
- Foundation/basement wall at addition to receive self-adhering bituminous membrane waterproofing, drainage panel, and perimeter foundation drainage system
- At roof raising/extension, sidewall back-up to be reinforced, grout-filled 8” CMU with insulated prefinished metal panel exterior treatment
- Roof to be poly-iso insulated TPO roofing system on 6” normal weight concrete on metal deck at audience chamber and stage, metal deck and poly-iso insulation at addition with roof access hatch from egress stair
- Exterior wall at addition to be masonry veneer with mineral fiber insulation & air barrier on CMU back-up with prefinished aluminum windows with insulated glazing at occupied spaces
- Perimeter (wall & roof) expansion joint at acoustic joint

Saengerhalle

- Modification of envelope to accommodate joining with Connector Building
- Masonry veneer on CMU back-up at Courtyard toilet rooms

Connector Building

- Foundation/basement wall at addition to receive self-adhering bituminous membrane waterproofing, drainage panel, and perimeter foundation drainage system
- West exterior wall at addition to be masonry veneer with mineral fiber insulation & air barrier on CMU back-up with prefinished aluminum windows with insulated glazing at occupied spaces
- East/Courtyard (and link to Lambert lobby) elevation to include multi story glazed curtainwall (70%) and articulated limestone veneer with mineral fiber insulation & air barrier on CMU back-up
- Roof to be poly-iso insulated TPO roofing system on metal deck with roof access hatch from egress stair

Interior Construction & Equipment

General

The following descriptions of construction techniques and components should be combined and coordinated with the systems and equipment described within the theater, acoustical, and MEP narratives.

Partitions

- Typical interior partitions to utilize light metal framing from floor to structure above with painted 5/8" GWB with Level 4 finish at BOH locations, Level 5 finish at painted FOH locations and mineral acoustical batts at toilet locations
- Perimeter partitions at Connector Building rehearsal space to be 8" grout-filled CMU from floor to structure above with a combination of articulated wood wall diffusion and absorptive panels
- Rehearsal spaces in Saengerhalle to utilize double wall light metal framing with 5/8" GWB and a combination of articulated wood wall diffusion and absorptive panels
- 8" CMU at rated egress stair enclosures
- LVT on BOH performer occupied floors, epoxy finish at technical spaces, carpeting at administrative and sealed concrete at loading dock and mechanical spaces

Elevators & Lifts

- 4,000 lb. capacity holeless, 4-stop, dual entrance, hydraulic passenger elevator with custom interior at Connector Building FOH
- 4,000 lb. capacity holeless, 3-stop, single entrance, hydraulic passenger elevator with standard interior at Connector Building BOH
- 750 lb. capacity platform/wheelchair lift in enclosed shaftway at Lambert Hall and Saengerhalle
- Piano lift at Saengerhalle in Theater Equipment budget

Egress Stairs

- Concrete and metal pan stairs with safety nosing and pipe/tube guards & handrails

Doors & Frames

- Typical flush stained finish wood veneer 1 ¾" doors with Grade 1 cylindrical locksets and lever handles in HM frames. Rated where required

- Typical flush HM 1 ¾” doors with Grade 1 cylindrical locksets and lever handles in HM frames at technical/mechanical spaces and egress stair exits. Rated where required
- Prefinished aluminum storefront entry/vestibule doors at Connector Building lobby

Interior Finishes & Materials

General

- Toilet rooms have floor to ceiling ceramic tile at wet walls and porcelain floor tile with solid surface lavatory countertops and solid phenolic toilet partitions. Showers included at BOH performer toilet rooms

Lambert Hall

- New fixed audience seating at orchestra and balcony levels
- Axminister carpeting at orchestra and balcony audience aisles and existing lobby, ¾” hardwood flooring at seating
- Floating 7/8” hardwood flooring system at stage
- LVT on BOH performer occupied floors, epoxy finish at technical spaces, carpeting at administrative and sealed concrete at loading dock
- Historically influenced articulated wood treatment at balcony fronts for acoustical diffusion
- GWB ceilings throughout BOH unless required for access above
- Acoustical treatment to underside of catwalks in audience chamber
- All existing surfaces to remain to be repaired and painted where applicable
- Multi-station dressing rooms to have solid surface countertops with make-up mirrors & lighting with shelving and lockable cubbies/lockers

Saengerhalle

- LVT on BOH performer occupied floors, and epoxy finish at technical spaces
- All existing surfaces to remain to be repaired and painted where applicable
- Bierstube to be outfitted with single station bar/servery and higher level finishes

Connector Building

General

- LVT on BOH performer occupied floors, epoxy finish at technical spaces and catering loading area, carpeting at administrative, and sealed concrete at mechanical spaces
- Non-slip quarry tile floor and anti-microbial FRP wall treatment with food grade ACT and suspension system
- Donor Lounge to be outfitted with two-station bar/servery and higher level finishes

Lobby & Lambert Access

- Flooring to be a combination of cementitious terrazzo and Axminister carpet
- Lobby stairs and ramp to be cast-in-place cementitious or precast terrazzo with decorative guards & rails and at upper floor openings
- Acoustic plaster ceiling
- Articulated transparent finish wood wall treatment at east/north walls and elevator enclosure, at Ground, Main, and Upper levels
- Concessions to have 2-3-station bar/server with back-bar storage & refrigeration
- Concessions & Concierge to have secure closure from Lobby when not in use

Planning Overview | Site & Structures

AMS PLANNING & RESEARCH

Wilson Butler Architects

The Shalleck Collaborative Inc.
Planning and Design of Theatres | Production Systems | AV

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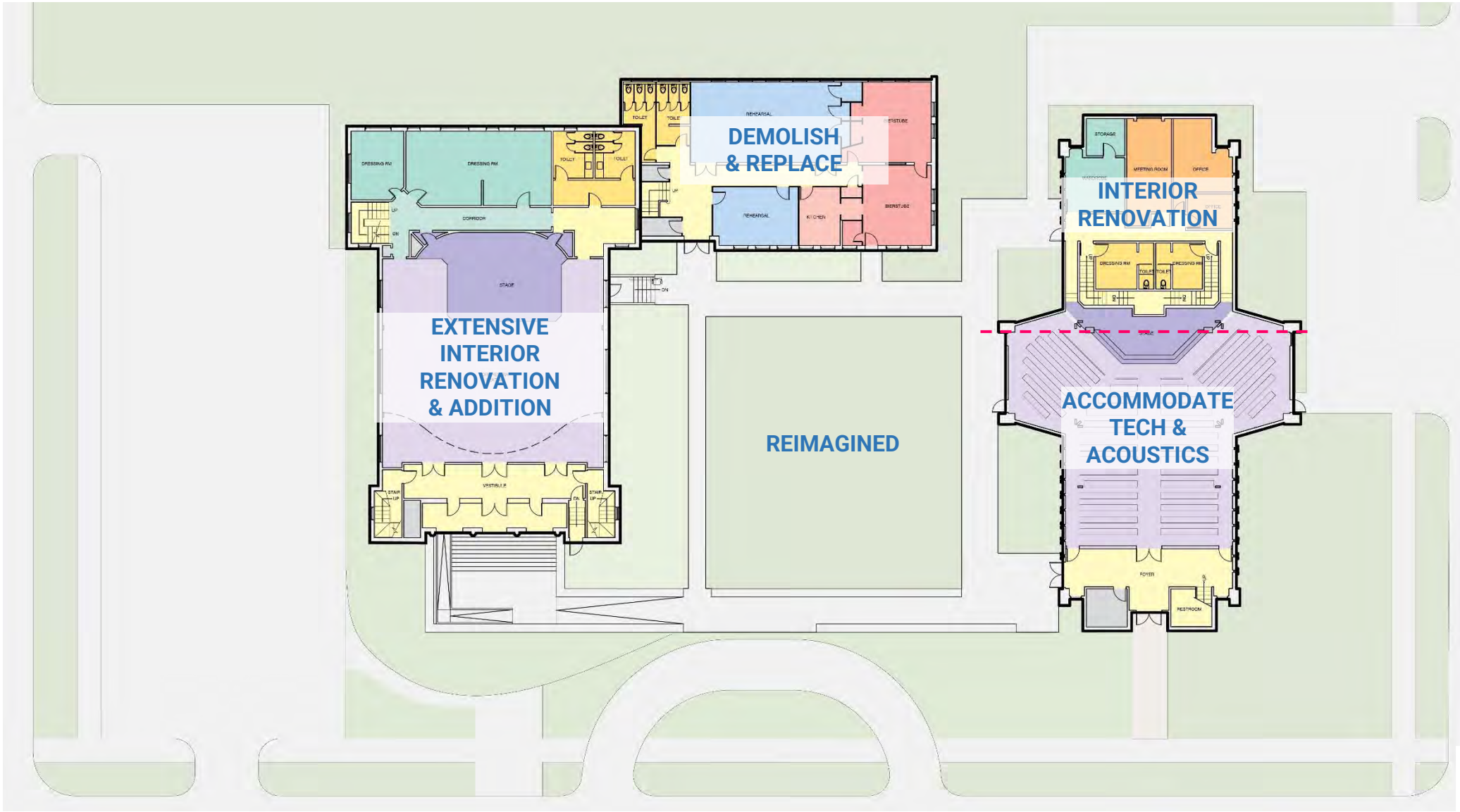
COLLABORATIVE ENGINEERING GROUP

PLANNING OVERVIEW | SITE & BUILDINGS



Lambert Hall

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COLLABORATIVE ENGINEERING GROUP

Lambert Hall

Architectural

- Complete interior demolition & renovation
- Increased cubic volume
- Improved lines-of-site
- Reconfigured balcony
- Larger stage
- Expanded back-of-house performer and support spaces
- Life safety & accessibility improvements
- Exterior envelope (windows & masonry) repaired

Lambert Hall

Production Systems

- Overhead Rigging & Stage Draperies
- Onstage Acoustical Reflector Walls
- Orchestra Pit/Stage Extension Platforms
- Stage Lighting Control & Fixtures
- Production AV Including Scenic Video Wall
- Fixed Theatre Seating

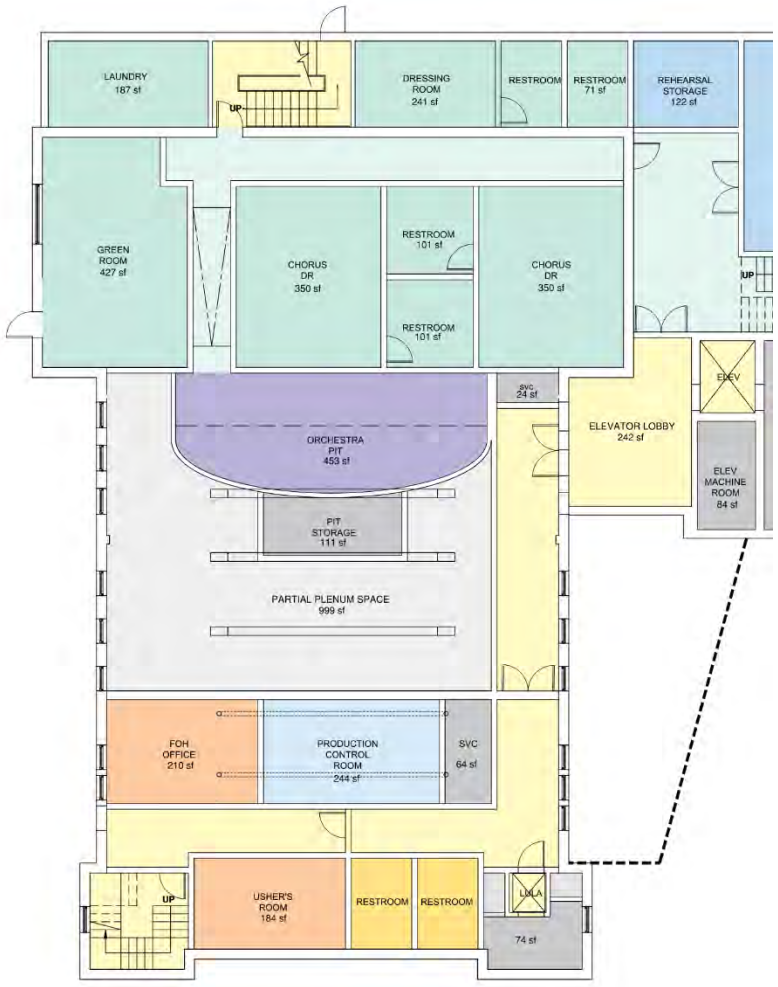
The Shalleck Collaborative Inc.

Lambert Hall

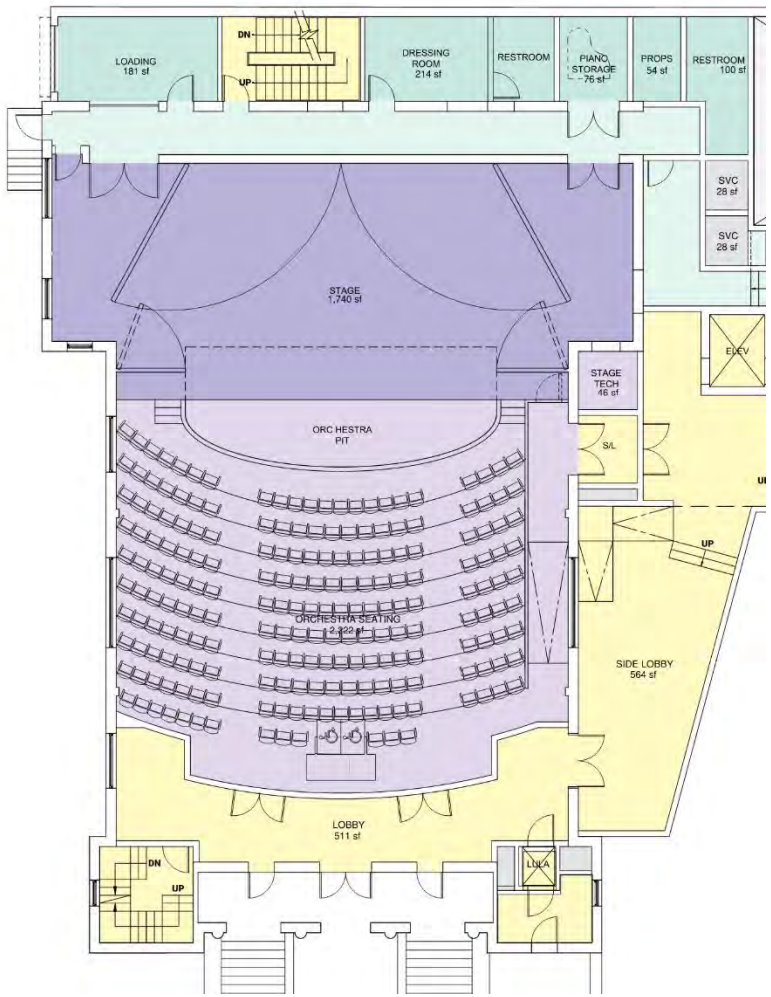
Acoustics

- **Improved background noise levels**
- **Increased volume to accommodate chamber ensembles**
- **Supportive geometry and architectural elements for Opera and Chamber music**
- **Robust construction to provide measures of isolation for simultaneous use of spaces.**
- **Acoustic treatments (diffusive, transparent, and absorptive)**

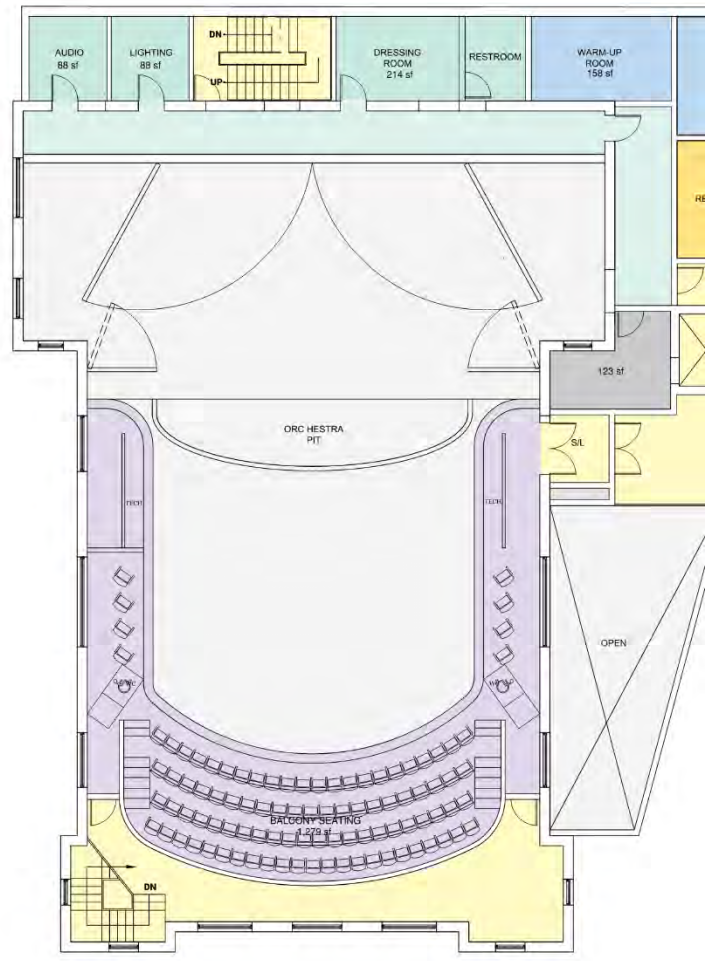
LAMBERT HALL



Lower Level

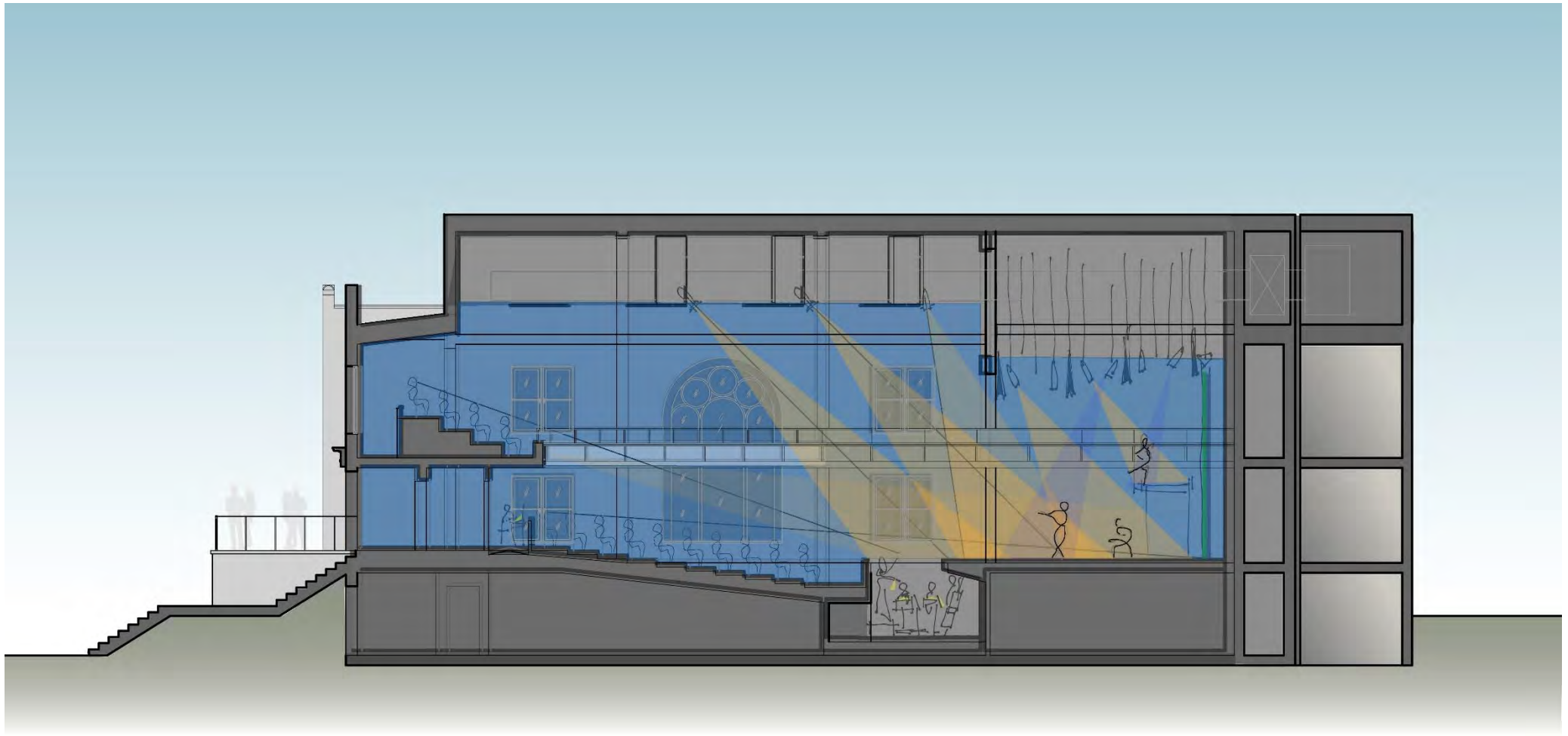


Ground Level



Second Level

LAMBERT HALL



Longitudinal Section

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Sängerhalle

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COLLABORATIVE ENGINEERING GROUP

Sängerhalle

Architectural

- **Complete back-of-house interior demolition & renovation**
- **Expanded back-of-house performer and support spaces**
- **Larger stage**
- **Accommodations for acoustic and production enhancements**
- **Accessibility improvements**

Sängerhalle

Production Systems

- Variable Acoustic Banners
- Stage Extension Platforms
- Piano Lift
- Stage Lighting Control & Fixtures
- Production AV

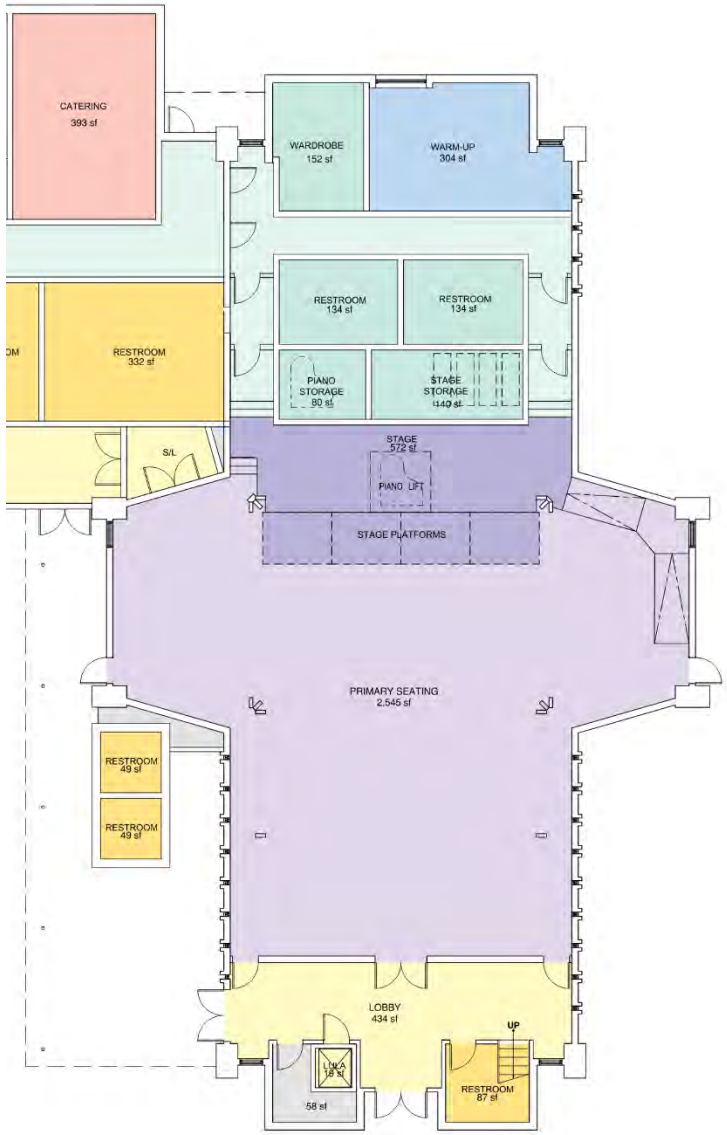
The Shalleck Collaborative Inc.

Sängerhalle

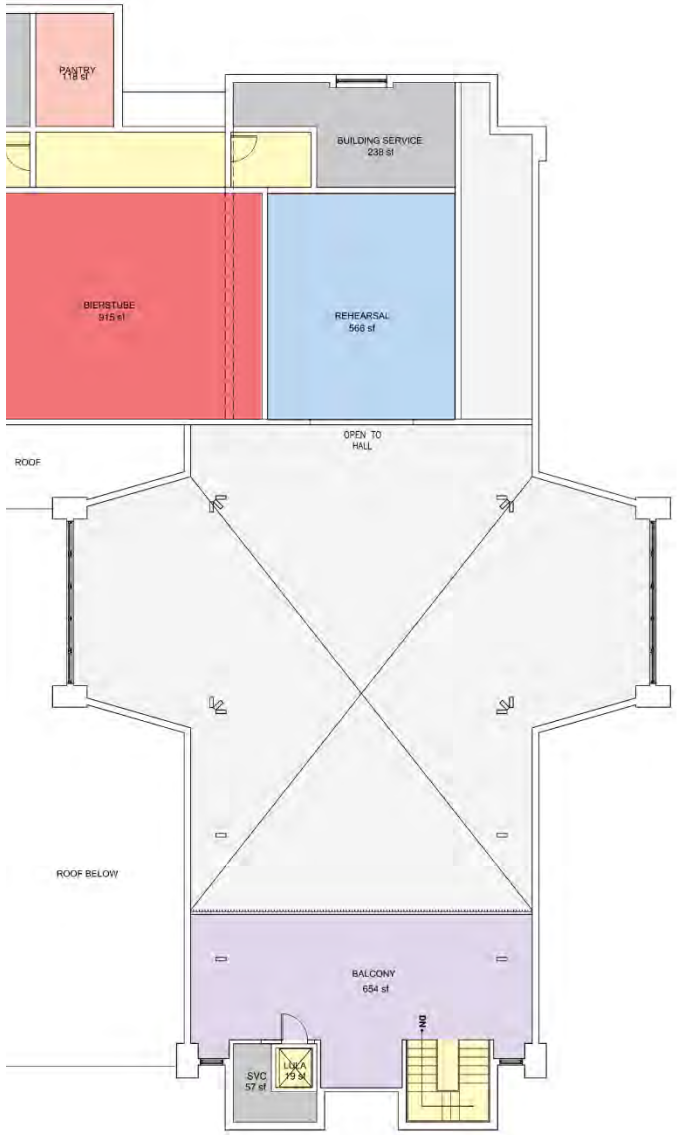
Acoustics

- **Improved background noise levels**
- **Robust BOH construction to provide measures of isolation for simultaneous use of spaces.**
- **Acoustic reflectors**
- **Variable acoustic banners**
- **Acoustic treatments (diffusive, transparent, and absorptive)**

SÄNGERHALLE



Ground Level



Second Level

Connector Building

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venue. the bottom line

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Connector Building

Overview

- Central Patron Lobby
- Concessions & Restrooms
- Rehearsal Rooms
- Conference Room
- Administrative Offices
- Donor Lounge
- Catering Support
- Campus-Wide A/V Systems, Signage/Latecomer Monitors

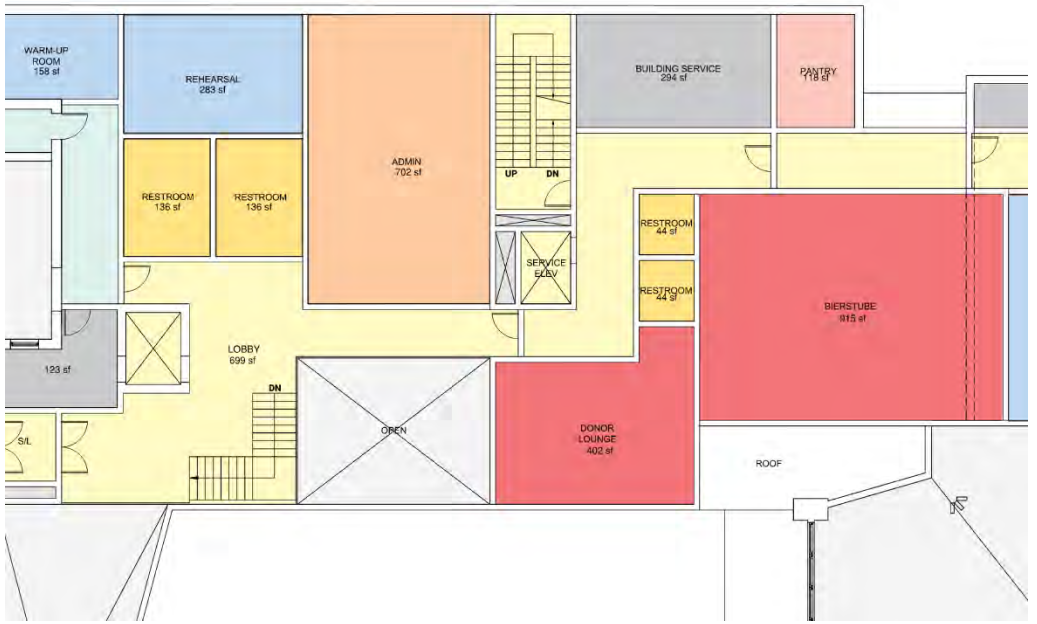
Connector Building

Acoustics

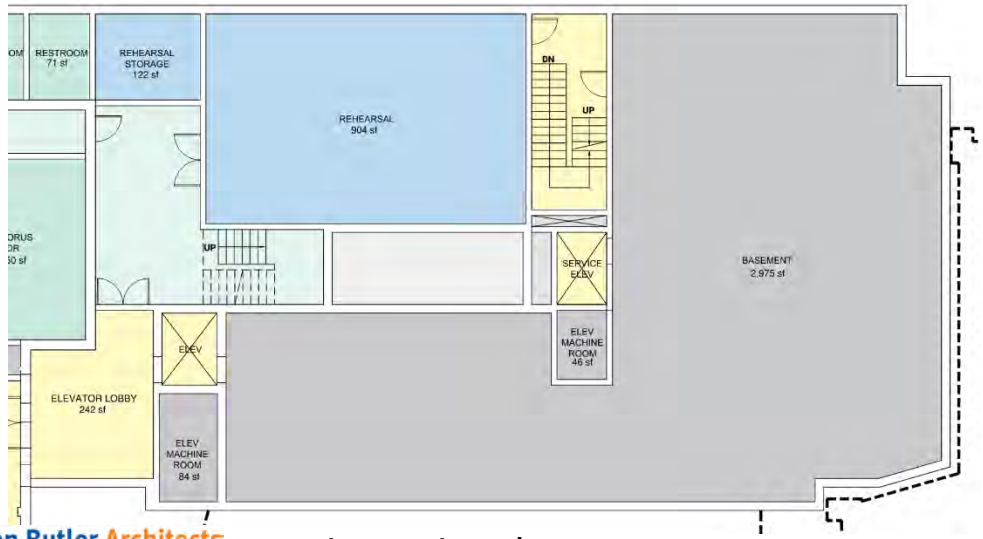
- **Appropriate background noise levels**
- **Robust construction to provide measures of isolation for simultaneous use of spaces.**
- **Appropriate acoustic treatments (diffusive, transparent, and absorptive).**
- **Appropriate volume for rehearsal spaces.**

CONNECTOR

Ground Level



Second Level



Lower Level

Planning Overview

AMS PLANNING & RESEARCH

Wilson Butler Architects

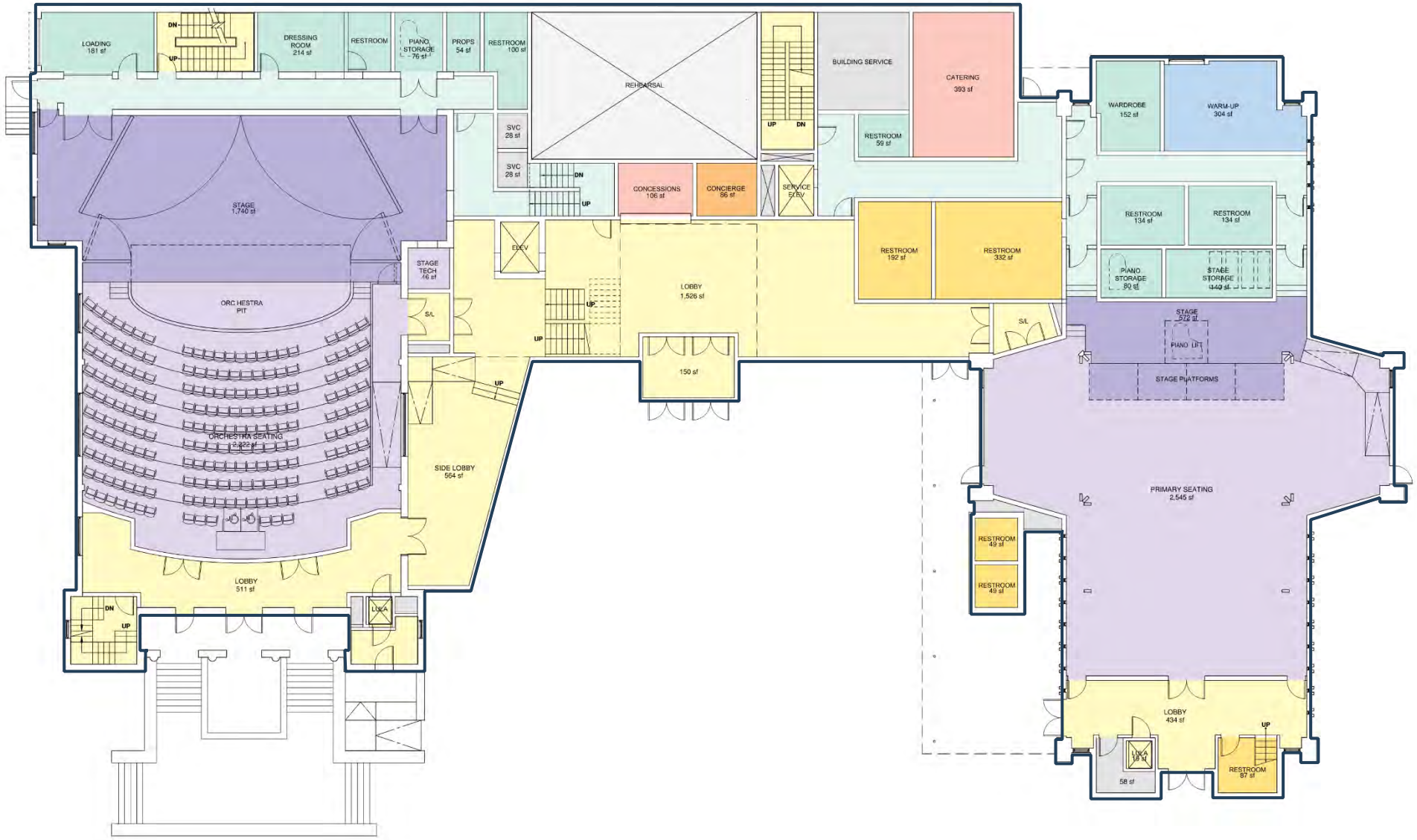
The Shalleck Collaborative Inc.
Planning and Design of Theatres | Production Systems | AV

threshold

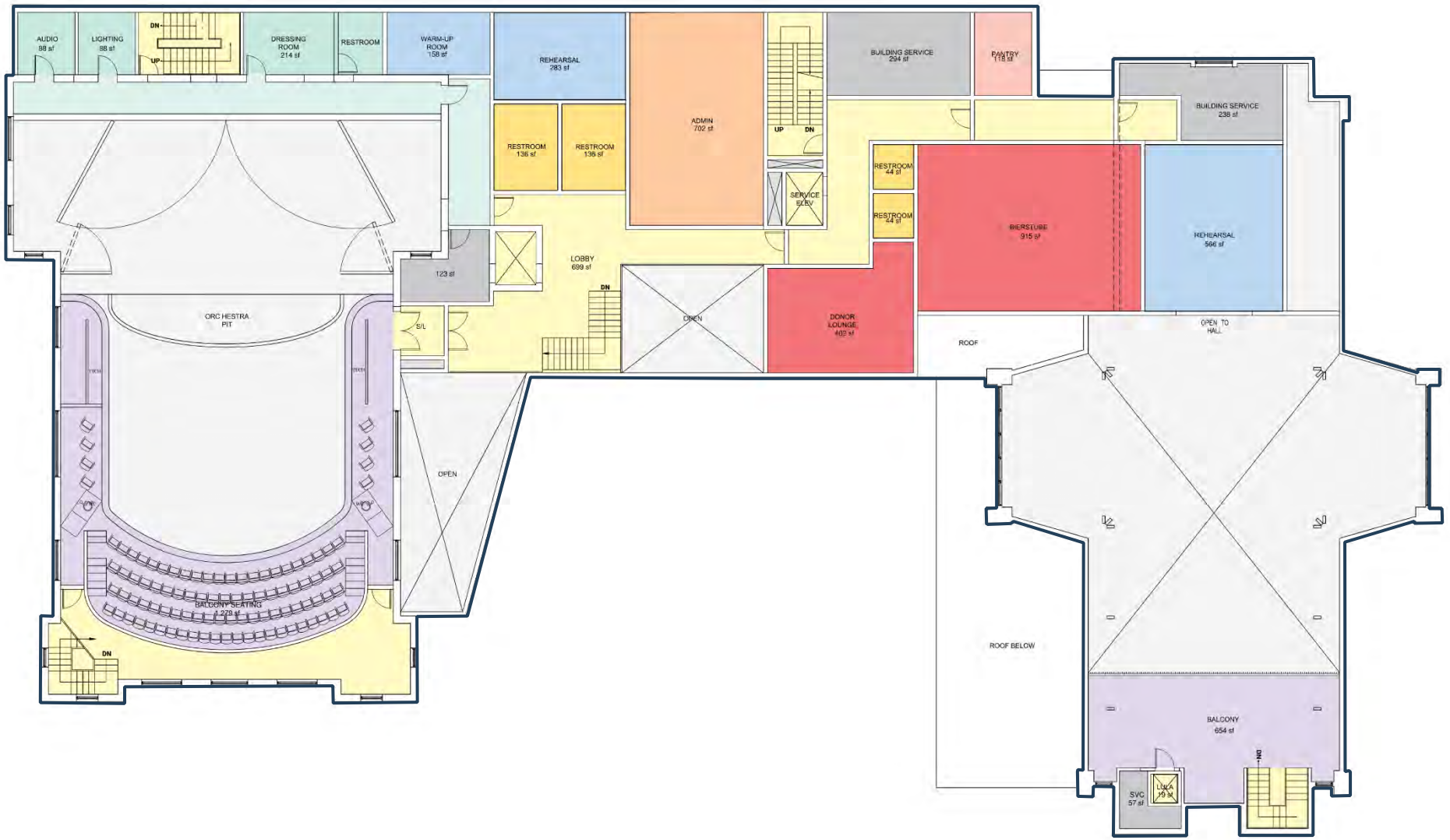
venue. the bottom line

COLLABORATIVE ENGINEERING GROUP

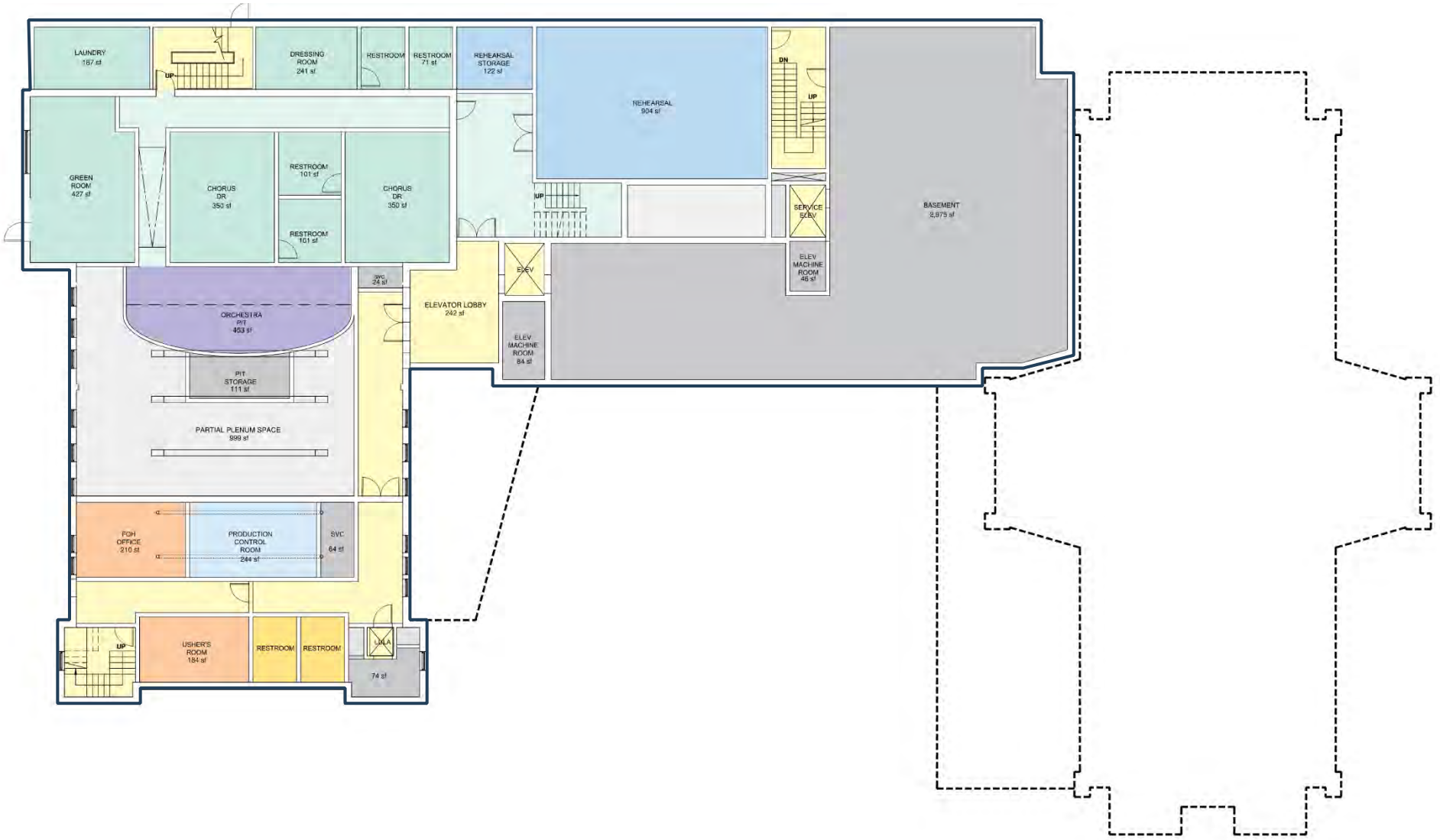
GROUND LEVEL



SECOND LEVEL



LOWER LEVEL

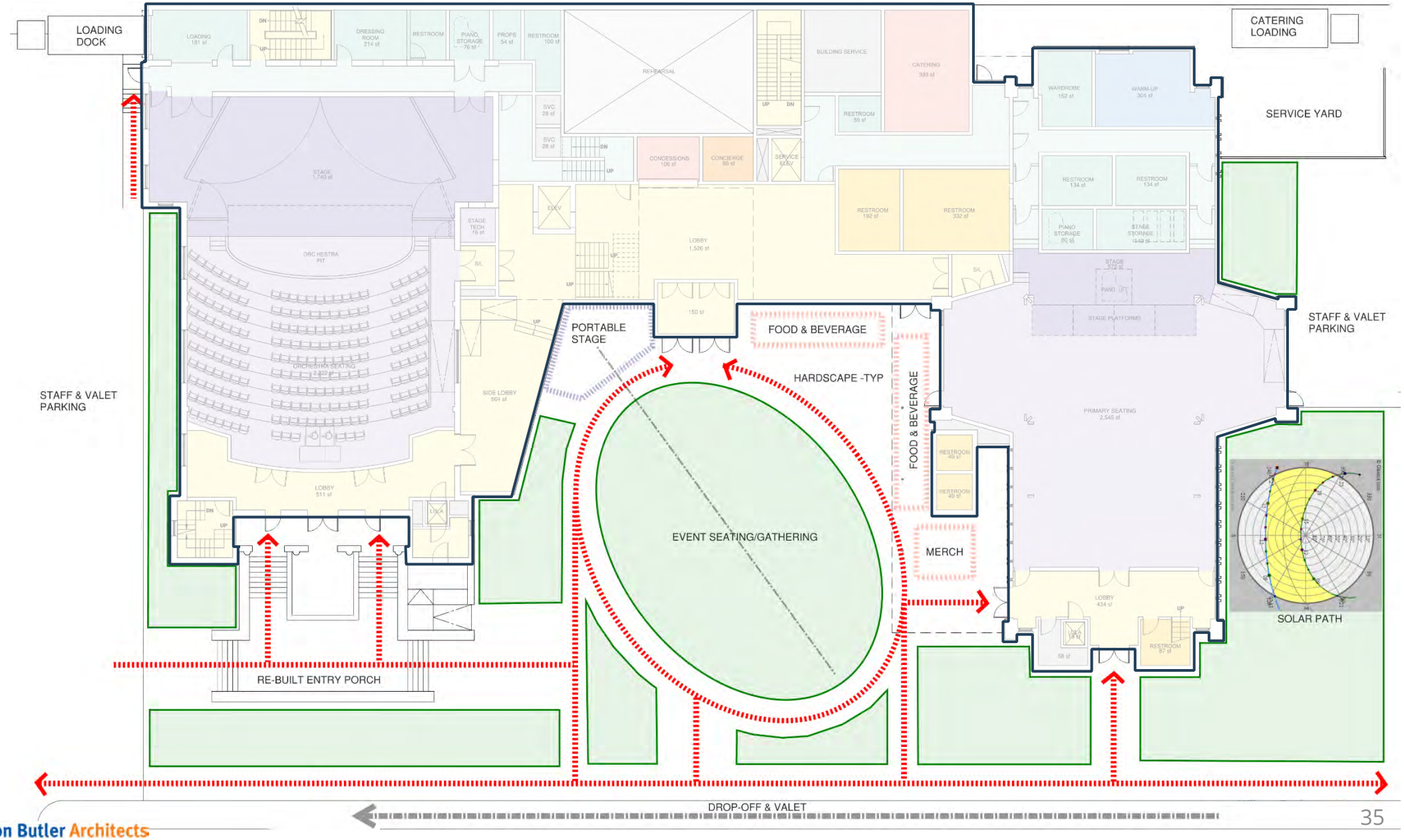

LAUNDRY
187 sf
UP
DRESSING ROOM
241 sf
RESTROOM
RESTROOM
71 sf
REHEARSAL STORAGE
122 sf
REHEARSAL
904 sf
DN
UP
GREEN ROOM
427 sf
CHORUS DR
350 sf
RESTROOM
101 sf
CHORUS DR
350 sf
RESTROOM
101 sf
UP
SERVICE ELEV
BASEMENT
2,975 sf
ELEV
ELEV MACHINE ROOM
46 sf
SVC
24 sf
ELEVATOR LOBBY
242 sf
ELEV MACHINE ROOM
84 sf
ORCHESTRA PIT
453 sf
PIT STORAGE
111 sf
PARTIAL PLENUM SPACE
999 sf
FOH OFFICE
210 sf
PRODUCTION CONTROL ROOM
244 sf
SVC
64 sf
UP
USHER'S ROOM
184 sf
RESTROOM
RESTROOM
LULA
74 sf

Courtyard

Courtyard

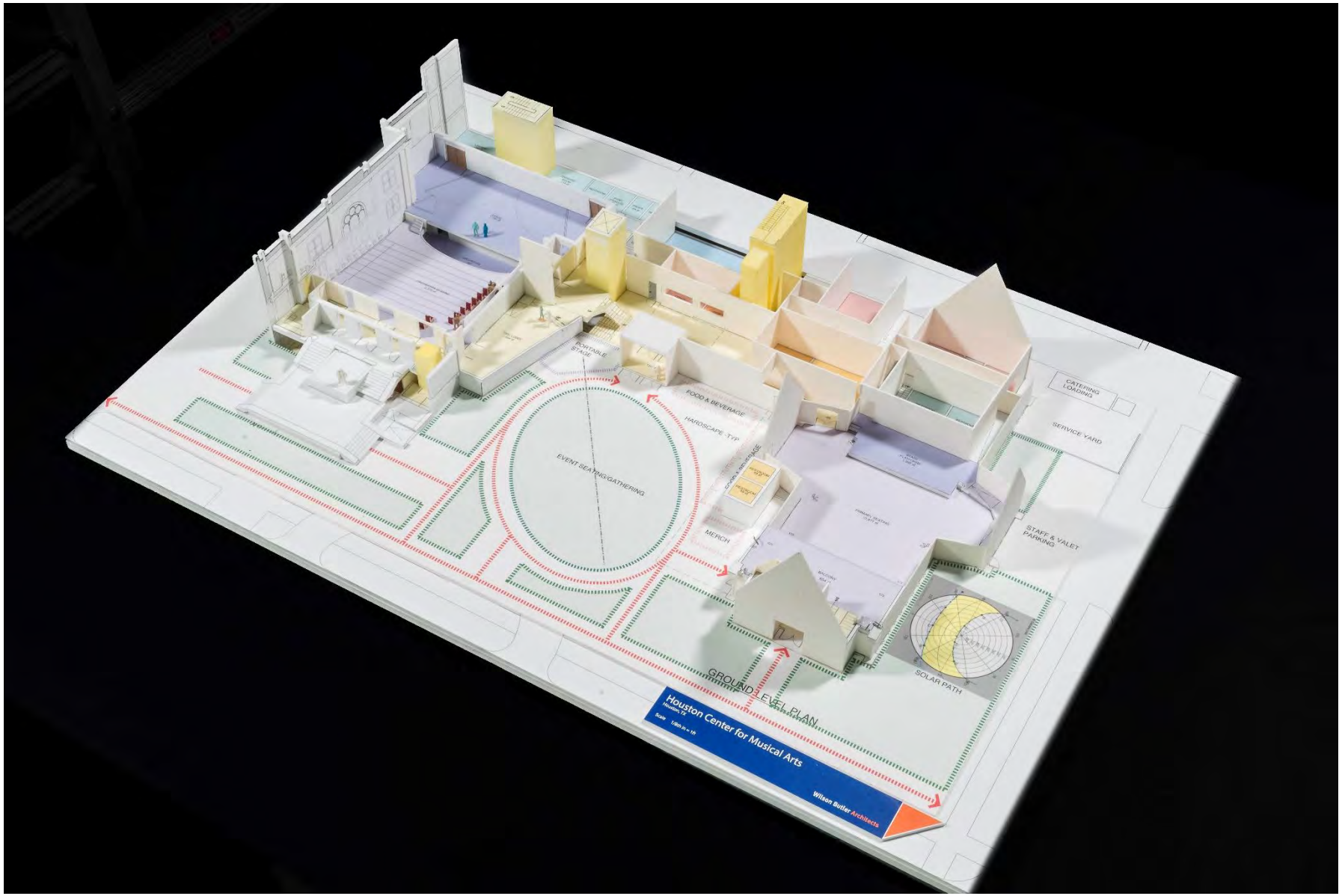
- Remove barriers - Encourage community engagement & interaction
- Address arrival sequence, circulation & access
- Streamline valet/ride-share
- Landscape & hardscape suitable for events and performances
- Production & A/V company switches
- Infrastructure for food, beverage and merchandise
- Dedicated patron amenities
- Signage

COURTYARD


LOADING DOCK
CATERING LOADING
SERVICE YARD
STAFF & VALET PARKING
STAFF & VALET PARKING
PORTABLE STAGE
FOOD & BEVERAGE
HARDSCAPE -TYP
FOOD & BEVERAGE
EVENT SEATING/GATHERING
MERCH
SOLAR PATH
RE-BUILT ENTRY PORCH
DROP-OFF & VALET

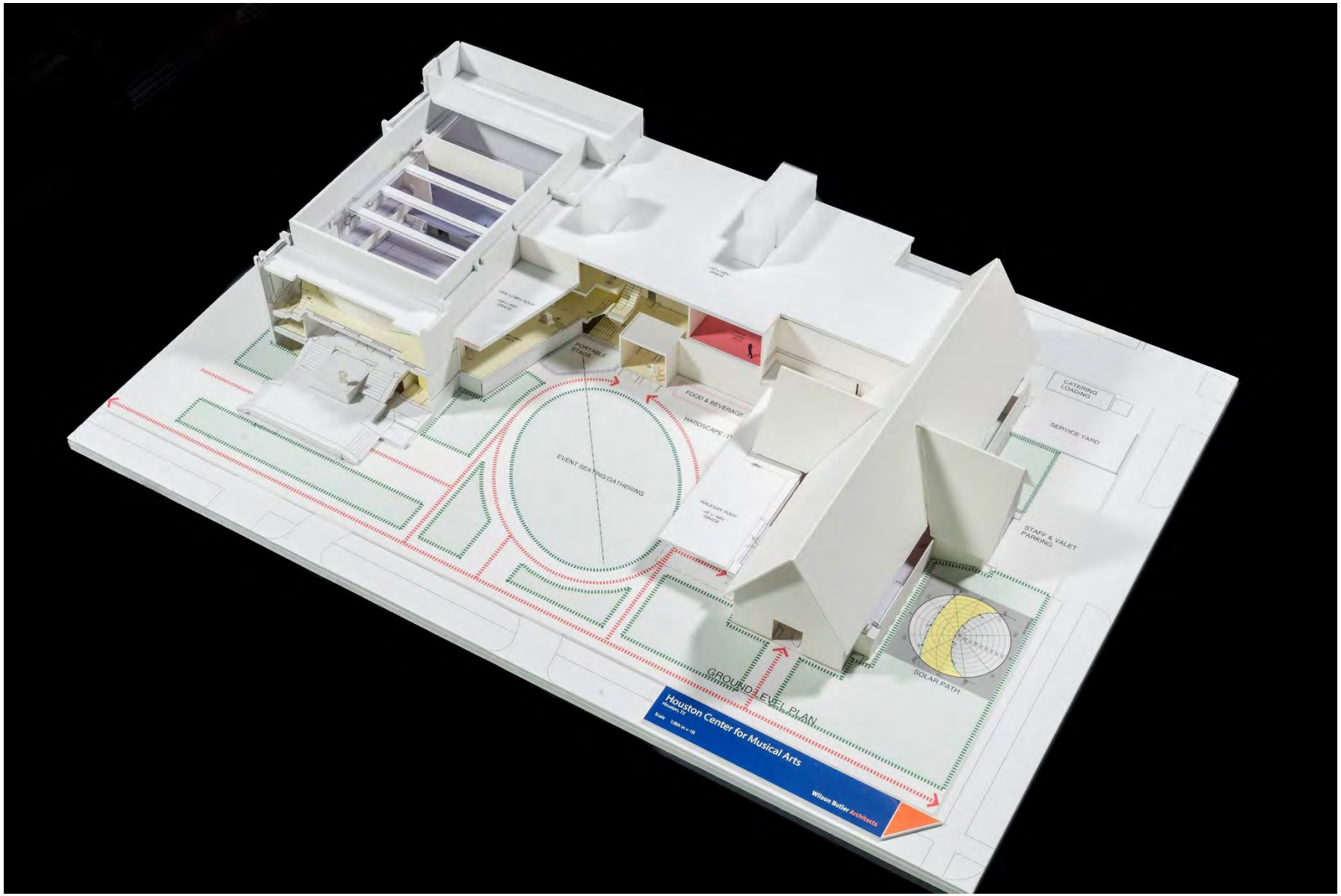
LOWER LEVEL

MAIN LEVEL

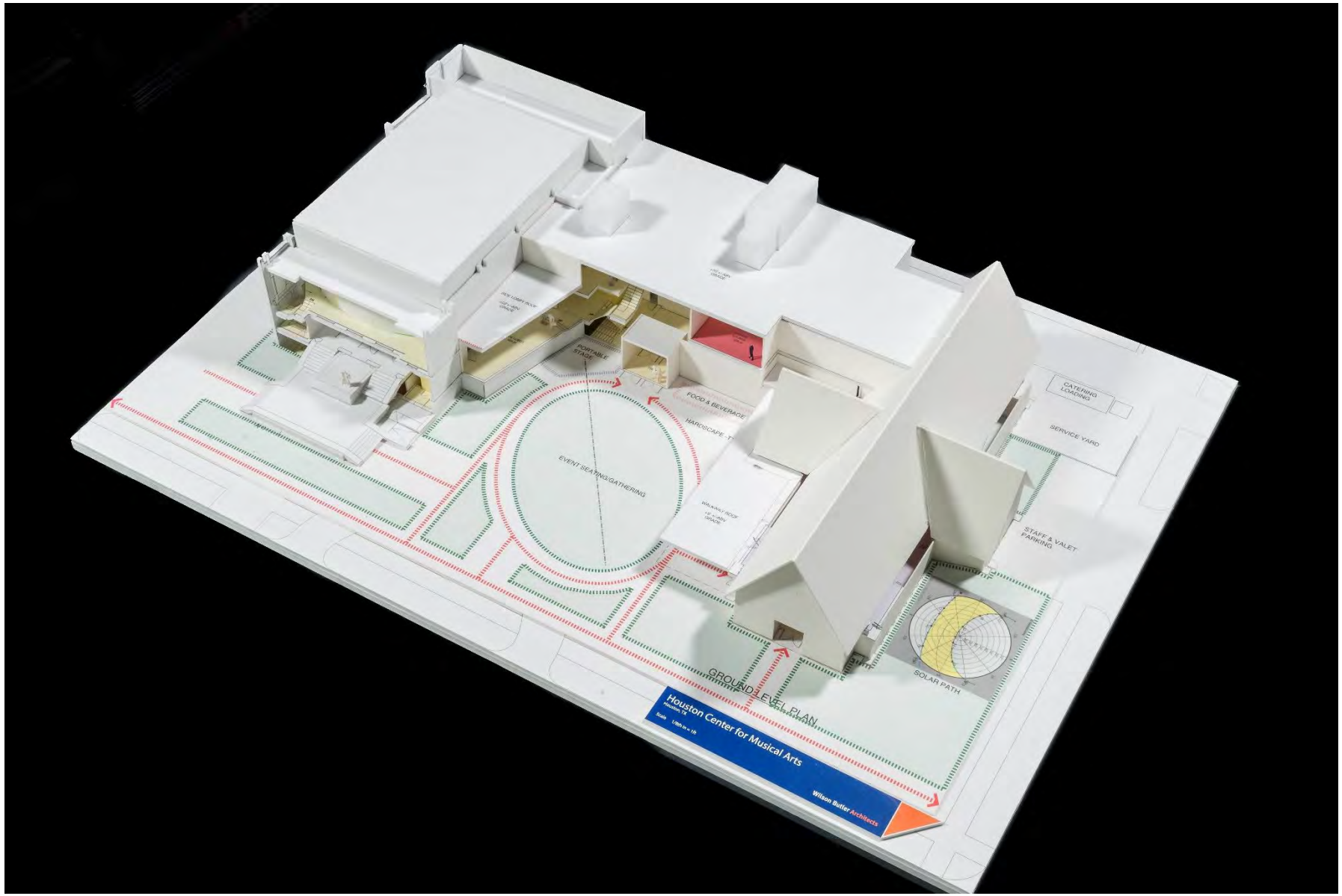

PORTABLE STAGE
FOOD & BEVERAGE
HARDSCAPE - TYP
EVENT SEATING/GATHERING
MERCH
CATERING LOADING
SERVICE YARD
STAFF & VALET PARKING
SOLAR PATH
GROUND LEVEL PLAN
Houston Center for Musical Arts
Wilson Butler Architects

SECOND LEVEL

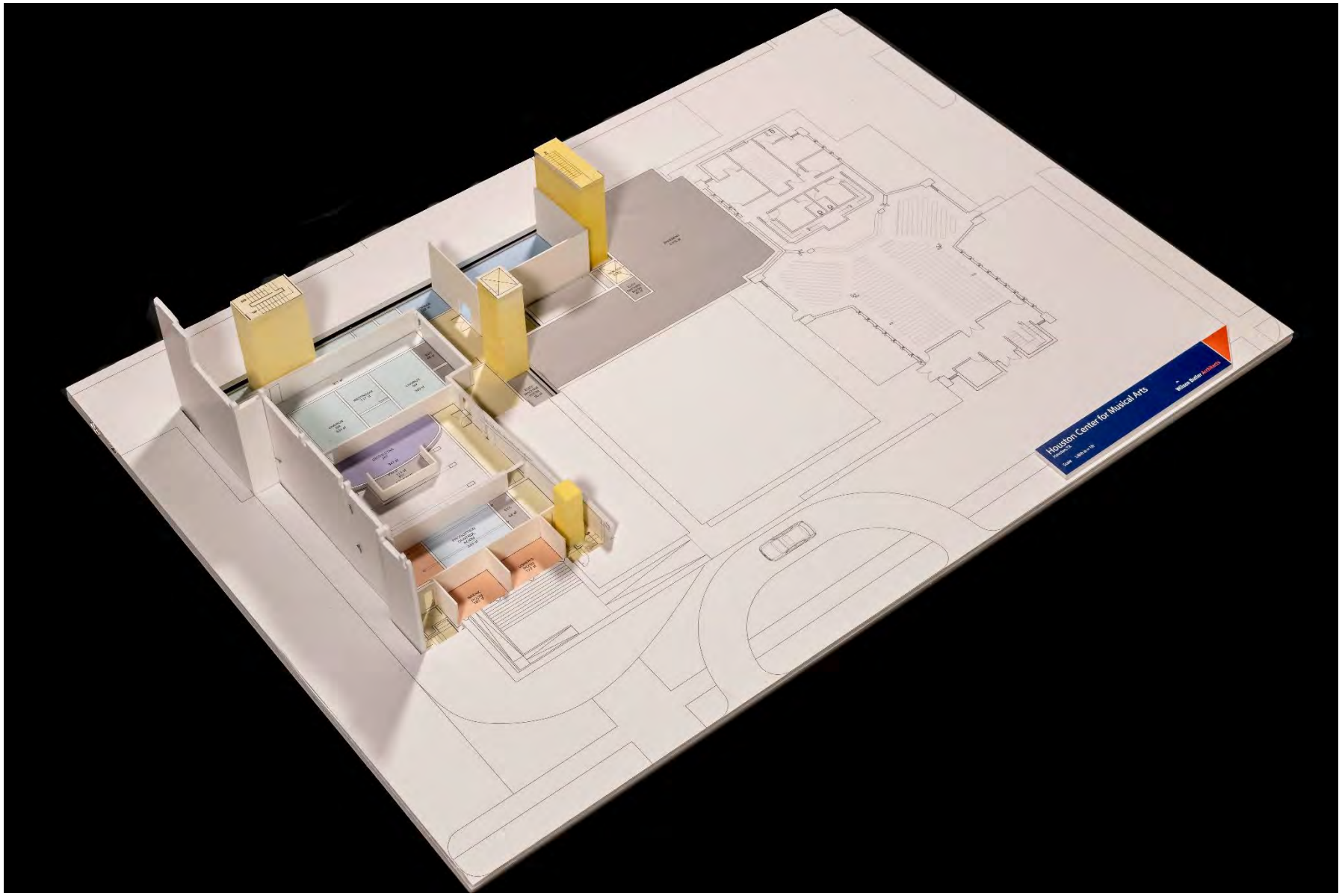
CATWALK LEVEL



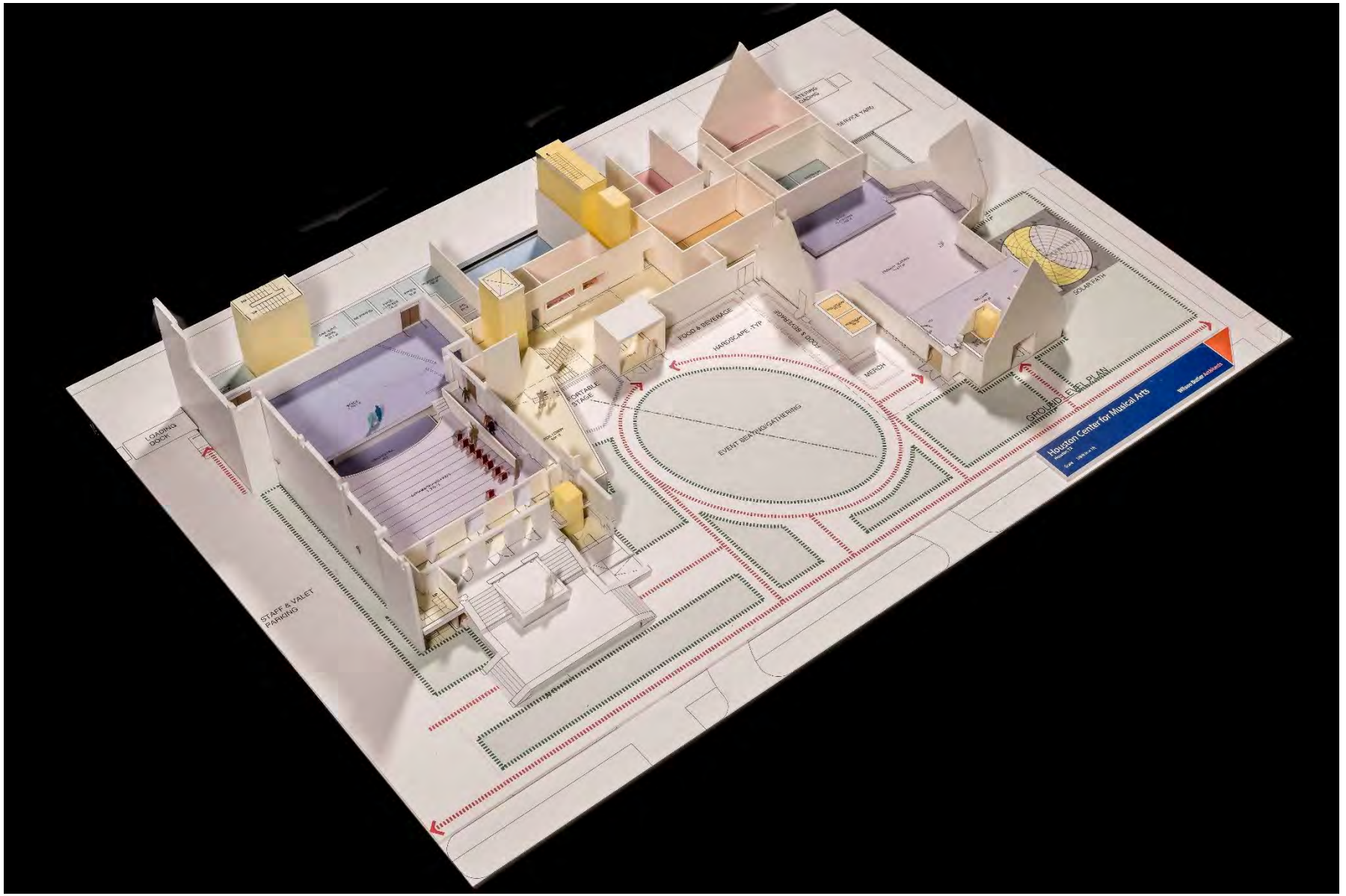
ROOF LEVEL


PORTABLE STAGE
FOOD & BEVERAGE
HARDSCAPE
EVENT SEATING/GATHERING
CATERING LOADING
SERVICE YARD
STAFF & VALET PARKING
SOLAR PATH
GROUND LEVEL PLAN
Houston Center for Musical Arts
Wilson Butler Architects

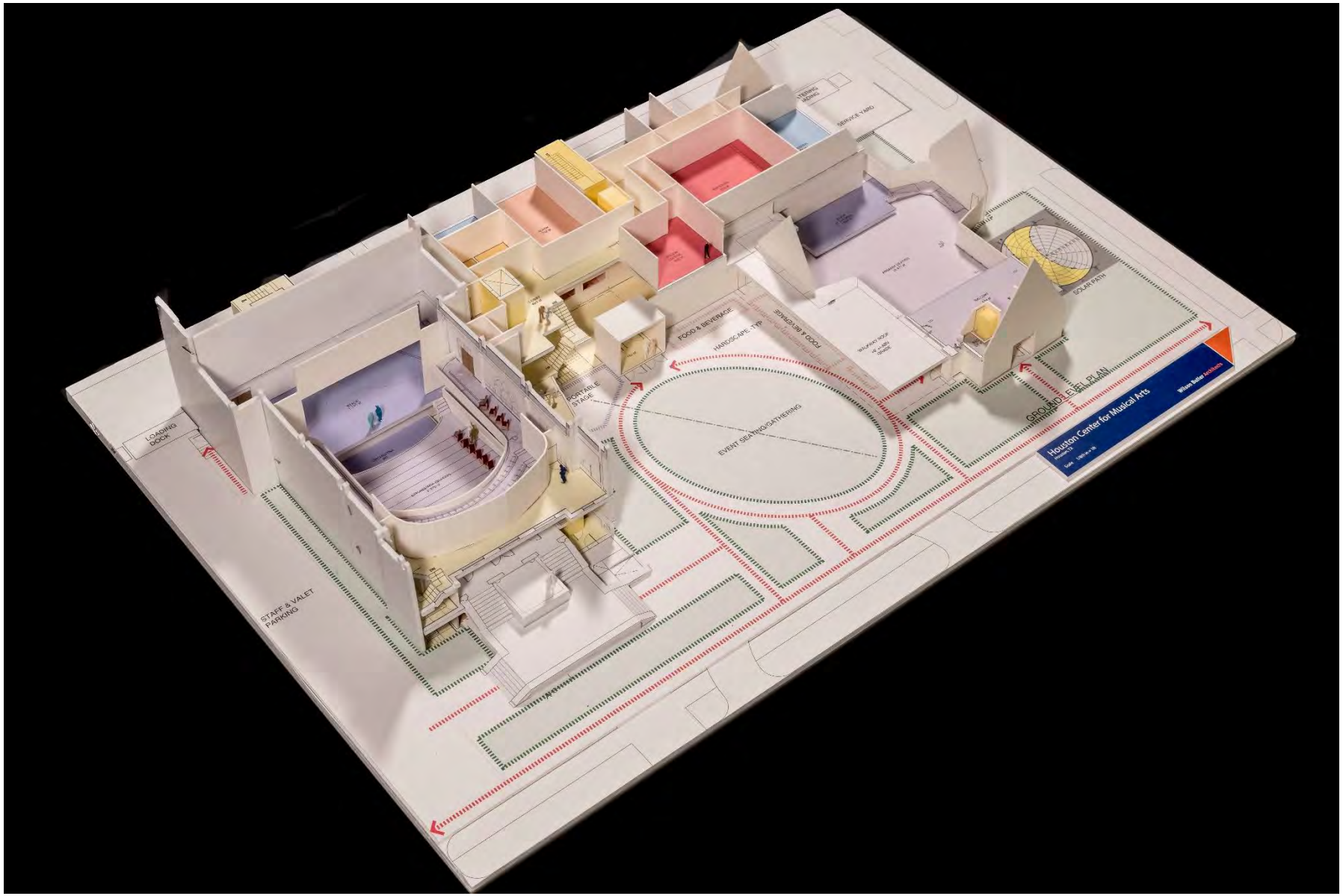
LOWER LEVEL



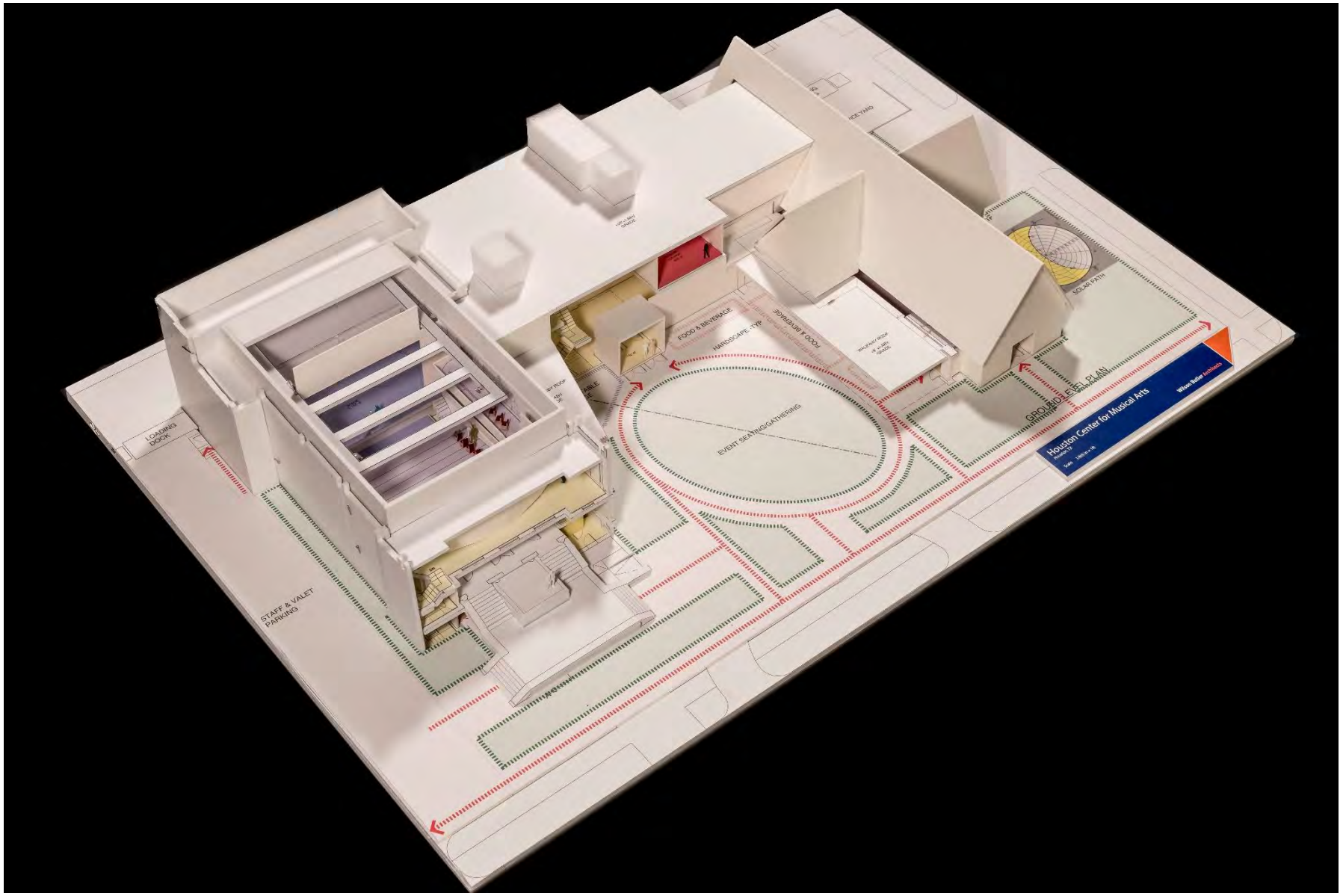
MAIN LEVEL


LOADING DOOR
STAFF & VALET PARKING
PORTABLE STAGE
EVENT SEATING/GATHERING
FOOD & BEVERAGE
MERCH
SOLAR PATH
GROUND LEVEL PLAN
Houston Center for Musical Arts

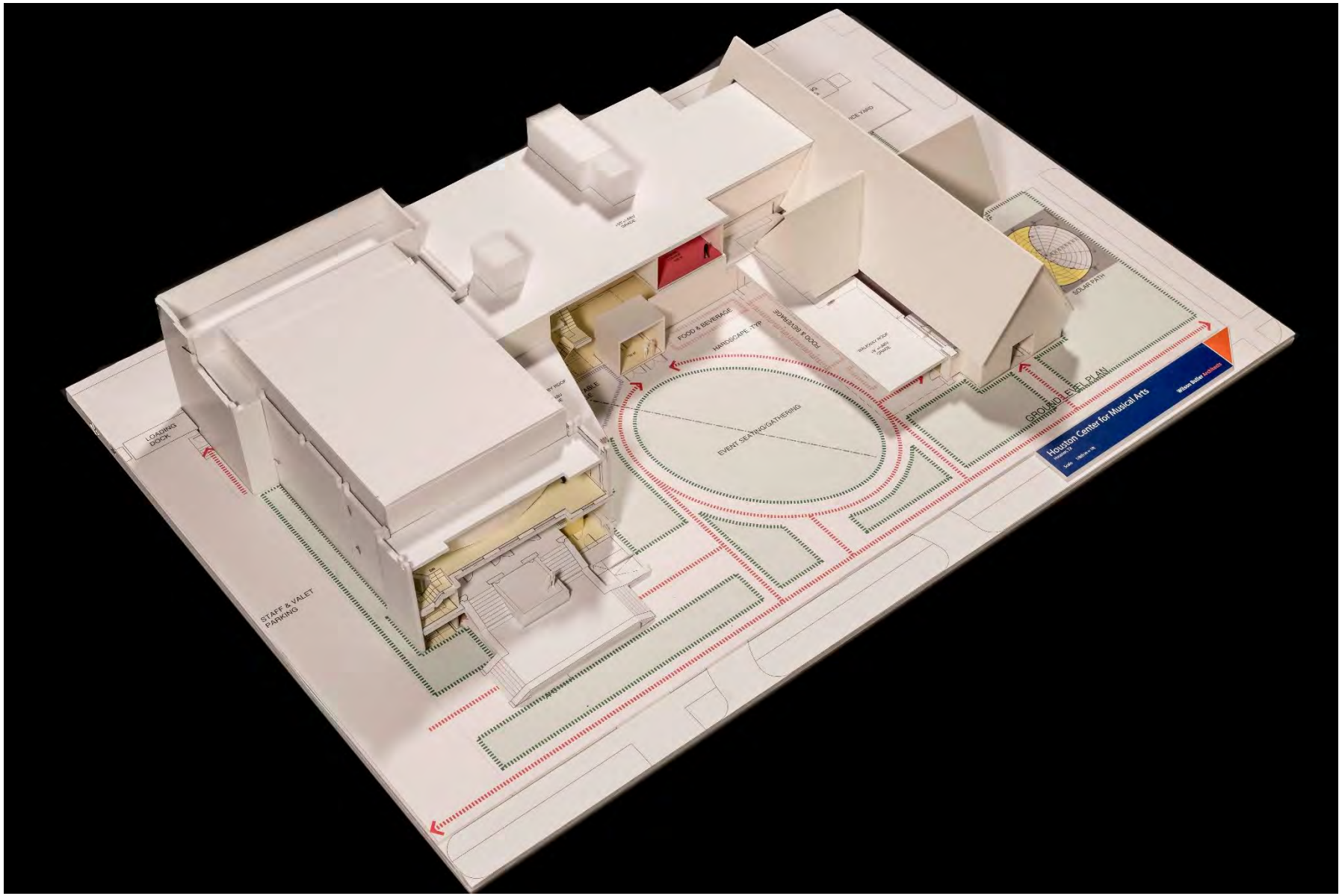
SECOND LEVEL



CATWALK LEVEL



ROOF LEVEL


LOADING DOCK
STAFF & VALET PARKING
EVENT SEATING/GATHERING
FOOD & BEVERAGE
HARDSCAPE - TYP
SEDUM MAT
GROUND LEVEL PLAN
Houston Center for Musical Arts

APPENDIX H

Preliminary Pricing Narrative and Outline Specification

Houston Center for Musical Arts

Houston, Texas

August 11, 2023

Prepared By

COLLABORATIVE ENGINEERING GROUP

8904 Fairbanks N Houston

Houston, TX 77064

281.598.1170

Firm No. 12678

This document is released for the purpose of schematic design on 08.11.2023 under the authority of:

Andy Solberg, P.E. 84821 (Mechanical)

Kevin Schmidt, P.E. 97556 (Electrical)

It is not to be used for construction, bidding, or permit purposes.

DESIGN GUIDELINES – Division 21

This document has been prepared to record and establish the level of quality upon which the project will be based through Schematic Design. This document is also intended to aid in the preparation of cost estimates and the selection of materials.

Section 21 00 00 – Fire Suppression Basic Requirements

A. Scope of work shall be to provide a complete and NFPA 13 compliant automatic fire sprinkler system to protect the facility, and a complete and NFPA 14 compliant automatic standpipe system to provide pressurized fire water in the egress stairs. Scope will include providing a wet pipe system to protect the conditioned building interior spaces.

B. Minimum standards for all work shall be the 2015 International Fire Code (IFC) with City of Houston Amendments, National Fire Protection Association (NFPA 101), and 2015 International Building Code (IBC) with City of Houston Amendments.

C. Incoming fire water services shall be minimum 6" and shall be documented on Civil engineering drawings up to 5' outside the building. MEP shall detail an automatic fill valve arrangement to fill the fire water section of a combined domestic water / fire water break tank.

D. Where this division's piping crosses expansion joints between buildings, sway joints will be used to ensure appropriate flexure at points of movement.

Section 21 05 23 – General Duty Valves for Water-Based Fire Suppression Piping

A. Shut-off valves: up to 2 ½": bronze ball valve, full port, Nibco KT-505-8 or equal. 3" and larger: Lug body butterfly valve w/ tamper switch, Nibco LD3510-8 or equal. Exception: on suction side of fire pump: resilient wedge OS&Y gate valve, Nibco F-607-RW or equal.

B. Ball valves: bronze body with threaded ends, for drain connections. Provide ¾" hose thread nipple, cap and chain. Nibco KT-585-70-UL or equal.

C. Check valves: up to 3", bronze body with threaded ends, Nibco T-433 or equal. 4" and larger: swing check, Tyco CV-1F or equal.

Section 21 05 29 – Hangers and Supports for Fire Suppression Piping and Equipment

A. Pipe hangers: per NFPA 13.

B. Concrete thrust blocks at changes of direction in underground pipe.

Section 21 05 53 – Identification for Fire Suppression Piping and Equipment

A. Laminated plastic nameplates.

B. Metal valve tags.

C. Vinyl pipe markers.

Section 21 12 00 – Standpipe Systems

A. Standpipe System

1. Provide a complete Class I wet pipe automatic standpipe system to serve the building.

2. Standpipes shall be schedule 40 black steel pipe with grooved type ductile iron fittings, Victaulic or equal.

3. Provide 6" standpipes in all stairs required for egress. Where stairs are exterior to the building and exposed to the elements, standpipe shall be in a chase adjacent to the stair entrance to the building. Insulate and heat trace pipe exposed in the garage.

4. Provide a 3" galvanized steel drain riser adjacent to each standpipe.

5. Provide 2 1/2" fire department valves in each stair and on every level.

Section 21 13 00 – Fire Break Tank

A. Welded Steel Tank

1. Size to be determined by flow test, minimum 2500 Gallons. Provide minimum 12" freeboard above top fill.

2. ¼" steel plate, top, bottom, and sides

3. Channel reinforcement, sides and top

4. Flanged openings, with vortex plates as required by City of Houston. Flanged overflow.

5. 24"x24" manholes, gasketed, top and sides, with stainless steel ladders inside and outside tank.

6. Threaded openings for level measuring elements, sight glass, fill and test connections, drain connection.

7. Lifting lugs, nameplate.

8. Blast interior and provide epoxy interior liner. Prime exterior and provide two coats of paint.

9. Solenoid valve for hard fill shutoff, and (2) float controlled valves for fill control. Valves by Cla-Val.

10. Fire alarm points connected in compliance with NFPA 14.

11. Set tank on concrete housekeeping pad in basement.

Section 21 13 13 – Fire-Suppression Sprinkler Systems

A. Wet Pipe Sprinkler System

1. Provide an automatic wet pipe sprinkler system to protect conditioned spaces in compliance with the requirements of NFPA and the City of Houston fire code.

2. Provide a single sprinkler control station for each level. For each zone of control, provide inspector's test/drain.

3. Provide white, concealed type sprinkler heads for office spaces, back of house areas, front of house areas, and other areas with finished ceilings. Provide concealed type sprinkler heads for performance spaces, with finish as specified by architect. Provide bronze, upright or pendent type sprinkler heads for back-of-house spaces without finished ceilings. Coverage for light hazard occupancy shall not exceed 225 square feet coverage area and ordinary hazard occupancy shall not exceed 130 square feet coverage.

4. Light hazard occupancy spaces shall be office spaces, dressing rooms, performance spaces, corridor and lobby areas, and lounges. All other areas of the building shall be ordinary hazard group 1.

B. Sprinkler Pipe

1. Schedule 40 black steel pipe.

2. 2 ½" pipe and larger: grooved type ductile iron fittings, Victaulic or equal.

3. 2" pipe and smaller: class 125 black cast iron screwed pattern fittings.

4. Painted, two coats of urethane.

Section 21 30 00 – Centrifugal Fire Pump

A. Fire pump sized to provide 1000 GPM at 150 psi, 125 HP, with 100 psi at most hydraulically remote 2-1/2" hose connection. Located in basement.

B. Jockey Pump sized to provide 10 GPM at 160 psi, 2 HP, to maintain pressure in system. Located in basement.

C. Provide controllers for both fire pump and jockey pump with integral transfer switches for emergency power.

D. Provide fire pump test header on building exterior. Provide recirculating test arrangement with flow meter.

E. Provide housed spring isolators, 1” deflection, for fire pump vibration isolation. Locate pump on a 4” concrete housekeeping pad.

DESIGN GUIDELINES – Division 22

This document has been prepared to record and establish the level of quality upon which the project will be based through Schematic Design. This document is also intended to aid in the preparation of cost estimates and the selection of materials.

Section 22 00 00 – Plumbing Basic Requirements

A. Scope of work will be to provide domestic cold and hot water, sanitary waste and vent, storm sewer, and natural gas systems to serve the needs of the building. Water heaters shall be natural gas.

B. Minimum standards for all work shall be the 2015 Uniform Plumbing Code (UPC) with City of Houston Amendments, 2015 International Energy Conservation Code, 2015 International Building Code (IBC) with City of Houston Amendments, 2015 Texas Accessibility Standards (TAS), and 2010 American Disabilities Act (ADA).

C. Extend all utilities to 5 feet outside of the building. Extension of utilities to mains shall be provided under another division (Civil).

D. Where this division's piping crosses expansion joints between buildings, sway joints will be used to ensure appropriate flexure at points of movement.

Section 22 05 03 – Plumbing Piping

A. Domestic Water

1. Domestic cold water system:

   a. Provide a system of domestic cold water to serve all fixtures including sinks, lavatories, urinals, water closets, mop sinks, drinking fountains, hose bibbs and wall hydrants. Provide shut-off valve to each unit.

   b. Provide wall hydrants around perimeter of building spaced maximum 100 ft.

2. Domestic hot water circulating system:

   a. Provide a system of hot water to serve all fixtures including sinks and lavatories. Provide circulation system piping, circulating pump, automatic hot water circulation balancing valves and thermal expansion tank.

3. Domestic water piping shall be type "L" copper with sweat fittings above grade, inside the building. Domestic water piping shall be ductile iron with mechanical fittings below grade. Domestic water piping serving trap primers shall be continuous type "K" copper tubing with no joints or fittings.

4. Backflow preventer for incoming domestic water service is documented on Civil plans.

5. The entire domestic water system shall be “lead free” as defined by the Safe Drinking Water Act.

B. Natural Gas

1. Provide a natural gas piping system to serve generator, gas fired water heaters, and hydronic boilers. Pressure shall be line pressure. Gas meter to be provided by the utility company.

2. Natural gas piping outside the building to be PE pipe and fittings.

3. Provide dedicated natural gas pressure regulator for each piece of gas fired equipment. Gas pressure regulator vent piping shall be individually routed thru roof of building and shall not be combined with other gas pressure regulator vents.

4. Gas piping inside the building shall be ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B. The fittings are to be Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.

C. Sanitary Waste and Vent

1. Provide a system of waste and vent piping to all plumbing fixtures and floor drains/sinks. Provide floor drains in each restroom. Collect and extend to a sanitary line 5'-0" from building. Extend multiple vents through the roof.

2. Waste and vent piping shall be standard weight cast iron pipe and DWV pattern fittings with hub or no-hub joints inside building. Outside the building, below grade, and below slab shall be cast iron pipe with DWV pattern hub joints and fittings.

3. Provide floor sinks for indirect waste fixtures and condensate drains from mechanical equipment.

4. Electronic automatic trap primers and odor trap guards shall be provided on all floor drains/floor sinks.

D. Storm

1. Provide a system of heavy-duty roof and overflow drains. Storm and overflow piping shall be sized based on rainfall rate of 8 inches per hour. Collect storm piping and extend below slab. Collect overflow piping and daylight to spill to splash blocks at grade.
2. Storm piping shall be standard weight cast iron pipe and DWV pattern fittings with hub or heavy-duty no-hub joints inside building. Outside the building, below grade, and below slab shall be Schedule 40 PVC pipe and solvent weld DWV pattern fittings.

Section 22 05 23 - General Duty Valves for Plumbing Piping

A. Domestic water valves: 2 inches and smaller, Nibco T-585-70-66 or equal, ball valve, bronze, stainless steel stem and ball w/ full port. 2 ½" and larger: Nibco LD-3022 or equal, butterfly valve, ductile iron lug body w/ stainless steel disc and stem and EPDM seals/liner.

B. Domestic hot water balancing valve: ThermOmegaTech Circuit Solver CSUAS-3/4-130-CV1-TW or equal. Balancing valve shall be self-balancing type, NSF61 and NSF372 accredited, fixed temperature with strainer, unions, check valve, temperature gauge and isolation ball valves.

Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

A. Carbon steel pipe hangers: pre-galvanized, with carbon steel all thread rod.

B. Copper pipe hangers: copper coated steel, with copper coated steel all thread rod.

C. Trapeze hangers: carbon steel structural assemblies suspended with carbon steel all thread rod with saddles and U-bolts.

D. Spring hangers at vibration-isolated equipment.

E. Storm and Overflow piping shall be clamped and supported at each change of direction and connected to building structure.

F. Concrete thrust blocks at changes of direction in underground pipe.

Section 22 05 53 – Identification for Plumbing Piping and Equipment

A. All plumbing equipment shall have permanently affixed, multilayer, multicolor, plastic labels for mechanical engraving with predrilled holes for attachment hardware.

B. All plumbing piping shall have service identified using self-adhesive pipe labels with flow direction arrows. Permanently painted stenciled labels are acceptable on uninsulated piping.

   a. Near each valve and control device.

   b. Near each branch connection, excluding short takeoffs for fixtures. Where flow pattern is not obvious, mark each pipe at branch.

   c. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.

   d. At access doors, manholes, and similar access points that permit view of concealed piping.

   e. Near major equipment items and other points of origination and termination

   f. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

Section 22 07 19 – Plumbing Piping Insulation

A. Domestic hot water: mineral fiber, preformed, type I, 1" thick for all pipe sizes.

B. Domestic cold water in exterior walls and plenum spaces subject to freezing: mineral fiber, preformed, type I, 1" thick for all pipe sizes.

C. Floor drains, traps, and sanitary drain piping within 10 feet of drain receiving condensate below 60°F: mineral fiber, preformed, type I, 1/2" thick for all pipe sizes.

D. Storm and overflow drain bodies and horizontal storm and overflow piping: mineral fiber, preformed, type I, 1" thick for all pipe sizes.

E. Exposed insulated piping shall be provided with aluminum jacket.

F. Piping running exposed through unheated areas shall be heat traced and insulated.

Section 22 11 19 – Domestic Water Piping Specialties

A. Backflow preventers: Watts or equal, reduced pressure, bronze body threaded, for water makeup to equipment.

B. Wall hydrants: Jay R. Smith or equal, non-freeze wall hydrants, deep nickel-bronze box with key, spaced not more than every 100 feet around the perimeter of the building.

C. Water hammer arresters: Precision Plumbing Products or equal, metal bellows type, on cold and hot water connections to single fixtures or fixture batteries.

Section 22 11 23 – Domestic Water Packaged Booster Pump

A. Domestic Water Packaged Booster Pump: Provide duplex house pump package to supply 35 psi to most remote plumbing fixture at second level.

B. Provide with combination fire/domestic water welded steel break tank and solenoid fill valve arrangement per City of Houston requirements. Minimum 1000 gallon storage for domestic water.

Section 22 12 13 – Domestic Water Break Tank

A. Welded Steel Tank

1. Size to be determined by flow test, minimum 1000 Gallons of usable stored water (does not include volume below vortex plate or above overflow). Provide minimum 12" freeboard above top fill.

2. ¼" steel plate, top, bottom, and sides.

3. Channel reinforcement, sides and top.

4. Flanged openings, with vortex plates as required by City of Houston. Flanged overflow.
5. 24”x24” manholes, gasketed, top and sides, with stainless steel ladders inside and outside tank.
6. Threaded openings for level measuring elements, sight glass, fill and test connections, drain connection.
7. Lifting lugs, nameplate.
8. Blast interior and provide epoxy interior liner. Prime exterior and provide two coats of paint.
9. Solenoid valve for hard fill shutoff, and (2) float-controlled valves for fill control. Valves by Cla-Val.
10. Set tank on concrete housekeeping pad in basement.

Section 22 13 19 – Sanitary System Piping Specialties

A. Cleanouts: Jay R. Smith or equal, cast iron hubless type with brass plug, at ends of lines.

B. Floor drains: Jay R. Smith or equal, cast iron, with heel-proof grate in restrooms.

C. Floor sinks: Jay R. Smith or equal, cast iron with half grating, in mechanical and equipment rooms, and at icemakers.

D. Trap primers: Precision Plumbing Products or equal, electronic recessed or surface-mounted with 120V solenoid valve and distribution units.

E. Odor trap guards: ProVent, elastomeric duck-bill membrane, in floor drains.

Section 22 14 29 –Sump Pumps

A. Provide elevator sump pump at each elevator pit per State of Texas requirements. Include oil notification system with alarm connected to building management system. Size for 50 GPM per cab, routed to sanitary.

B. Provide floor drain in orchestra pit. Route sanitary drain piping to a sump pump located in a pit in an adjacent mechanical space. Size for 50 GPM, routed to sanitary.

C. Provide a sump with duplex sump pumps in basement pump room capable of discharging full flow of overflowing fire pump fill station (estimated 1000 gpm, 25’ lift). 5’ diameter sump, 8’ deep.

D. All sump pumps will be on emergency power.

Section 22 33 00 – Gas-Fired, Domestic Water Heaters

A. Provide two 100-gallon, 150 cfh tank-type domestic water heaters similar to A.O. Smith model BTH-150(A), to be located in the boiler room on the second level.

B. Provide hot water return piping system with a recirculating pump to serve the bank of water heaters. Recirculating pumps shall run during time of operations and shall be controlled by a seven-day time clock and aquastat to maintain hot water temperature at each fixture. Hot water shall be circulated at 140° F and tempered at each fixture or group of fixtures with point of use mixing valves. This will reduce the risk of Legionella.

Section 22 40 00 – Plumbing Fixtures

A. Provide low water consumption fixtures complying with TAS/ADA.

B. Provide ASSE 1070 compliant/listed thermostatic mixing valve for each Lavatory. Set temperature to 110° F delivery temperature.

C. Water closets shall be American Standard vitreous china, wall-hung with 1.28 gpf automatic sensor type flush valve.

D. Urinals shall be American Standard vitreous china, wall-hung with 0.5 gpf automatic sensor type flush valve by Sloan.

E. Lavatories shall be American standard vitreous china, under counter mount with 0.5 GPM automatic sensor type faucet by Elkay, Sloan or Zurn. Include commercial grade heavy-duty chrome plated brass fittings and trim including 17-gauge p-traps and Chicago Faucet chrome plated loose key supply stops.

F. Sinks shall be stainless steel counter mount with 2.2 GPM Chicago Faucet with wrist-blade or lever handles and replaceable cartridges. Include commercial grade heavy-duty chrome plated brass fittings and trim including 17-gauge p-traps and Chicago Faucet chrome plated loose key supply stops.

G. Mop sinks shall be Stern-Williams floor mounted pre-cast terrazzo with Chicago Faucet wall mounted faucet with integral checks and vacuum breaker.

H. Electric drinking fountains shall be Elkay wall mounted, bi-level, self-contained type with bottle-filler, 8 GPH chiller, all stainless-steel cabinet option and floor mounted carrier.

I. Fixture support carriers with rectangular uprights shall be provided for wall-hung fixtures.

J. Floor drains shall be Jay R. Smith with nickel bronze strainer, nickel bronze heel-proof grate.

K. Floor sinks shall be Jay R. Smith with acid resistant enamel cast iron and nickel bronze half-grate.

DESIGN GUIDELINES – Division 23

This document has been prepared to record and establish the level of quality upon which the project will be based through Schematic Design. This document is also intended to aid in the preparation of cost estimates and the selection of materials.

Section 23 00 00 - Project Description

A. Scope of work shall be to provide mechanical conditioning and ventilation systems to serve the new and renovated structures that are included in the project scope.

Project consists of the renovation of two existing facilities (Lambert Hall and the Saengerhalle), the demolition of an existing connector structure, and the new construction of a new and expanded connector structure. Lambert Hall will consist of a lower level, ground floor, second floor, and a largely mechanical third floor. Saengerhalle will consist of a ground floor and a second floor. The connector will consist of a lower level, ground floor, second floor, and a roof which will be used for mechanical equipment.

The project's cooling plant will be hydronic. Chilled water will be provided with two air-cooled scroll compressor chillers, nominal 110 tons, located on the connector roof. Basis of Design is Carrier 30RB. Pumping will be variable primary with two horizontal end-suction pumps, 220 GPM at 110' head, 10HP, variable speed drives, located in the Lambert third floor pump room. Basis of Design is Xylem e-1510 2EB. Chilled water loop will be provided with air separator, automatic makeup water with backflow preventer, bladder tank for pressure maintenance, and pot feeder for chemical makeup.

The project's heating plant will be hydronic. Heating hot water designed to operate at 160F to 130F will be provided with two 1 MMBTUH gas-fired condensing boilers located in the Lambert third floor boiler room. Basis of Design is Lochinvar Crest FCB1000N. Pumping will be primary secondary, with constant speed primary circulators provided at each boiler and injecting water into a secondary loop using a low-loss header. Secondary pumping will be variable speed with two horizontal end-suction pumps, 60 GPM at 100' head, 5 HP, variable speed drives, located in the Lambert third floor pump room. Basis of Design is Xylem e-1510 1.5BC. Heating hot water loop will be provided with air separator, automatic makeup water with backflow preventer, bladder tank for pressure maintenance, and pot feeder for chemical makeup.

Outside air will be provided with a single outside air pretreatment unit. The unit will be provided with a heat wheel designed to provide energy exchange between 4600 CFM of outside air and 3100 CFM of exhaust and relief air. Supply and exhaust fans will be plug fans with variable speed drives. The heat wheel will be total enthalpy 3 angstrom molecular sieve. The outside airstream will also be provided with a preheat coil for freeze protection and a cooling coil, 40 tons. Outside air ductwork will distribute air through pressure-independent terminal units to the air handling units described below. Exhaust and relief ductwork will be regulated through pressure-independent terminal units serving restrooms, concierge and bierhalle spaces, and also drawing relief air to maintain building pressurization. The outside air pretreatment unit will be located on the connector roof. Basis of design is Temtrol semi-custom manufacture.

Five air handling units will provide space conditioning. The basis of design for each air handling units shall be Trane modular air handling units. The air handling units are:

- AHU-1 serves Lambert front of house and is located in a mechanical room in the Lambert basement. It is designed to move 2300 CFM with a 3HP fan on a variable speed drive. It will operate as a cooling-only VAV unit delivering air through 4" pressure class ductwork to (5) zones of control. Each zone of control will have a pressure-independent terminal unit with hydronic reheat control, and a space temperature sensor.

- AHU-2 serves Lambert house and is located on the connector roof. It is designed to move 15,000 CFM with a 15HP fan on a variable speed drive. It will operate as a single zone VAV unit, delivering air through low speed ductwork to high diffusers in the Lambert house and stage areas, and return air through the low seating, the four corners of the house, and through the wings of the stage. It will have a cooling coil with a hydronic reheat coil.

- AHU-3 serves most of the connector and the back of house spaces, and it is located in a mechanical room on the 2nd floor of the connector. It is designed to move 19,000 CFM with a 20HP fan on a variable speed drive. It will operate as a cooling-only VAV unit delivering air through 4" pressure class ductwork to (33) zones of control. Each zone of control will have a pressure-independent terminal unit with hydronic reheat control, and a space temperature sensor. Two piano storage rooms will also have a wall-mounted humidifier; Basis of Design is Dri-Steem Vapormist VM2.

- AHU-4 serves Saengerhalle house and is located in a mechanical room in the Saengerhalle 2nd floor back of house. It is designed to move 8000 CFM with a 10HP fan on a variable speed drive. It will operate as a single zone VAV unit, delivering air through low speed ductwork to high diffusers in the Saengerhalle house and stage platform, and return air through the corners of the house and stage. It will have a cooling coil with a hydronic reheat coil.

- AHU-5 services Saengerhalle front of house and balcony and is located in a mechanical room in the Saengerhalle 2nd floor front of house. It is designed to move 1600 CFM with a 2HP fan on a variable speed drive. It will operate as a single zone VAV unit, delivering air through low speed ductwork to the balcony and front lobby areas and returning air through sidewall grilles. It will have a cooling coil with a hydronic reheat coil.

A control system will be provided for the above-referenced equipment that will be accessible through a web-enabled front end.

B. Minimum standards for all work shall be the 2015 Uniform Mechanical Code (UMC) with City of Houston amendments, 2015 International Energy Conservation Code, and 2015 International Building Code (IBC) with City of Houston amendments.

C. References: The standards mentioned herein will be referred to in the design of mechanical systems. The engineer will select appropriate sections of the standards to be applied in accordance with established engineering principles and practices.

1. Applicable Sections of NFPA 101

2. Latest Version of SMACNA

3. 2010 Americans with Disabilities Act (ADA)

D. Design Conditions:

Location	RC	Summer (F)	RH	Winter (F)
Outside	--	90.9/79.2 WB	--	28
Lobby	30-35	75	50%	70
Sound/Light Locks	25	75	50%	70
Lambert Stage	20	75	50%	70
Lambert Seating	20	75	50%	70
Saengerhalle Stage	25	75	50%	70
Saengerhalle Seating	25	75	50%	70
Rehearsal	25	75	50%	70
Theatrical Technical	--	80	50%	65
Mechanical/Electrical	--	80	50%	65
Back of House	30	75	50%	70
Front of House	35	75	50%	70
Bierstube	30	75	50%	70
Donor Lounge	25	75	50%	70
Office	35	75	50%	70
Storage	--	75	50%	70

E. Load Calculation Criteria

1. Building Envelope: All building envelope components (roofs, walls, and glass) shall meet or exceed the requirements of the 2015 International Energy Conservation Code.

2. Internal Loads:

   a. Lighting loads shall meet or exceed the requirements of the 2015 International Energy Conservation Code.

   b. Miscellaneous power loads shall be 1 W/sqft for all general-purpose areas.

   c. Power and lighting loads in theatrical areas shall be as follows:
   * Audience chamber: 10 kW
   * Stage: 20 kW
   * Production Lighting - Sanctuary: 8 kW
   * Relay Room: 1 kW
   * Amplifier Room: 6 kW
   * Production Lighting – Lambert: 4 kW

3. Outside Air Ventilation: Shall be in accordance with the 2015 Uniform Mechanical Code with City of Houston Amendments and the requirements of ASHRAE 62.1.

G. Noise Criteria

1. The following table shall apply for duct air velocity (in feet/minute) for sound sensitive areas:

	At air device	Within 10' of air device	Within 20' of air device	Within 50' of air device
RC 20 Supply	300	500	550	1100
RC 20 Return	350	500	650	1300
RC 25 Supply	350	550	700	1400
RC 25 Return	425	650	800	1600
RC 30 Supply	425	700	850	1700
RC 30 Return	500	800	900	1800
RC 35 Supply	500	800	1000	2000
RC 35 Return	600	900	1100	2000

2. Refer to Design Conditions above for desired space RC values.

H. Where this division's piping crosses expansion joints between buildings, sway joints will be used to ensure appropriate flexure at points of movement.

Section 23 05 13 – Common Motor Requirements for HVAC Equipment

A. Provide high efficiency motors in accordance with 2015 International Energy Conservation Code.

Section 23 05 14 – Variable Frequency Drives

A. Provide variable frequency drives for air handling units and pumps as scheduled.

B. The VFD control shall produce a 3 phase output capable of providing efficient operation of standard NEMA or IEC design AC induction motors. The VFD control shall consist of a power section made up of a fixed AC to DC converter, a fused filter and storage network, and an inverter using insulated gate bi-polar transistors in the power switching section to improve motor performance and minimize acoustical noise. The logic control section shall be microprocessor based using a minimum 16-bit processor. The power section shall be electrically isolated from the control logic to prevent electrical shock hazard.

C. Comply to IEEE 519-1992 without external modification on a power system with 2% maximum source impedance and a capacity of at least 1.04 times the control full load input current. As a minimum, provide a 3% dc link reactor (also called inductive choke) connected

to the dc bus between the rectifier and the PWM inverter on all drives. If additional or different supplemental equipment is required to meet the standard (such as ac input line reactor) provide same as part of the drive.

D. DC Link Reactor: Provide a 3% dc link reactor connected to the dc bus between the rectifier and the PWM inverter.

E. Bypass: Provide bypass for all VSD's.

F. Acceptable Manufacturers: ABB, Danfoss, Toshiba

23 05 23 – General-Duty Valves for HVAC Piping

A. Valve applications shall be as follows:
   1. Shutoff Service:
      a. NPS 2 and smaller: Ball or butterfly valves.
      b. NPS 2 ½ and larger: Butterfly valves.
   2. Throttling Service: High performance butterfly or plug valves.

B. Valve Installation:
   1. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
   2. Locate valves in horizontal piping with stem at or above center of pipe.
   3. Install valves in position to allow full stem movement.

C. High Performance Butterfly Valves:
   1. Acceptable Manufacturers: Nibco or Grinnell.
      a. Class 150.
      b. Body Design: Lug type, suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
      c. Body Material: Carbon steel or cast iron.
      d. Seat: Reinforced PTFE or metal.
      e. Stem: Stainless steel, offset from seat plane.
      f. Disc: Stainless steel.
      g. Shut off pressure: 285 psi.
      h. Temperature range: -50°F to +200°F.
      i. Operators: 6" and smaller shall have lockable hand lever operators; 8" and larger shall have gear operators.

D. Plug Valves:
   1. Acceptable Manufacturers: Milliken Valve Company or R&M Energy Systems.
   2. Description:
      a. Class 125.
      b. Body Material: ASTM A 126 Cast Iron.
      c. Plug: Cast iron or bronze with sealant groove.
      d. Seat: EPDM.

E. Bronze Ball Valves:
   1. Acceptable Manufacturers: Nibco or Watts.
   2. Description:

a. Two piece, full port bronze ball valve with stainless steel stem.
b. SWP Rating: 150 psig.
c. Body Material: Bronze.
d. Seat: PTFE or TFE.
e. Stem: Stainless steel.
f. Ball: Stainless steel, vented.

F. Check Valves:
1. Acceptable Manufacturers: Nibco.
2. Description:
a. Class 150.
b. Body Material: Cast Iron.
c. Springs: Stainless steel.

Section 23 05 29 – Hangers and Supports

A. Horizontal steel pipe and insulated copper pipe: carbon steel clevis, black finish in conditioned spaces, galvanized in unconditioned spaces.

B. Horizontal bare copper pipe: carbon steel clevis, plastic coated, black finish in conditioned spaces, galvanized in unconditioned spaces.

C. Horizontal trapeze: P-1000 Unistrut, galvanized, with galvanized clamps, and elastomer cushions for bare copper pipe.

D. Wall supports: P-1000 Unistrut, galvanized, for 3" and larger; welded galvanized steel angle brackets with galvanized U-bolts, for 4" and larger; elastomer cushions for bare copper pipe.

E. Vertical supports: Steel riser clamp, black finish in conditioned spaces, galvanized in unconditioned spaces, plastic-coated for bare copper pipe.

F. Floor supports: Cast iron adjustable pipe saddle with locknut nipple and special cast iron reducer. Schedule 40 pipe support welded to plate footing, hot-dip galvanized.

G. Hanger rods: black carbon steel in conditioned spaces, galvanized in unconditioned spaces.

Section 23 05 48 – Vibration Isolation

A. Vibration isolation will be provided as required to minimize transmission to structure. Equipment and piping shall have isolators installed at points of support.

B. Approved manufacturers: Mason, Amber/Booth, and Kinetics Noise Control.

Equipment	Type (Mason)	Deflection	Housekeeping Pad
Air Handling Units - Indoor	Internal Fan Isolators (integral to equipment)	1"	4" concrete
Air Handling Units - Roof	Isolated Roof Curb	1"	Curb bearing on roof

			structure
Pumps - Indoor	Spring Isolation Floor Support	1”	4” concrete
Chillers	Spring Isolation Supports	1”	Steel Dunnage
Boilers	Elastomeric Pads	n/a	4” concrete

Section 23 05 53 – Identification

A. All mechanical equipment shall have permanently affixed, multilayer, multicolor, plastic labels for mechanical engraving with predrilled holes for attachment hardware.

B. All mechanical piping shall have service identified using self-adhesive pipe labels with flow direction arrows. Permanently painted stenciled labels are acceptable on uninsulated piping.

1. Near each valve and control device.

2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.

3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.

5. Near major equipment items and other points of origination and termination.

6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

A. Adjust all air system dampers and volume controllers to obtain proper air balance throughout the conditioned area. The air quantities shown on the Drawings for individual outlets may be changed to obtain uniform temperature within each zone, but the total air quantity shown for each zone must be obtained. Maximum temperature variation within a zone shall be 2ºF. Air quantities shall be +/- 5 percent of scheduled values.

B. Adjust all blower drives to obtain proper total amounts of air, including exhaust and outside air supply.

C. Calibrate, set, and adjust all automatic temperature controls.

D. AABC - National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Sixth Edition, 2002.

Section 23 07 13 – Duct Insulation

A. Acoustical Liner: Johns Manville Permacote Linacoustic or approved equal; density 1.5 lb per cubic foot or greater, "K" value not more than .28 at 75ºF mean temperature difference. Interior face of liner shall be coated with a smooth, polymer based substance that inhibits microbiological growth, does not have cavities for collection of dirt and debris, and meets NFPA 25/50 standards for flame speed and smoke developed ratings. The manufacturer shall certify that the surface coating is cleanable with industry standard duct cleaning equipment and show type of equipment.

1. Provide 1 ½" thick liner in all return elbows and ductwork within 20' of the air handling unit.

2. Provide 1 ½" thick (minimum R6) liner in all supply ductwork downstream of blowers within the conditioned building envelope.

3. Provide 2" thick (minimum R8) liner in all supply ductwork downstream of blowers serving the Warehouse, or for all supply and return ductwork outside the conditioned building envelope.

4. Provide ½" thick liner in return air boots and transfer boots.

B. Insulation Wrap: 1.5 lb. density glass fiber wrap with foil back vapor barrier jacket.

1. Provide 2" thick wrap (minimum R6) for all supply and return ductwork not provided with an acoustical liner within the conditioned envelope.

2. Provide 3" thick wrap (minimum R8) for all supply and return ductwork not provided with an acoustical liner outside the conditioned envelope.

D. All insulation thicknesses shall meet the minimum requirements of 2015 International Energy Conservation Code and 2015 Uniform Mechanical Code with City of Houston Amendments.

Section 23 07 16 – Equipment Insulation

A. Insulate hydronic hot water pump bodies with removable panels insulated with 3" cellular foam insulation or 2" of 2 lbs/cu.ft density mineral board.

B. Insulate chilled water and hot water air separator and bladder tank with 1" of 2 lbs/cu.ft density mineral board.

Section 23 07 19 – HVAC Piping Insulation

A. Chilled Water Piping Systems: Factory molded cellular glass pipe covering manufactured in accordance with ASTM C552 and fabricated in accordance with ASTM C1639, with factory attached white AS-J SSL vapor barrier jacket. Joints shall be sealed with PITTSEAL 444N. Thickness shall be minimum 1½" for piping 2" and smaller, 2" for piping 2 ½" and larger, indoors and outdoors. Provide alumninum jacket over insulation outdoors.

B. Hydronic Hot Water Piping Systems: Preformed mineral fiber insulation. Thickness shall be 1 ½" for piping 1" and smaller, 2" for piping 1 ¼" and larger, indoors and outdoors.

C. Valves, Fittings, Strainers, Expansion Tank, and Other Components: Pre-molded or job-formed cover of same material as pipe covering. Finished insulation thickness shall be not less than for adjacent pipe.

D. Condensate Drain Piping Systems within Air Conditioned Spaces: Type I, flexible elastomeric insulation, minimum 1 inch thick.

Section 23 09 23 – HVAC Controls

A. Provide a DDC Control system consisting of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. System shall be based on ANSI/ASHRAE Standard 135-2004, BACnet. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

B. Automatic Shutdown: Provide duct mounted smoke detectors installed in the return air duct upstream of filters for all units over 2,200 CFM.

C. CO2 sensors shall be utilized for demand ventilation control for all spaces 500 square feet with an occupancy greater than 25 people per 1000 square feet.

D. Control system will monitor sump pump (furnished by Division 22) status and levels, as well as generate alarms.

E. Control system will monitor domestic water pump package (furnished by Division 22) status and will generate alarms.

F. Control system will integrate power meter and submeter (furnished by Division 26) inputs and trend information.

G. Control system will integrate generator set and transfer switch (furnished by Division 26) inputs and switch positions.

Section 23 21 13 – Hydronic Piping

A. Hydronic Hot Water and Chilled Water Piping, Above Grade: Sizes up to and including 2" shall be Schedule 40 screwed black steel; 2-1/2” shall be Schedule 40 screwed or welded black steel; 3" and above shall be Schedule 40 welded black steel.

B. Condensate Drain Piping: Type L hard drawn copper sweat or screwed, or Schedule 40 galvanized steel with screwed fittings. Provide trap of height required for air seal. Provide screw plug cleanout at each change of direction.

Section 23 21 16 – Hydronic Specialties

A. Provide new expansion tank, air separator, and make up water with backflow preventer for new hot water loop and new chilled water loop.

B. Provide automatic air vents at high points.

C. Provide new strainers at all new coil connections.

Section 23 21 23 – Hydronic Pumps

A. Hydronic hot water and chilled water: end suction split coupled pump. Cast iron body, bronze fitted, bronze impeller, 316 or 416 stainless steel shaft, bronze wearing rings, shaft sleeves, motor per motor section, structural steel support frame, coupling, guards, grease lubricated bearings with alemite fittings, Aegis rings. Pump construction and selection shall be non-overloading throughout full range of operation and shall be suitable for operation at water temperatures encountered. Where pumps are in parallel, each pump shall be selected to provide stable and quiet operation against the system resistance when operating singly. Seals shall be the outside balanced type with rotating carbon face, silicon carbide stationary seat and Viton secondary seal that permits seal replacement without disturbing piping or removing pump motor. Seals shall be rated for the service and temperatures encountered. Provide vent/flush line with sediment separator.

B. Motors: Provide premium efficiency, TEFC motors. Provide with variable speed drive.

C. Acceptable Manufacturers: Armstrong, Taco, Xylem.

Section 23 25 00 – HVAC Water Treatment

A. Provide pot feeder and circulating chemical treatment for new hot water loop and new chilled water loop.

B. Provide cleaning and passivation, including flushing, of new chilled water hydronic heating piping.

Section 23 31 13 – Metal Ducts

A. General: Install per latest edition of SMACNA.

B. Air Plenums: Galvanized sheet metal, gauge per SMACNA recommendations for the appropriate pressure class, 24 gauge minimum sheet metal where lighter gauges are allowed.

C. Pressure Rating: All supply ducts downstream of VAV air handling units, including OAHU's, shall be considered 4" pressure per SMACNA recommendations upstream of terminal units, and 2" pressure per SMACNA recommendations downstream of terminal units. All exhaust ductwork and air handling unit return ductwork shall be considered 4" pressure per SMACNA recommendations.

D. All supply, return, and outside air ductwork shall be sealed with either "MP" (Multi-Purpose), Hardcast "Iron-grip 601", Polymer Adhesive "Airseal #11", or "United Duct Seal" (United McGill Corp.) water base, latex or acrylic type sealant.

E. Supply Ducts, Return Ducts, Outside Air Ducts, and General Exhaust Ducts: Galvanized sheet metal.

Section 23 33 00 – Air Duct Accessories

A. Volume Dampers: Provide volume dampers in branch ductwork as required for proper balancing of the supply air systems.

B. Flexible Ductwork: Insulated, Flexible Duct: UL 181, Class 1, interlocking spiral of aluminum foil; fibrous-glass insulation; polyethylene vapor-barrier film with a flame spread less than 25; smoke developed less than 50.

C. Flexible Connectors: Provide flexible connectors for all duct connections to fans or air handling units. Flexible connections shall be made using Ventglas fabric that is fire-resistant, waterproof, mildew resistant and practically airtight, and shall weigh approximately thirty ounces (30 oz.) per square yard. There shall be a minimum of one-half inch (1/2 inch) slack in the connections, and a minimum of two and one-half inches (2-1/2 inch) distance between the edges of the ducts except that there shall also be a minimum of one inch (1 inch) of slack for each inch of static pressure on the fan system.

Section 23 34 16 – HVAC Power Ventilators

A. General Exhaust Roof Fans: Roof mounted, spun aluminum, downblast, centrifugal direct drive exhaust fans with backdraft damper and roof curb.

B. General Exhaust Wall Fans: Wall mounted, spun aluminum, sidewall, centrifugal direct drive exhaust fan with backdraft damper.

Section 23 36 00 -- Air Terminal Units

A. VAV Terminals shall have pressure independent primary airflow control, dual density insulation meeting requirements of NFPA 90A and UL181, minimum 22 gauge galvanized steel casing, and digital controls. 1800 CFM is the maximum allowable size for VAV Terminals.

B. VAV Terminals with heat shall have pressure independent primary airflow control, dual density insulation meeting requirements of NFPA 90A and UL181, minimum 22 gauge galvanized steel casing, digital controls, and hot water heating coils. 1800 CFM is the maximum allowable size for VAV Terminals.

C. Acceptable Manufacturers: Titus, Price Industries, Enviro-tec

Section 23 37 13 – Diffusers, Registers, And Grilles

A. Provide perforated face supply grilles for back-of-house areas.

B. Provide louver face supply grilles for restrooms and front-of-house areas.

C. Provide perforated face return and exhaust grilles.

D. Provide sidewall devices for mechanical rooms, electrical rooms, and storage units as well as supply and return in performance spaces.

E. All air devices shall be aluminum construction.

F. Acceptable Manufacturers: Titus, Price, Krueger and Metal-Aire.

G. Device NC listings shall align with the desired RC ratings of spaces.

Section 23 41 00 – Particulate Air Filtration

A. MERV 8A filters, 2", for blowers serving spaces that are not normally occupied and for pre-filters.

B. MERV 11 filters, 2", for blowers serving spaces that are normally occupied.

Section 23 52 39 – Condensing Fire Tube Boilers

A. Condensing, 96.2% efficiency, natural gas, hydronic.

B. ASME 'H' stamp, National Board listed, 160 psi working pressure.

C. 316L stainless steel interior with carbon steel shell fire tube heat exchanger.

D. Pressure drop no greater than 6.5 psi at 180 GPM.

E. Pre-painted steel exterior.

F. Microprocessor controller to modulate firing rate with BACnet card.

G. Sidewall flue and combustion air intakes.

H. 10-year warranty on heat exchanger.

I. Basis of Design: Lochinvar Crest. Acceptable alternates: Viessmann, RBI.

Section 23 64 23.13 – Air-Cooled Scroll Chillers

A. Packaged air-cooled chiller. Efficiency shall exceed minimum requirements of ASHRAE 90.1-2013 by 17%.

B. R-410A refrigerant.

C. Galvanized steel casing with baked enamel powder coating capable of withstanding a 1000-hour salt spray test.

D. Condenser fans: airfoil axial, corrosion resistant, on VFD. Wire guards. Motors are totally enclosed single-speed 3-phase with permanently lubricated bearings and class F insulation.

E. Fully hermetic scroll compressors, direct drive, 3500 rpm, motor temperature sensors, suction gas cooled motor, rubber vibration isolators, crankcase heaters.

F. Cooler: shell and tube type DX, internally enhanced seamless-copper type tubes rolled into tube sheets, Victaulic-type water connections, insulated, ASME stamped, factory-installed flow switch and heater.

G. Condenser: air-cooled aluminum microchannel coils, 2-pass, sealed, leak and pressure tested, all components easily removeable.

H. Refrigeration components: filter drier, moisture indicating sight glass, electronic expansion device, discharge service valve, liquid line service valve, complete charge of refrigerant and oil.

I. Controls: PLC Microprocessor with BACnet card and non-volatile memory, terminal block for power and controls, control transformer, on/off control switch, replaceable solid-state controllers, pressure sensors for suction and discharge pressure, thermistors for cooer entering and leaving fluid temperatures.

J. Power: single point connection, factory installed, control points accessed through terminal block.

K. Provide low ambient kit, hail guards.

Section 23 72 00 – Air to Air Energy Recovery Units

A. Cabinet: Structural members and casing panels shall be all galvanized. Casing shall be 18 gauge exterior and 22 gauge interior.

1. Panels shall be double wall construction with solid interior panel over fiberglass insulation. Insulation shall be R-8.33.
2. Unit shall be rated for 6" positive or 4" negative static pressure.
3. Provide access panels for all components.
4. Modules shall include closed cell foam gasketing to prevent air leakage at joints.

B. Fans: Provide direct driven, plenum fans, minimum two fans per unit.

C. Coils: Copper tubing with copper or aluminum fins.
1. Rated for 200 PSIG working pressure.
2. Entering chilled water temperature shall be 44°FDB. Leaving Chilled Water temperature shall not exceed 56°FDB.
3. Entering heating hot water temperature shall be 160°F. Leaving heating hot water shall not be below 130°F.
4. Cooling coil face velocity shall not exceed 450 FPM. Heating coil face velocity shall not exceed 700 FPM. Capacity ratings shall be ARI certified.
5. Coils shall be removable.

D. Provide a double-wall stainless steel drain pan, sloped in two planes.

E. Motors: Provide TEFC, premium efficiency motors.

F. Heat Recovery Device: Heat wheel.
1. Rotor: Aluminum, segmented wheel, strengthened with radial spokes, with nontoxic, noncorrosive, silica-gel desiccant coating.
2. Drive: Fractional horsepower motor and gear reducer and self-adjusting multilink belt around outside of rotor.

3. Provide manufacturer's guarantee of not greater than 0.04% cross contamination of the exhaust air concentration by volume.

G. Filters: 450 FPM maximum. MERV 8.

H. Acceptable Manufacturers: Temtrol, Climate Craft, Haakon

Section 23 73 13 – Modular Central Station Air Handling Units

A. Cabinet: Structural members and casing panels shall be all galvanized.
   1. Interior duty.
   2. Access doors for all components.
   3. 2" or 3" double wall panel construction.
   4. Minimum R-13.
   5. Non-condensing at 85 degree F dry bulb, 75 degree F wet bulb conditions.

B. Cooiling Coils: Copper tubing with aluminum fins.
   1. Rated for 200 PSIG working pressure.
   2. Entering chilled water temperature shall be 44°FDB. Leaving Chilled Water temperature shall not exceed 56°FDB.
   3. Face velocity shall not exceed 500 FPM. Capacity ratings shall be ARI certified.
   4. Coils shall be removable.
   5. Provide a double-wall stainless steel drain pan, sloped in two planes.

C. Heating Coils: hydronic, copper tube/aluminum fin, with face velocity not to exceed 700 FPM. Refer to description of option.

D. Drain Pan: Stainless Steel, insulated.

E. Fans: Housed centrifugal, direct drive.

F. Motors: Provide TEFC, premium efficiency motors with variable speed drive.

G. Filters: 2" MERV 8 and 4" MERV 11.

H. Acceptable Manufacturers: Trane, JCI, Carrier, Daikin.

DESIGN GUIDELINES – Division 26

This document has been prepared to record and establish the level of quality upon which the project will be based through Schematic Design. This document is also intended to aid in the preparation of cost estimates and the selection of materials.

Section 26 00 00 – Electrical Basic Requirements Introduction

A. The existing utility overhead electrical service installed along the west side of the property provides electrical power via three (3) 75kVA pole mounted Centerpoint Energy utility service transformers. It appears the same overhead service transformers provides electrical power to a 208/120 volt, single phase electrical service connected to a commercial retail strip center building located on the adjacent property. A 208/120 volt, 800 amp, 3 phase, 4 wire distribution switchboard is connected to the overhead service weatherhead via an 800 amp service disconnect furnishes electrical connections to electrical distribution and mechanical equipment serving both the Lambert and Sangerhalle buildings. The current electrical service and associated distribution equipment will not have sufficient capacity to serve the buildings' expansion and renovation.

B. The existing electrical service overhead service conductors and conduit will be disconnected and removed. All associated electrical distribution equipment, luminaires, mechanical equipment branch circuit connections, electrical devices, feeder and branch circuit raceways, conductor, supports, fire alarm equipment/devices, telecommunication equipment, associated cabling and devices will be removed back to its source in the Lambert and Sangerhalle buildings.

C. It is anticipated the entire site will be served by a new Centerpoint Energy padmount mount utility service transformer. It is anticipated the new electrical service will be 480/277 volt, 1600 amp, 3 phase, 4 wire. Power will be distributed underground from the utility service transformer to a new main distribution switchboard via an underground concrete encased ductbank. General purpose 208/120 volt electrical loads will be connected to branch circuit panelboards served by standard dry type stepdown transformers. Theatrical production lighting, A/V equipment, and company switch loads will be served by lighting relay panels and sequencing branch circuit panelboards equipped with motorized circuit breakers and 200% rated neutrals. A company switch will be installed in both Lambert Hall and Sangerhalle, with a company switch within a NEMA 3R enclosure located in the courtyard. Reference the electrical distribution diagram, included with this narrative, for additional information.

D. In the event of loss of electrical power to the building, emergency back-up power will be provided via a 480/277 volt, 3 phase, 4 wire diesel generator equipped with a UL 2085 subbase fuel tank. It is anticipated the generator capacity will be 250 kW/312.5 kVA, serving life safety loads, fire pump, refrigeration, and select building loads. A separate emergency power distribution system connected to both the normal and emergency power sources via automatic transfer switches will be provided. A temporary generator docking station will be furnished in accordance with the National Electrical Code.

E. Proposed One-Line Diagram: Reference electrical distribution diagram, included with this narrative, for anticipated new electrical distribution system serving the facility expansion and renovation.

F. Work Includes, but not limited to:

1. Utility conduit in red concrete encasement
2. Secondary power wiring and distribution system
3. Circuiting for lighting fixtures
4. Wiring devices
5. Lighting controls including but not limited to vacancy sensors, daylight harvesting sensors, wall switches, etc.
6. Power wiring for equipment specified in other Divisions, but not limited to the following:
    a. HVAC/BAS equipment
    b. Plumbing (water heating and domestic water pump)
    c. Theatrical production lighting and equipment
    d. IT/AV/Security equipment
7. Raceway or cabling for systems, including, but not limited to:
    a. Telephone
    b. Data
    c. Fire Alarm/ Emergency Radio Response Communication
    d. Security

G. Related Work Specified Under Other Divisions:

1. Foundations and pads required for equipment furnished under this Division
2. Field painting, except such painting as is required to maintain shop coat painting and factory finish painting
3. Flashing of conduit penetrations through the roof and exterior walls
4. Cutting and patching for electrical Work, except for errors and omissions under this Division

H. Quality Assurance:

1. Comply with applicable local, state, and federal codes.

2. Warrant electrical Work against faulty material or Workmanship in accordance with Division 1. If the Project is occupied or the systems placed in operation in several phases at the request of the Owner, then the warranty of each system or piece of equipment used shall begin on the date each system or piece of equipment was placed in satisfactory operation and accepted as such, in writing, by the Owner. The use of building equipment for temporary service and testing does not constitute the beginning of the warranty.

3. Equipment and material provided under this Division shall be periodically inspected and serviced by competent mechanics. This function becomes the responsibility of the Owner when the system is accepted by the Owner. The one-year material and Workmanship warranty is not intended to supplant normal inspection or service and shall not be construed to mean the Contractor will provide free service for normal maintenance items such as periodic lubrication and adjustment due to normal use, nor to correct without charge, breakage, maladjustment, and other trouble caused by improper maintenance.

4. Turn over electrical equipment provided under this Division to the Owner in lubricated condition. Include instructions on further lubrication in the operating manual.

5. Upon completion of contract and progressively as work proceeds, clean-up and remove dirt, debris and scrap materials. Maintain premises neat and clean. Protect and preserve access to energized equipment at all times. Clean items with factory finishes. Touch-up minor damage to surfaces; refinish entire piece of equipment if judged by Architect to have sustained major damage. Use only factory supplied paints of matching color and formula.

I. Standards:

1. Perform Work specified in Division 26 in accordance with standards listed below. Where these Specifications are more stringent, they shall take precedence. In case of conflict, obtain a decision from the Architect/Engineer.

   a. 2018 International Building Code with City of Houston Amendments

   b. 2018 International Energy Conservation Code with City of Houston Amendments

   c. 2015 International Fire Code with City of Houston Amendments

   d. 2023 NEC – National Electrical Code with City of Houston Amendments

   e. 2015 NFPA 101 – Life Safety Code

   f. 2016 NFPA 110 – Standard for Emergency and Standby Power Systems

   g. All applicable City of Houston Codes

J. Submittals:

1. Submit Shop Drawings as called for in the Sections that follow.

2. Submit dimensioned layout of all electrical equipment locations, to scale, with equipment location shown therein. Clearances shall be in accordance with NEC and local codes.

3. Panelboard and switchboard submittals will be rejected without dimensioned room or equipment location layouts.

K. Operating and Maintenance Manuals:

1. Provide manuals in accordance with Division 1.

L. Delivery and Storage:

1. Insofar as possible, deliver items in manufacturer's original unopened packaging. Where this is not practical, cover items with protective materials to keep them from being damaged. Use care in loading, transporting, unloading, and storage to keep items from being damaged.

2. Store items in a clean dry place and protect from damage.

M. Record Drawings:

1. Comply with provisions of Division 1.

N. Coordination:

1. Visit site and observe conditions under which Work must be performed. No subsequent allowance will be made because of error or failure to obtain necessary information to completely estimate and perform Work required by these documents.

2. Examine Specifications and Drawings to be familiar with items which require electrical connections and coordination. Electrical Drawings are diagrammatic and shall not be scaled for exact sizes.

3. Coordinate with other trades for services to be run in common and in spaces for close coordination and to avoid conflicts.

O. Tests:

1. On completion of Work, installation shall be completely operational and entirely free from grounds, short circuits, and open circuits. Perform operational tests as required to demonstrate substantial completion of the Work. Balance circuits so that feeders to panels are not more than 10 percent out of balance between phases with all available load energized and operating. Furnish all labor, materials and instruments for above tests.

2. Furnish the Owner and the Engineer a copy of test reports, including identification of each circuit and readings recorded. Include the main service ground resistance test as described in Section 260526. Include ampere readings of all panels and major circuit breakers.

3. Prior to final observation and acceptance test, all electrical systems and equipment shall be in satisfactory operating condition including, but not limited to, the following:

a. Electrical distribution system

b. Electric motors for all equipment

c. Alarm systems

P. Inspection Fees and Permits:

1. Obtain and pay for all necessary permits and inspection fees required for critical installation.

Q. Temporary Lights and Power:

1. Comply with provisions of Division 1.

2. Provide a temporary electrical lighting and power distribution system of adequate size to properly serve the following requirements, including adequate feeder sizes to prevent excessive voltage drop. Temporary Work shall be installed in a neat and safe manner in accordance with the National Electrical Code, Article 305, NFPA 241, and as required by OSHA or applicable local safety codes. The temporary service can be used for construction with contractor paying utility costs.

3. Provide one pigtail socket with LED lamp (25-watt) for every 1,000 square feet of floor area, evenly distributed throughout the building and with a minimum of one pigtail socket per room.

4. Provide suitable guards for temporary lights to prevent accidental contact with lamps.

5. Provide a minimum of one duplex power outlet for every 1,500 square feet of floor area, evenly distributed throughout the building. Power outlets shall be duplex 20 amps, 120 volts.

6. Provide feeders, disconnects, connections, etc., required for construction equipment, e.g.: cranes, pumps etc.

7. Prior to installation, determine if any lighting or power outlets over the minimum quantity noted above are required and if so, provide them.

8. Provide service and panelboards required for above lighting and power outlets.

9. Requirements for paying utility bills during construction are specified in Division 1.

10. Provide single phase and three phase service as required by Project.

11. Temporary wiring shall be removed upon completion of use.

R. Wall and Ceiling Access Panels:

1. Comply with provisions of Division 1-13.

2. Style and type as required for material in which installed.

    a. Size: 16-inch x 16-inch minimum, as indicated, or as required to allow inspection, service and removal of items served.
    b. 14-gauge minimum sheet metal for doors, 16-gauge frames of cadmium-plated or galvanized construction. Doors shall have expanded plaster rings where located in plaster walls or flanged finish where located in drywall or block construction.

    c. Panels shall have spring hinges with screwdriver locks in. non-public areas. Key lock, keyed alike, for panels in public areas.

    d. Prime painted or rust inhibitive paint finish.

    e. UL labeled when in fire-rated construction, 1 ½ hour rating.

    f. Provide in walls, floors, and ceilings to permit access to all equipment and junction boxes.

    g. Furnish and locate access panels under this Division. Coordinate with trades who are responsible for building system in which panels are to be installed.

    h. Acceptable manufactures: Milcor, Nystrom, Karp, J.L. Industries, or Williams Brothers. Use panels equal to Milcor Style M for masonry and drywall construction; equal to Milcor Style K for plastered masonry walls and ceilings. Stainless steel panels shall be used in ceramic tile or glazed structural tile.

S. Cutting and Patching:

1. Comply with provisions of Division 1

2. Repair or replace routine damage caused by cutting in performance of Work under this Division.

3. Correct unnecessary damage caused due to installation of electrical Work brought about through carelessness or lack of coordination.

4. Holes cut through existing floor slabs shall be core drilled with drill designed for this purpose. All openings, sleeves, and holes in slabs between floors shall be properly sealed, fire proofed and waterproofed.

5. Repairs shall be performed with materials which match existing materials and be installed in accordance with appropriate sections of these Specifications.

T. Foundations and Pads:

1. Provide concrete foundations and pads for equipment under Division 3. Locate and size foundations, pads, and anchor bolts under this Division.

U. Identification of Equipment:

1. Identify the following electrical equipment:

   a. Main switchboard(s) switchgear, and individual devices installed therein.

   b. Panelboards.

   c. Transformers

   d. Safety switches and disconnects.

   e. Contactors and motor starters.

   f. Individually mounted circuit breakers.

   g. Relays.

2. Identify electrical equipment with permanently attached black (normal power), phenolic plates with ¼ inch white engraved lettering on the face of each, attached with two sheet metal screws.

3. Starters and relays connected under this Division shall be identified whether furnished under this Division or under other Divisions.

V. Warning Signs:

1. Provide warning signs called for by NFPA 70, by OSHA and by the list included below.

2. Use Seton Name Plate Company products, 10-inch x 7-inch size, pressure-sensitive (PSPL) for indoor use, 30 ga. baked enamel for outdoor use (30 BE) with style numbers shown below.

3. Danger - Electrical Hazard - Authorized Personnel Only, Style No. 161.

   a. Main electrical room(s).

   b. Electrical equipment closet(s).

4. Danger – High Voltage - Keep Out, Style No. 265S.

   a. Pull and junction boxes used on systems operated over 600 volts nominal.

   b. Main electrical room(s).

   c. Electrical equipment space(s).

W. Control Systems and Interlock Wiring:

1. Control systems, components and control and interlock wiring for mechanical equipment will be furnished under Division 23. Control devices including, but not limited to,

thermostats, fan speed and level control switches, relays and electro-pneumatic switches shall be furnished under Division 23.

2. Provide power wiring to starters and contactors under Division 26. Power wiring to magnetic starters shall consist of wiring to the line side terminals of the magnetic starter or contactor and wiring away from the load side terminals to the equipment, except where such wiring is installed pre-wired by-the equipment vendor such as for rooftop A/C units.

    a. Power wiring to 120-1-60 and 277-1-60 volt fans, unit heaters, fan-coil units and pumps shall include all portions of the branch circuit, except wiring inside an automatic temperature control panel (ATC) or Direct Digital Control Panel (DDC) or magnetic starter. Such internal wiring shall be furnished under Division 23.

3. Under Division 28:

    a. Furnish duct mounted smoke detectors.

    b. Provide wiring among detectors, fire alarm system, magnetic starters and relays, ATC panels and DDC panels.

    c. Install line voltage components.

4. See CONTROLS section of Division 23.

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

A. Conductors:

1. Provide 98 percent conductivity copper conductors with 600-volt insulation.

2. For conductors No. 12 AWG and No. 10 AWG, provide solid type THWN or THHN.

3. For conductors No. 14 AWG and smaller, provide solid type THHN. Where stranded conductors are used, maximum stranding shall be 7 for #16 and #18; 19 for #14.

4. For conductors No. 8 AWG and larger, provide stranded type THHN, or THWN applied consistently with insulation ratings and NEC requirements.

5. Provide white or gray colored neutral conductors; provide color coded phase conductors.

6. Minimum conductor size shall be #12 for power wiring; #14 for hard wired controls unless otherwise specified. Provide digital communication, network cabling, and other low voltage systems wiring as directed elsewhere in this specification.

B. Acceptable Manufacturers:

1. American Insulated Wire

2. General Cable.

3. Okonite.

4. Pyrotenax (Mineral Insulated applications)

5. Rome.

6. Southwire.

Section 26 05 26 – Grounding and Bonding for Electrical Systems

A. Installation Requirements:

1. General
   a. Clean all conductive surfaces on equipment to be grounded, to assure good electrical continuity.

   b. Effectively bond all grounding conductors to grounding electrodes, equipment enclosures and ground busses.

   c. Locate all grounding attachments away from areas subject to physical damage. Provide protective covering as required.

   d. All circuits shall have separate ground wire installed in accordance with Table 250-122 of the National Electrical Code.

2. Main Switchboard/Building Ground:
   a. Main service switchboard shall be bonded to incoming main water line with heavy duty ground clamp in accordance with Article No. 250-66 of National Electrical Code. Bonding conductor shall be sized in accordance with Table 250-66 of National Electrical Code and shall be insulated.

   b. Building steel shall be connected to ground bus on main service with a conductor the same as specified above.

   c. Grounding electrode conductors specified herein shall be installed without conduit, in general.

   d. Underground Grounding Conductors: Install bare copper conductor, No. 3/0 AWG minimum. Bury at least 24 inches below grade. Duct-Bank Grounding Conductor.

3. Feeder/Branch Circuits:

   a. Feeder circuits to panels shall have a separate green grounding conductor in conduit sized in accordance with Table 250-122 of the National Electrical Code.

   b. Branch circuits shall have a separate green grounding conductor installed in same conduit as phase and neutral conductor from panel ground bus to device. Install an equal number of grounding and neutral conductors. The grounding conductor shall be sized in accordance with Table 250-122 of the National Electrical Code.

c. Bond the receptacle ground pin to its box using a bonding jumper, except where isolated ground receptacles are required.

d. Flexible conduit will not be approved as a grounding means. Flexible conduit shall have a jumper wire sized to ampacity of branch breaker and connected to conduit system on both ends. This applies to fixtures, motors, controls, and other devices.

4. Transformers:

a. Ground secondary neutral of transformers to grounding conductor in primary feeder, sized in accordance with Table 250-66 of the National Electrical Code, and to grounding electrode system as indicated on the drawings, cold water main, 1 1/2 inch or larger. Bond across any dielectric unions between point of connection and domestic water entrance. All transformers shall be installed with acoustical sound isolators.

B. Test:

1. Ground on main service shall be tested using test equipment similar to a "Biddle" tester. Test data shall be submitted to Owner for approval and such approved test data shall become a part of the Operating and Maintenance Instruction Manual. In no event shall ground resistance exceed 25 OHMS. Additional rods or other means shall be employed when measured resistance exceeds 10 OHMS.

Section 26 05 29 – Hangers and Supports for Electrical Systems

A. Acceptable Manufacturers:

1. Erico Products. Inc.

2. ABB, Steel City.

3. Minerallac.

4. Rayco Fasteners.

B. Types of Supporting Devices:

1. Provide a complete system of supporting devices and hangers for support or bracing of conduit, electrical equipment.

2. Unless otherwise directed in Specifications or Drawings provide appropriate supporting devices and hangers for electrical equipment from this list of Caddy fasteners:

a. "Z" purlin clips – 1 ¼ inch maximum conduit.

b. Conduit clips – 2-inch maximum conduit.

c. Beam clamps (rod hanger clamps and vertical flange clamps) for support of threaded rods

d. Beam clamps (set screw type) – 2-inch maximum conduit.

e. Beam clamps (universal) for support of boxes and combination conduit hanger clamps.

f. Combination push-in conduit clips – 1-inch maximum conduit.

g. Combination conduit hanger clamps – 2-inch maximum conduit.

h. Flexible conduit clips – 1-inch maximum flexible conduit.

i. Special combination conduit clips – 1-inch maximum conduit.

j. One-hole steel straps.

k. Conduit hangers – 4-inch maximum conduit.

Section 26 05 33 – Raceway and Boxes for Electrical Systems

A. Raceways and Conduit:

1. EMT, IMC, and Rigid conduit shall be hot dipped, galvanized, or electrogalvanized steel by Allied, General Electric, Republic, Triangle, or Wheatland.

2. Surface metal raceways shall be Wiremold.

3. Associated couplings, connectors and fittings shall be steel as manufactured by Raco or equivalent.

4. Erickson couplings shall be used where neither length of conduit can be rotated.

5. EMT box connectors shall be set screw.

6. Conduit, connectors, couplings and fittings shall be UL listed and labeled.

B. Electrical Metallic Tubing (EMT):

1. Use Electric Metallic Tubing (EMT) where drawings call for conduit to be:

a. Concealed in walls.

b. Installed above suspended ceilings.

c. Installed exposed, above 6 feet.

C. Intermediate Metal Conduit (IMC):

1. Use Intermediate Metal Conduit (IMC) where drawings call for conduit to be:

a. Installed in hazardous areas.

b. Installed in concrete slabs at ground floor.

c. Installed exposed below 6 feet.

d. Installed in wet locations.

D. Rigid Steel Conduit (RSC):

1. Use rigid steel conduit where drawings call for conduit to be:

a. Exposed to severe mechanical damage.

E. Flexible Metal Conduit:

1. Provide flexible metal conduit for termination at equipment subject to motion and vibration.

2. Conduit shall be electrically continuous from outlet or conduit end to utilization equipment.

3. Length shall not exceed 6 feet.

4. Maximum length concealed in walls shall be 3 feet.

5. Where exposed to continuous or intermittent moisture, conduit shall be liquid tight.

F. Type MC cable where permitted by code for 120V branch circuit receptacle drops, whips to light fixtures no longer than 6 feet. MC cabling is not acceptable for branch circuits exiting electrical panels and in locations of exposed architectural ceilings.

G. Acceptable Manufacturers for Outlet Boxes:

1. Eaton.

2. Emerson, Appleton

3. Hubbell Electrical Products, Raco

4. ABB, Steel City

H. Installation Requirements for Outlet Boxes:

1. Locate boxes to prevent moisture from entering or accumulating within them.

2. Support outlet boxes independently of conduit as required by the National Electrical Code.

3. Provide 4-inch octagonal x 1-1/2-inch ceiling outlet boxes. For increased cubic capacity, provide 4-inch octagonal x 2-1/8 inch, 4-inch square x 1-1/2 inch or 4-11/16-inch square x 2-1/8-inch ceiling outlet boxes.

4. Provide 4-inch square x 1-1/2-inch-deep boxes for switches, receptacles, telephone and computer outlets in drywall partitions. Use square cut plaster rings installed within 1/4 - inch of finished wall.

5. Where required to hang a specified fixture, provide a fixture stud of the no-bolt, self-locking type on ceiling outlets.

6. Provide 2-1/2-inch x 3-3/4 inch one gang masonry boxes for switches and receptacles installed in concrete block walls not plastered. For increased cubic capacity, provide 3-1/2-inch x 3-3/4 inch one gang masonry boxes. Where more than two conduits enter the box from one direction, provide 4 inch square boxes with square cut device covers not less than 1-inch-deep specifically, designed for this purpose. Use rounded edge plaster rings only lf the block walls are to be plastered. Use sectional or gang able type outlet boxes only in drywall construction.

7. Provide 4-11/16-inch square x 2-inch-deep outlet boxes with square cut device corners for block walls or rounded edge plaster rings for plastered walls for computer outlets Single gang device boxes are not acceptable.

8. Provide fittings with threaded hubs for screw connections and with the proper type covers for switches and receptacles served by exposed conduit. Use pressed steel outlets only for ceiling fixture outlets.

9. Provide conduits with threaded hubs and covers and with proper configurations for all changes of direction of exposed conduits. Standard conduit ells may be used if they do not interfere, damage, or mar the appearance of the installation.

10. Use boxes of sufficient cubic capacity to accommodate the number of conductors to be installed. See Article 314 of the National Electric Code.

11. Effectively close unused openings in boxes with metal plugs or plates.

12. Set boxes so that front edges are flush with finished surfaces.

13. Secure boxes to surfaces upon which they are mounted or embed boxes in concrete masonry. Support boxes from structural members with approved braces.

14. Install blank device plates on outlet boxes left for future use.

15. Provide bushings in holes through which cords or conductors pass.

16. Install boxes so that the covers will be accessible at all times.

17. Electrical outlet boxes may be installed in vertical fire resistive assemblies classified as fire/smoke and smoke partitions without affecting the fire classification, provided such openings occur on one side only in each framing space, that openings do not exceed sixteen square inches and that boxes on opposite faces of a partition are separated horizontally not less than 24 inches. All clearances between such outlet boxes and the gypsum board shall be completely filled with joint compound or approved fire-resistive compound. The wall shall be built around outlet boxes larger than sixteen square inches so as not to interfere with the wall rating.

18. Conduits entering boxes and enclosures shall be banded within 6 inches of box, using bands 1-inch-wide and same colors as above.

19. Install outlet boxes on opposite sides of the same wall offset to avoid back to back mounting where possible.

I. Acceptable Manufacturers for Junction Boxes:

1. Eaton.

2. Emerson, Appleton

3. Hoffman Enclosures

4. Hubbell Electrical Products, Raco

5. ABB. Steel City

J. General Junction Box Requirements:

1. For interior work provide galvanized sheet metal boxes of code thickness with lapped and welded joints, ¾ inch flanges and screw covers.

2. For exterior work, provide galvanized sheet metal boxes of code thickness with lapped and welded joints. ¾ inch flanges, bolted covers with full gaskets forming a completely rain tight assembly, equal to Keystone 19000, and 37900 series.

3. For exterior work in graded areas outside the building, provide heavy-duty sidewalk junction boxes externally flanged for flush mounting. Covers shall be fully gasketed, watertight and secured with plated screws or bolts equal to Quazite type PC.

K. Installation Requirements for Junction Boxes:

1. Provide junction boxes as shown on drawings and otherwise where required, sized according to number of conductors in box or type of service to be provided. Minimum junction box size 4-inch square and 2-1/8 inch deep.

2. Provide screw covers for junction boxes.

3. Install boxes in conduit runs wherever necessary to avoid excessive runs or bends. Do not exceed 100' runs without pull boxes.

4. Rigidly secure boxes to walls or ceilings. Conduit runs will not be considered as adequate support.

5. Install boxes with covers in accessible locations. Size boxes in accordance with Articles 370 and 373 of the National Electric Code.

6. Do not install pull or junction boxes for joint use of line voltage and signal or low voltage controls unless all conductors are insulated for the highest voltage being used in the same box.

7. Identify branch circuit j-boxes and pull boxes with designation of panelboard and circuit number of circuits contained therein, with permanent marker.

8. Identify feeder j-boxes and pull boxes with designation of panel board/switchboard source as "FROM" and load served as "TO" with permanent labels.

Section 26 05 43 – Underground Ducts and Raceways for Electrical Systems

A. Acceptable Manufacturers:

1. Carlon where installed underground.

B. Schedule 40 PVC.

C. Medium voltage and secondary service feeders shall be encased in red concrete. Installation shall be in accordance with local utility company construction standards.

D. Provide and install warning tape for underground installations.

Section 26 05 44 – Sleeves and Sleeve Seals for Electrical Raceways and Cabling

A. Provide U.L. listed firestop sealing systems at all electrical penetrations of rated floors and walls.

Section 26 05 53 – Identification for Electrical Systems

A. Comply with NFPA 70 requirements for fault current warning labels.

B. Comply with NFPA 70 requirements for arc-flash warning labels.

C. Identify electrical distribution equipment and devices nameplates in accordance with Section 26 00 00.

Section 26 05 72 – Overcurrent Protection Device Short-Circuit Study

A. This study is a delegated design and will be performed by the electrical gear manufacturer.

B. Perform study following the general study procedures contained in IEEE 399.

C. Calculate short-circuit currents according to IEEE 551.

D. Base study on the device characteristics supplied by device manufacturer.

E. The extent of the electrical power system to be studied is indicated on Drawings.

F. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

G. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

H. The calculations shall include the ac fault-current decay from induction motors, synchronous motors shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

I. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each of the following:

1. Electric utility's supply termination point.

2. Low-voltage switchboard.

3. Control panels.

4. Branch circuit panelboards.

5. Disconnect switches.

Section 26 05 73 – Overcurrent Protection Device Coordination Study

A. This study is a delegated design and will be performed by the electrical gear manufacturer.

B. Comply with IEEE 242 for calculating short-circuit currents and determining coordination time intervals.

C. Comply with IEEE 399 for general study procedures.

D. Base study on the device characteristics supplied by device manufacturer.

E. The extent of the electrical power system to be studied is indicated on Drawings.

F. Begin short-circuit current analysis at the service, extending down to the system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 10 kA or less.

2. Exclude equipment rated 240-V ac or less when supplied by a single transformer rated less than 125 kVA.

G. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for Project. Study all cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

H. Transformer Primary Overcurrent Protective Devices:

1. Device shall not operate in response to the following:

a. Inrush current when first energized.

b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.

c. Permissible transformer overloads according to IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings shall protect transformers according to IEEE C57.12.00, for fault currents.

I. Motor Protection:

1. Select protection for low-voltage motors according to IEEE 242 and NFPA 70.

2. Select protection for motors served at voltages more than 600 V according to IEEE 620.

J. Conductor Protection: Protect cables against damage from fault currents according to ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

K. The calculations shall include the ac fault-current decay from induction motors, synchronous motors shall apply to low- and medium-voltage, three-phase ac systems. The calculations shall also account for the fault-current dc decrement, to address the asymmetrical requirements of the interrupting equipment.

1. For grounded systems, provide a bolted line-to-ground fault-current study for areas as defined for the three-phase bolted fault short-circuit study.

2. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault and single line-to-ground fault at each of the following:

a. Electric utility’s supply termination point.

b. Low-voltage switchboard.

c. Branch circuit panelboards.

L. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare short-circuit ratings.

2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.

3. Any application of series-rated devices shall be recertified, complying with requirements in NFPA 70.

Section 26 05 73 – Overcurrent Protection Device Arc-Flash Study

A. This study is a delegated design and will be performed by the electrical gear manufacturer.

B. Comply with NFPA 70E and its Annex D for hazard analysis study.

C. Preparatory Studies:

1. Short-Circuit Study Output: As specified in "Short-Circuit Study Output" Paragraph in "Short-Circuit Study Report Contents" Article in Section 260572 "Overcurrent Protective Device Short-Circuit Study."

2. Protective Device Coordination Study Report Contents: As specified in "Protective Device Coordination Study Report Contents" Article in Section 260573 "Overcurrent Protective Device Coordination Study."

D. Calculate maximum and minimum contributions of fault-current size.

1. The minimum calculation shall assume that the utility contribution is at a minimum and shall assume no motor load.

2. The maximum calculation shall assume a maximum contribution from the utility and shall assume motors to be operating under full-load conditions.

E. Calculate the arc-flash protection boundary and incident energy at locations in the electrical distribution system where personnel could perform work on energized parts.

F. Include medium- and low-voltage equipment locations, except equipment rated 240-V ac or less fed from transformers less than 125 kVA.

G. Safe working distances shall be specified for calculated fault locations based on the calculated arc-flash boundary, considering incident energy of 1.2 cal/sq.cm.

H. Incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond three to five cycles.

2. Fault contribution from synchronous motors should be decayed to match the actual decrement of each as closely as possible.

I. Arc-flash computation shall include both line and load side of a circuit breaker as follows:

1. When the circuit breaker is in a separate enclosure.

2. When the line terminals of the circuit breaker are separate from the work location.

J. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

Section 26 09 23 – Lighting Control Devices

A. Provide switching for building automatic lighting shutoff in accordance with the current IECC.

B. Vacancy Sensor: Provide vacancy sensor for automatic light control as required per energy code. Manual control to be furnished in all areas where ceiling mounted vacancy sensors are installed.

C. Provide daylighting controls, as required, per energy conservation code.

D. Theatrical production lighting will be controlled via ETC Sensor IQ lighting relay panels.

E. Architectural house and work lighting will be controlled via ETC Echo lighting relay panels.

Section 26 22 00 - Low-Voltage Transformers

A. Location: Installed in mechanical/electrical rooms.

B. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Transformers Rated 15 kVA and Larger: Comply with DOE 2016 Efficiency Standards: Low Voltage Distribution Transformers.

E. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

F. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.

2. Coil Material: Copper.

G. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

H. Shipping Restraints: Paint or otherwise color code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

I. Transformers serving theatrical production lighting, A/V equipment, and company switch loads shall be K-13 rated or Harmonic Mitigating Transformers (HMT).

Section 26 24 16 – Panelboards

A. Locations:

1. Provide 277/480 volt panelboards for HVAC equipment and lighting in mechanical/ electrical rooms.

2. Provide 120/208 volt panelboards for branch circuits in mechanical/electrical rooms.

3. Provide 277/480 volt and 120/208 volt emergency power panelboards in mechanical/ electrical rooms.

B. Acceptable Manufacturers:

1. ABB

2. Eaton

3. Schneider Electric, Square D

4. Siemens

C. Panelboard Types:

1. Branch-circuit panelboards for 120/208 volts, 3-phase, 4-wire service, with circuit breakers rated 14.000 AIC.

2. Branch-circuit panelboards for 277/480 volts, 3-phase, 4-wire service, with circuit breakers rated 35,000 AIC.

3. Distribution panelboards for 277/480 volt, 3-phase, 4-wire service, with circuit breakers rated 65,000 AIC

4. Bus bars shall be copper.

D. Required Features:

1. Provide circuit breakers with lugs (both main and branch circuit lugs) suitable and UL approved for both aluminum and copper conductors.

2. Provide electrically isolated factory installed neutral bus. Panelboards served by K-rated or harmonic mitigating transformers shall be equipped with a 200% rated neutral.

3. Provide separate equipment ground bars complete with lugs on bar.

4. Provide isolated ground bar complete with lugs in all panelboards serving A/V equipment.

5. Provide panel doors equipped with chrome-plated locks and catches, all keyed alike. Provide two keys for each lock. Provide fronts with adjustable indicating trim clamps.

6. Provide thermal magnetic circuit breakers which are fully rated and temperature rated for a 40 degrees C ambient. Breakers shall be quick-make, quick-break type with trip indication shown by handle position other than ON or OFF and with a common trip on all multi-pole breakers.

7. Panelboards located indoors are to be in a NEMA 1 enclosure. Exterior panelboards are to be installed in a NEMA 3R enclosure.

Section 26 27 26 – Wiring Devices

A. Acceptable Manufacturers:

1. Hubbell

2. Legrand

3. Leviton

4. Pass and Seymour

5. The following specification numbers are used as guidance in the types of wiring devices to be procured, unless otherwise noted, but products of equivalent quality by named manufacturers will be acceptable.

B. Switches:

1. 15-Amp. 120/277 VAC:

a. Single pole: Leviton No. 1201-1 white on white, decorator style, with rocker switches.

b. Three-way: Leviton No. 1203-1 white on white, decorator style with rocker switches.

c. Single pole. weatherproof: Leviton No. 1201 with Steel City, ABB No. SWI-C weatherproof plate.

d. Single pole with pilot light (120 VAC): Leviton No. 1201-PL.

2. Occupancy Sensors Wattstopper DT-300 or approved equal.

C. Receptacles:

1. 20-Amp. 125 VAC:

a. Duplex type: Leviton No. 5662 (white on white, Decorator).

b. Ground fault circuit interrupter: Leviton No. 6598HG-I.

c. Duplex safety type: Leviton No. 5262-SGI.

d. Extra-Duty weatherproof in-use metal cover: Hubbell TayMac No. MX3200.

e. Leviton 8200-I, isolated ground type for information system peripherals. Leviton No. 5262-IGW.

2. 20-Amp. 125 VAC Receptacles:

a. Leviton No. 5362 (white on white Decora)

D. Miscellaneous Devices:

1. Pin and sleeve company switch: ESL Power Model No. 3361-00; 120/208V, 100A, 3 phase, 5 wire

2. Manual motor starter with thermal unit: Square "D" Class 2510.

E. Floor Boxes and Fittings:

1. Boxes: Rectangular, fully adjustable before and after concrete pour. Manufacturer shall be ABB, Steel City or approved equal.

a. Two gang: ABB, Steel City No. 642.

b. Three gang: ABB, Steel City No. 643.

2. Covers:

a. Single gang: ABB, Steel City No. P64-3/4-2.

b. Single gang: ABB, Steel City No. P64-D4/P64DS, aluminum, with duplex screw cover for duplex receptacle.

3. Carpet Flanges:

a. Single gang: ABB, Steel City No. P64LCP Lexan.

b. Two gang: ABB, Stee1 City No. P642LCP Lexan.

c. Three gang: ABB, Steel City No. P643LCP Lexan.

4. Fittings:

a. High tension (15A-125 VAC): ABB, Steel City No. SFH50, satin aluminum.

b. Leviton No. 5252 duplex receptacles.

F. Device Plates equal to Leviton nylon. In color specified by Architect.

G. Provide cast alloy or stamped metal plates on exposed switches and receptacles.

Section 26 28 16 – Enclosed Switches and Circuit Breakers

A. Acceptable Manufacturers:

1. ABB

2. Eaton

3. Schneider Electric, Square D

4. Siemens

B. Installation Requirements:

1. Provide non-fusible switches at remote motor locations (rain-tight where required) as indicated on drawings and as required by NEC.

2. Identify safety switches with acrylic nameplates in accordance with Section 26 00 00.

3. Use NEMA 1 for interior use, NEMA 3R for exterior use, and NEMA 4X for kitchen areas.

4. Provide two normally open and two normally closed auxiliary contacts for disconnect switches used to serve fan system motors including supply fans, return air fans, exhaust fans, make up air fans, and relief air fans for electrical interlock with mechanical control circuits.

5. Switches used for service equipment shall be Heavy Duty type. UL listed for service equipment use. Provide Square D Series HU-660, six-pole safety switches for part-winding or two-speed motors requiring remote disconnects.

Section 26 51 00 – Interior Lighting

A. Interior lighting fixtures be specified on the drawings, furnished and installed by contractor.

Section 26 56 00 – Exterior Lighting

A. Site lighting will include landscape, and site fixtures designed by the Lighting Consultant and/or Landscape Architect, furnished and installed by contractor.

This document has been prepared to record and establish the level of quality upon which the project will be based through Schematic Design. This document is also intended to aid in the preparation of cost estimates and the selection of materials.

Section 27 00 00 – Communications Basic Requirements

A. Provide raceways and outlet boxes for all telephone, data, audio/visual, and security system devices.

B. Systems cabling and devices will be furnished by Owner's Vendor.

C. An electronic safety and security system installation will be included for this project. The security system will include interior & exterior surveillance cameras and the use of a door control/access system with electronic locking hardware and proximity readers. Division 26 will provide raceways and outlet boxes in accordance with security system requirements.

This document has been prepared to record and establish the level of quality upon which the project will be based through Schematic Design. This document is also intended to aid in the preparation of cost estimates and the selection of materials.

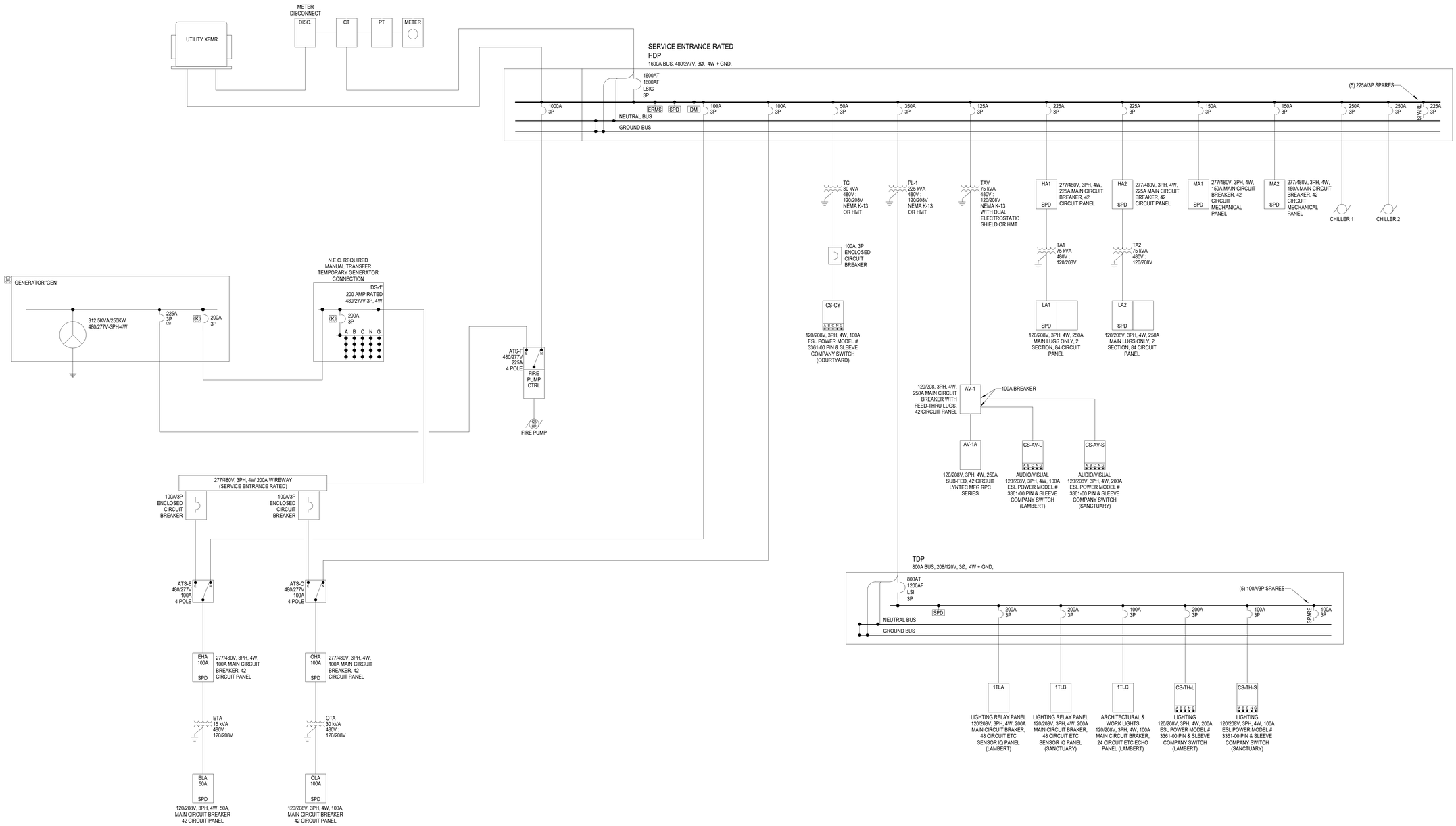
Section 28 31 11 – Digital, Addressable Fire Alarm System

A. Provide a complete fire alarm system compliant with NFPA 72 to serve the facility. Fire alarm devices will be located throughout the facility as required by the Fire Code. Complete fire alarm system shall be designed by at least a NICET Level 3 certified designer and installed by a State certified fire alarm contractor.

B. Photoelectric type detectors will be installed in all areas as required by Fire Code. Duct detectors will be installed in HVAC ducts of air handling units for early detection of developing fire. Smoke detectors in elevator lobbies, elevator machine rooms and hoistways will recall elevators. Additional smoke detectors will be installed at code required locations.

C. Heat detectors will be installed at Lambert Stage in accordance with Fire Code.

D. Fire alarm wiring will be installed in EMT conduit.



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08/15/2023

Drawing Name
ELECTRICAL DISTRIBUTION DIAGRAM

Scale
NONE

Drawing Number
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APPENDIX I

Houston Center for the Musical Arts

Houston, Texas

Preliminary Design Estimate - FINAL

September 26, 2023

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Houston Center for the Musical Arts

Preliminary Design Estimate - FINAL

September 26, 2023

Table of Contents

Introduction

AMS Planning and Research commissioned Venue to provide cost management services for the Houston Center for Musical Arts. Venue submits this preliminary design estimate as a cost model to assist in aligning scope, quality and budget.

Basis

Wilson Butler Architects provided preliminary design drawings and related narratives, dated August 11, 2023, form the basis of the documents for this estimate.

Financial Summary

The estimated total construction cost for the Houston Center for the Musical Arts is $44.8 million in July 2025 bid dollars

See estimate summary Page 6.

Building Summary

Gross floor area of 40,685 gsf comprising:
• reconstruction of the interior of Lambert Hall theatre
• extend roof height over Lambert Hall theatre
• new addition replacing the existing education building with a new addition connecting Lambert Hall to Saengerhalle
• reconstruction of Saengerhalle stage and back of house spaces
• new courtyard configuration, outdoor accessible restrooms and hard/soft scaping

Gross floor area clarification: plenum, grid iron, forestage grid, catwalks and exterior program areas are not included in the gross floor area.

Estimate Methodology

Detailed quantities were measured from the preliminary design drawings provided. Allowances were included for architectural, structural, mechanical and electrical systems not yet fully drawn or finalized. Pricing and market conditions data for Houston Center for the Musical Arts in Houston TX was obtained from construction managers and this current and project specific information included in the estimate.

Estimate Inclusions

- Demolition of existing elements
- Building shell
- Building interiors
- Mechanical & electrical services
- Performance equipment & seating & A/V equipment
- Siteworks/Utilities
- Design/pricing contingency
- General conditions, overhead and fee
- Escalation to July 2025
- GMP Buyout Contingency
- Construction change order contingency

Estimate Exclusions (typically budgeted in Soft Costs and Owner Project Costs)

- Owner purchase loose fixtures, fittings and equipment (FF&E) unless otherwise noted
- Relocation of main existing utilities
- Soil borings, geotech, site and utility surveys
- Contaminated soil treatment and disposal
- Hazardous materials abatement and disposal
- Testing/inspections expenses
- Sole sourced equipment or systems
- Service and maintenance contracts
- Third party M&E commissioning
- Permits and associated fees
- Professional fees and reimbursables
- Construction administration expenses
- Design build and/or fast-track construction schedule premium
- Models, mockups, renderings
- Financing
- Fundraising
- Public relations
- Legal fees and expenses
- Houston Center for the Musical Arts staff or project management expenses
- Owner moving expenses
- Groundbreaking, topping off and pre-opening expenses
- Art allowance
- Musical instruments etc.
- Houston Center for the Musical Arts overall project contingency
- Endowment/Subsidies

Definitions and Assumptions

The following helps define the terminology and assumptions in this report:

- Building shell includes:

- Substructure: spread footings; dewatering allowance; slab on grade; concrete basement walls.
- Structure: combination concrete/steel frame.
- Exterior enclosure: Walls comprise brick veneer wall covering; storefront, curtainwall and punch windows; acoustic glazing to rehearsal rooms; roofs comprise flat membrane; canopies; signage.

Definitions and Assumptions (Cont'd)

• Building interiors include:
- Partitions and doors: gasket and sealed doors to all sound critical spaces
- Conveying systems: 1 passenger elevators; 2 limited use/limited access lifts; 1 service elevator; multiple public stairs, multiple back-of-house/exit stairs.
- Finishes: see estimate for details.

- Performance equipment and seating allowance includes:

- theatrical lighting controls
- stage rigging
- audio/video system
- fixed seating

- Mechanical includes plumbing and drainage, fire protection, heating, ventilating, air conditioning and controls - specifically –

Plumbing and Drainage:

Plumbing and drainage includes electronically activated plumbing fixtures; domestic hot, cold and recirculation potable water piping to fixtures and fittings and HVAC systems throughout; Domestic hot water is extended from Incoming water service c/w water meter and backflow preventer; gravity and pumped flow sanitary waste (and vent) collection system from fixtures, fittings, floor drains and equipment throughout connected to site sanitary services; full flow complete Primary and Secondary roof drainage system with interior leaders consisting of roof drains and areaway drains, then overflow to outgoing site storm sewer service, below & above grade piping with joints, fittings and supports, cleanouts and line items; domestic water duplex booster pump is provided to boost street pressure. A complete system of natural gas is provided to serve hot water boilers and domestic hot water heaters. Piping is extended from PRV / meters (allowance included in site utilities) to equipment throughout.

Fire Protection:

Standpipe protection system c/w distribution mains and firehose cabinets are to be located in egress stairs as required to provide coverage in accordance with NFPA 14; Allowance for a complete wet sprinkler system to ordinary hazard NFPA 13 standards consisting of supervised valve & alarm check valve assembly, sch.40 black steel piping c/w joints, fittings, supports, drops and/or sprigs, & upright/concealed sprinkler heads will be provided. Zone valves are provided at each level. Fire hose valves located throughout the floor as required to provide coverage in accordance with OBC and NFPA 14; Fire pump 1000gpm@150Psi (125HP) is provided.

Heating, Ventilating, Air Conditioning (H.V.A.C.):

- A central, high efficiency air cooled chiller plant at 220 tons total capacity provides chilled water to serve the building HVAC loads. Chilled water loop is provided with primary circulation pumps c/w VFD's. Air and expansion control and chemical pot feeder are provided. Chilled water piping is extended to DOAS, air handling units and space cooling units throughout.

- A central, high efficiency boiler plant at 2,000 mbh total capacity provides heating water to serve the building HVAC loads. Air and expansion control and chemical pot feeder are provided. Hot water heating piping is extended to DOAS, air handling units, VAV reheat coils, unit heaters, etc. throughout utilizing fully redundant secondary circulation pumps c/w VFD's.

- Semi-Custom Single outside air pretreatment (DOAS) unit to provide outside air to AHU's. Unit is provided with a heat wheel designed to provide energy exchange between 4,600 CFM of outside air and 3,100 CFM of exhaust and relief air. Supply and exhaust fans will be plug fans with variable speed drives. The heat wheel will be total enthalpy 3 angstrom molecular sieve. The outside airstream is provided with a preheat coil for freeze protection and a cooling coil, 40 tons. Basis of design is Temtrol.

- AHU-1& AHU-3 - Cooling-only VAV units delivering air through 4” pressure class ductwork to (5) zones of control. Each zone of control has a pressure-independent terminal unit with hydronic reheat control, and a space temperature sensor. AHU-2& AHU-4 & AHU-5 - Single zone VAV unit, delivering air through low speed ductwork to high diffusers in the Lambert house and stage areas, and return air through the low seating, the four corners of the house, and through the wings of the stage. It will have a cooling coil with a hydronic reheat coil. All units equal to Trane, JCI, Carrier or Daikin.

- Ventilation and cooling air is delivered to all occupied areas of the building via air handling units, DOAS unit providing exhaust and relief air, and supplemented with localized spot cooling units to suit special purpose needs. Single zone constant and variable volume AHU's with noise-critical acoustic overhead air distribution system (low level return for acoustic sensitive areas), with pressure independent variable volume terminal boxes with hot water reheat coils to suit the specific zone space temperature / humidity environmental needs (where required). Split systems to serve electric rooms, elevator machine rooms (if applicable), and data/IT closets. Generally air is supplied to the spaces via a network of sheetmetal ducts to and from the respective air handling units supply air diffusers within the space. Duct is lined (Linacoustic R300) with internal 1.5" thick duct liner depending on location and area served.

- Central washroom exhaust system with roof mounted exhaust fan, exhaust sheetmetal ductwork and grilles. Exhaust air is exhausted via a heat reclaim device. Kitchenette's are ducted to general exhaust. Mechanical and electrical rooms are provided with inline exhaust fan, intake and exhaust louvers, exhaust sheetmetal ductworks and grilles. Allowance included for catering kitchen exhaust, non NFPA rated.

- Noise and Vibration Isolation : Vibration isolation is provided as required to minimize transmission to structure. Equipment and piping shall have isolators installed at points of support.

- Smoke exhaust - Heat actuated vented system for the stage by G.C.

- Acoustic Treatments : Provision for duct lagging, vinyl wrap, sound traps and the like for low RC spaces

- Generator support : No work required - Genset located outside the building.
- Humidification is achieved by wall mounted humidifiers for the two piano storage rooms; Basis of Design is Dristeem Vapormist VM2.

General:
- All systems / services located and routed for acoustic sensitivity and noise transfer elimination

• Electrical includes services and distribution, lighting, devices and controls, systems and ancillaries and performance equipment accommodation – specifically –

Distribution & Services:

The main service of the building is through a 1600A 277/480V main switchboard. Normal power distribution equipment is provided to accommodate the loads. Emergency power is provided by an exterior pad mounted 250kW diesel generator. ATS's and panels are provided to supply circuitry for life safety lighting and critical loads. Transformers are isolation type to accommodate the production equipment requirements and are located away from all production areas. Mechanical equipment is fed through 480V mechanical distribution panels and the electrical division is providing line and load side wiring. Building and technical grounding systems are included to accommodate the new equipment. A building lightning protection system is excluded.

Lighting, Devices and Heating:

Lighting is generally provided using recessed and wall mounted decorative LED fixtures. Exterior lighting includes LED light fixtures. Life safety lighting is powered through the emergency distribution system and is controlled using emergency control relays. Lighting control is provided using a central LV addressable control system. Local switching, occupancy and daylight sensors are incorporated into the design. These controls are interfaced with the production dimming systems. Devices are installed to meet general maintenance and specialty requirements for production facilities. Dimmer racks are provided as part of the equipment provided in the production equipment package and are fed through dedicated transformers. 20 receptacles are provided to supply AV power throughout the production areas.

Systems and Ancillaries:
A two stage addressable fire alarm, EVAC system and is provide throughout the facility. A security access control and CCTV system to control and monitor the complete facility with security access control for dressing rooms and non-public areas. Supply, programming, and installation of security equipment is by others. Empty raceway infrastructure for wall mounted communication outlets, wireless access points to runs back to communications rooms has been included. Communication structured cabling is by others. An empty raceway and wiring system for the production equipment, broadcast infrastructure and AV is provided to accommodate the new production equipment.

- Sitework/utilities allowance is intended to include for earthworks, paving/curbing, fencing and gates, stairs, ramps and railings, landscaping, and associated mechanical and electrical utilities.

- Design/pricing contingency allows for ongoing design detailing that will occur until drawings are complete and for quantity measurement and pricing adjustments.

- General conditions, overhead and fee includes all requirements for the general contractor (or construction manager), at a competitive rate.

- Escalation to bid date allows for normal price increases that will likely occur between now and the projected July 2025 bid date and for unforeseen pricing fluctuations and market conditions. Any final adjustment to pricing can only be made with any certainty once market conditions at bid time are known (the escalation contingency includes any buy-out contingency at bid by a general contractor).

- Owner purchase performance equipment and lighting, except where noted, is excluded.

- Construction change order contingency is for ground conditions variances, coordination conflicts on the drawings and other minor errors and omissions that may occur during the construction phase of the project (owner changes not included).

Note: Venue has no control over the cost of labor, materials or equipment, the general contractor/construction manager's bid prices, competitive/negotiated bidding, or market conditions. Whilst Venue cannot warrant that bids or negotiated prices will not vary from any estimate prepared, we do however use our best endeavors to ensure that our estimate closely reflects the anticipated bid cost.

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

Estimate Summary ***September 26, 2023***

	ITEM		AMOUNT	
A	Sub-Structure		$955,000	
B	Shell		$6,425,000	
C	Interiors		$6,445,000	
D	Mechanical & Electrical Services		$9,775,000	
E	Performance Equipment, AV & Seating		$2,685,000	
F	Demolition & Temporary Construction		$410,000	
G	General Requirements		$1,670,000	
H	Sitework/Utilities		$1,980,000	
	SUBTOTAL		***$30,345,000***	*$ 746 /gsf*
I	Design/Pricing Allowance	10.0%	$3,035,000	
J	General Conditions, Overhead & Fee	12.5%	$4,175,000	
K	Escalation to July 2025	12.6%	$4,730,000	
L	GMP Buyout contingency	3.0%	$1,270,000	
	TOTAL BID COST IN JULY 2025 DOLLARS		***$43,555,000***	*$ 1071 /gsf*
M	Owner Purchase Equipment		$0	to be confirmed
N	Construction Change Order Contingency	3%	$1,305,000	
	TOTAL CONSTRUCTION COST IN JULY 2025 DOLLARS		***$44,860,000***	*$ 1103 /gsf*

Overall Gross Floor Area ***40,685 gsf***

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

Elemental Summary — **September 26, 2023**

	ELEMENT		Total	$ per gsf	%
A1	**Sub-Structure**		**$956,400**	**$23.51**	**3%**
	A1.1 Excavation	$141,000		$3.47	
	A1.2 Foundations	$505,300		$12.42	
	A1.3 Slab-on-Grade	$156,600		$3.85	
	A1.4 Basement Walls	$153,500		$3.77	
B	**SHELL**		**$6,425,200**	**$157.93**	**23%**
B1	**Superstructure**	**$3,704,700**		**$91.06**	13%
	B1.1 Structural Concrete	$233,900		$5.75	
	B1.2 Structural Steel	$3,440,800		$84.57	
	B1.3 Other Structure	$0		$0.00	
	B1.4 Miscellaneous Structure	$30,000		$0.74	
B2	**Exterior Enclosure**	**$2,720,500**		**$66.87**	10%
	B2.1 Roofing	$534,200		$13.13	
	B2.2 Exterior Walls	$791,300		$19.45	
	B2.3 Exterior Windows & Curtainwall	$1,135,200		$27.90	
	B2.4 Exterior Doors	$177,000		$4.35	
	B2.5 Miscellaneous Exterior	$82,800		$2.04	
C	**INTERIORS**		**$6,444,000**	**$158.39**	**23%**
C1	**Partitions & Doors**	**$1,819,100**		**$44.71**	6%
	C1.1 Partitions	$1,404,700		$34.53	
	C1.2 Interior Doors	$414,400		$10.19	
C2	**Vertical Movement**	**$1,006,900**		**$24.75**	4%
	C2.1 Stairs	$381,900		$9.39	
	C2.2 Elevators & Lifts	$625,000		$15.36	
C3	**Interior Finishes & Fixtures**	**$3,618,000**		**$88.93**	13%
	C3.1 Public & Performance Spaces	$2,591,000		$63.68	
	C3.2 Non-Public Spaces	$1,027,000		$25.24	
D	**MECHANICAL & ELECTRICAL SERVICES**		**$9,777,300**	**$240.32**	**34%**
D1	**Mechanical**	**$6,248,200**		**$153.58**	22%
	D1.1 Plumbing & Drainage	$1,313,400		$32.28	
	D1.2 Fire Protection	$391,600		$9.63	
	D1.3 Heating, Vent, Air Cond	$3,938,200		$96.80	
	D1.4 Controls	$605,000		$14.87	
D2	**Electrical**	**$3,529,100**		**$86.74**	12%
	D2.1 Services & Distribution	$1,194,400		$29.36	
	D2.2 Lighting, Devices & Controls	$1,458,500		$35.85	
	D2.3 Systems & Ancillaries	$876,200		$21.54	
E	**EQUIPMENT**		**$2,685,000**	**$65.99**	**9%**
E1	**Performance/AV Equipment & Seating**	**$2,660,000**		**$65.38**	9%
	E1.1 Performance Equipment & Seating	$1,760,000		$43.26	
	E1.2 AV Equipment	$900,000		$22.12	
E2	**Miscellaneous Equipment**	**$25,000**		**$0.61**	0%
	E2.1 Miscellaneous Equipment	$25,000		$0.61	
F	**DEMOLITION & TEMPORARY CONSTRUCTION**		**$410,200**	**$10.08**	**1%**
	F1.1 Demolition	$385,200		$9.47	
	F1.2 Temporary Construction	$25,000		$0.61	
G	**GENERAL REQUIREMENTS**		**$1,670,000**	**$41.05**	**6%**
	G1.1 Equipment & Rentals	$130,000		$3.20	
	G1.2 Project Overhead Items	$1,540,000		$37.85	
	TOTAL BUILDING ELEMENTAL COST		**$28,368,100**	**$697.26**	**100%**
		GROSS FLOOR AREA	**40,685**	**gsf**	
H	**SITEWORKS & UTILITIES**				
	H1.1 Siteworks	$1,127,000			
	H1.2 Mechanical Utilities	$395,000			
	H1.3 Electrical Utilities	$460,300			
	TOTAL SITEWORKS & UTILITIES		**$1,982,300**		

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL
Mechanical Estimate Summary

Gross Floor Area 40,685 *sf*

September 26, 2023

Description Element\Sub-Element	Specialty Sub Break down	Sub Element Total	Element Total	$ per sf Sub Element	$ per SF Element	% Element
D1 Mechanical						
D1.1 Plumbing & Drainage			$1,313,400		$32.28	21.0%
D1.11 - Plumbing Fixtures		$242,800		$5.97		
D1.12 - Domestic Water		$335,300		$8.24		
D1.13 - Sanitary Waste & Vent		$212,600		$5.23		
D1.14 - Storm		$264,500		$6.50		
D1.15 - Natural Gas		$39,200		$0.96		
D1.16 - Specialty Systems:		$0		$0.00		
D1.17 - Miscellaneous Works and General Accounts		$219,000		$5.38		
D1.2 Fire Protection			$391,600		$9.63	6.3%
D1.21 - Standpipe		$40,700		$1.00		
D1.22 - Sprinklers		$348,400		$8.56		
D1.23 - Specialty Systems		$0		$0.00		
D1.24 - Fire Extinguisher		$2,500		$0.06		
D1.25 - Miscellaneous Works and General Accounts		$0		$0.00		
D1.3 Heating, Ventilation & Air Conditioning			$3,938,200		$96.80	63.0%
D1.31 - Liquid Heat Transfer (Heating)		$450,700		$11.08		
D1.32 - Liquid Heat Transfer (Cooling)		$523,700		$12.87		
D1.33 - Steam and Condensate		$0		$0.00		
D1.34 - Air Distribution		$1,991,800		$48.96		
D1.35 - Exhaust Systems		$91,400		$2.25		
D1.36 - Specialty Systems		$0		$0.00		
D1.37 - Support Systems and Works		$224,600		$5.52		
D1.37.1 - Noise and Vibration Isolation	$32,100					
D1.37.2 - Mechanical Wiring and Starters	$20,000					
D1.37.3 - Balancing and Commissioning	$101,800					
D1.37.6 - LEED / Sustainability	$0					
D1.37.7 - Seismic / Tornado / Hurricane Restraint	$0					
D1.37.8 - Acoustic Treatments	$40,700					
D1.37.10 - Generator Support	$0					
D1.38 - Miscellaneous Works and General Accounts		$656,000		$16.12		
D1.4 Controls			$605,000		$14.87	9.7%
D1.41 - Controls and Automation		$605,000		$14.87		
D1.42 - Miscellaneous Works and General Accounts		$0		$0.00		
Total (D1) Mechanical			$6,248,200		$153.58 $ per sf	
H1.2 - Mechanical Utilities						
H1.2 Mechanical Utilities			$395,000		$9.71 $ per sf	
H1.21 - Water		$50,000		$1.23		
H1.22 - Sanitary		$50,000		$1.23		
H1.23 - Storm		$200,000		$4.92		
H1.24 - Natural Gas		$75,000		$1.84		
H1.25 - Specialty Systems		$20,000		$0.49		
H1.26 - Miscellaneous Works and General Accounts		$0		$0.00		
Total (H1.2) Mechanical Utilities			$395,000		$9.71 $ per sf	

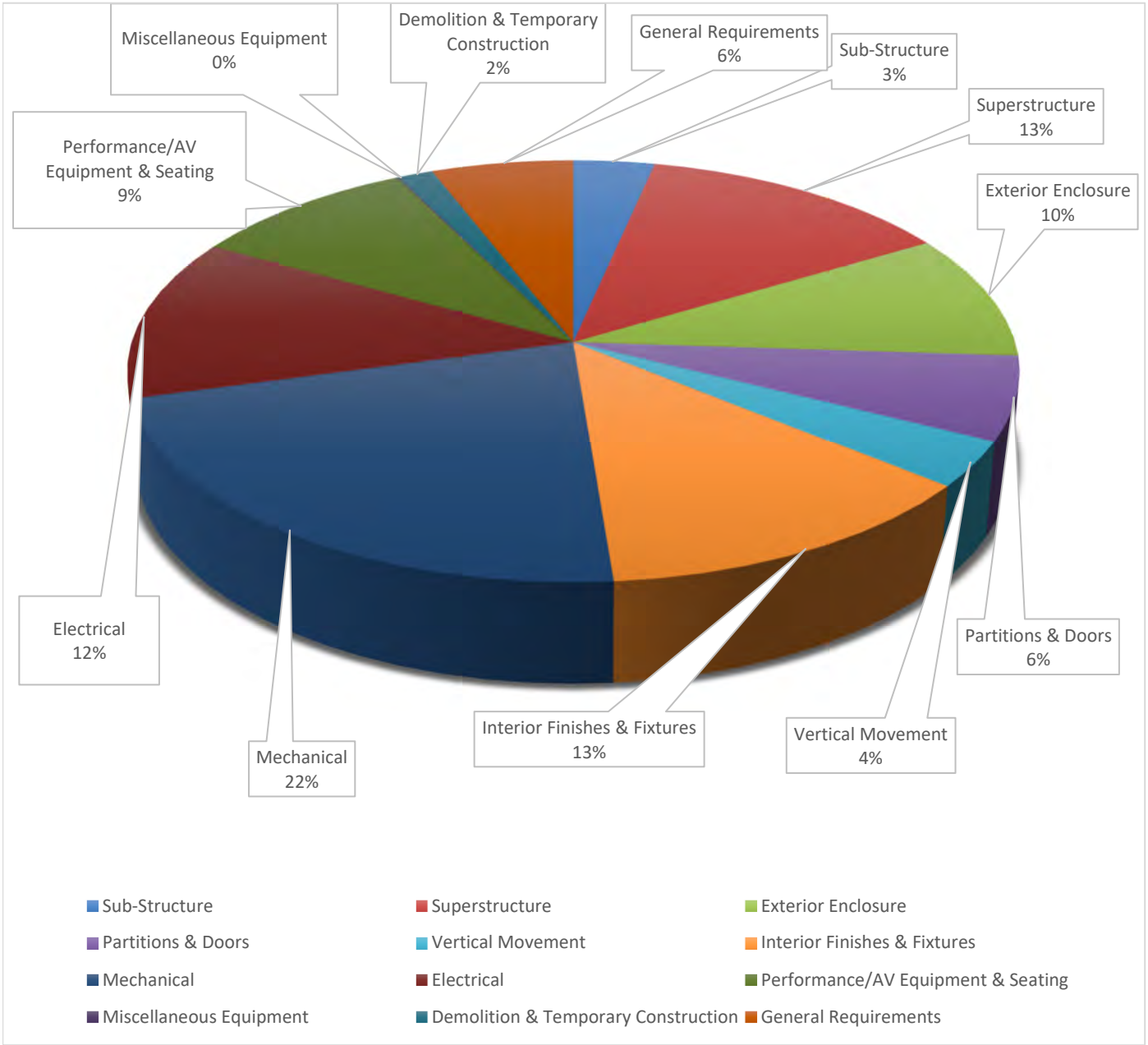
Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL
Electrical Estimate Summary

Gross Floor Area ***40,685*** ***sf***

September 26, 2023

Description ***Element\Sub-Element***	***Sub Element Total***	***Element Total***	***$ per sf Sub Element***	***$ per sf Element***	***% Element***
D2 Electrical					
D2.1 Service & Distribution		***$1,194,350***		***$29.36***	***33.8%***
D2.11 - L.V. Switchboard	*$201,400*		*$4.95*		
D2.12 - Emergency Power	*$282,000*		*$6.93*		
D2.13 - Distribution	*$198,300*		*$4.87*		
D2.14 - Feeders	*$203,500*		*$5.00*		
D2.15 - Motor Controls & Wiring	*$73,000*		*$1.79*		
D2.16 - Miscellaneous	*$38,150*		*$0.94*		
D2.17 - General Requirements	*$198,000*		*$4.87*		
D2.2 Lighting, Devices & Heating		***$1,458,450***		***$35.85***	***41.3%***
D2.21 - Lighting	*$979,470*		*$24.07*		
D2.22 - Branch Devices & Wiring	*$235,980*		*$5.80*		
D2.23 - Heating	*$0*		*$0.00*		
D2.24 - General Requirements	*$243,000*		*$5.97*		
D2.3 Systems & Ancillaries		***$876,200***		***$21.54***	***24.8%***
D2.31 - Fire Alarm System	*$195,300*		*$4.80*		
D2.32 - Security System	*$91,500*		*$2.25*		
D2.33 - Communications	*$77,300*		*$1.90*		
D2.34 - P.A. System	*$366,100*		*$9.00*		
D2.35 - Miscellaneous	*$0*		*$0.00*		
D2.36 - General Requirements	*$146,000*		*$3.59*		
Total Building (D2) Electrical		***$3,529,000***		***$86.74 $ per sf***	

Elemental Summary Pie Chart



Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

Detailed Estimate ***September 26, 2023***

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
	A SUB-STRUCTURE					
9.	***A1.1 Excavation***					
11.	Excavate & haul					
12.	new connector basement elev at -3'6"	855	cy	37.00	31,600	
13.	new connector basement elev at -6'	1,588	cy	37.00	58,800	
14.	foundations	included in Foundations				
16.	Imported backfill					
17.	new connector basement elev at -3'6"	187	cy	57.00	10,600	
18.	new connector basement elev at -6'	345	cy	57.00	19,700	
19.	foundations	included in Foundations				
21.	Shoring				0	excluded
23.	Dewatering - temporary	1	ls	20,000.00	20,000	allowance
25.	Dewatering - permanent				0	excluded, assume not required
29.	***Total for Section A1.1 Excavation***				***$140,700***	
32.	***A1.2 Foundations***					
34.	Footing pad, including cip concrete, reinforcing, formwork, and excavation:					allowance
35.	new connector	6,520	sf	14.50	94,500	
36.	for new columns at Lambert Hall	5,253	sf	7.25	38,100	
38.	Continuous footing, including cip concrete, reinforcing, formwork, and excavation:					allowance
39.	new connector	651	lf	115.00	74,900	
40.	for underpinning/connections to existing foundations at Lambert Hall	332	lf	115.00	38,200	
41.	for reconfigured structure at Saengerhalle Hall	272	lf	57.50	15,600	
43.	Cast in place concrete stem wall, 14" wide, assume 3' tall on new foundations above	2,361	sf	61.00	144,000	
45.	Elevator pits:					
46.	- public	1	ea	40,000.00	40,000	
47.	- service	1	ea	45,000.00	45,000	
49.	Acoustical isolation	1	ls	15,000.00	15,000	
52.	***Total for Section A1.2 Foundations***				***$505,300***	

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

Detailed Estimate ***September 26, 2023***

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
55.	***A1.3 Slab-On-Grade***					
57.	Concrete slab on grade, 5" thick, including concrete, rebar, formwork, and vapor barrier:					
58.	at new connector	6,520	sf	14.50	94,500	
59.	patching at Lambert Hall	5,253	sf	5.00	26,300	allowance, assume 30%
60.	patching at Saengerhalle Hall	1,807	sf	5.00	9,000	allowance, assume 30%
62.	Termite control (soil poisoning)	13,580	sf	0.50	6,800	
64.	Housekeeping pads	1	ls	5,000.00	5,000	
66.	Acoustical isolation	1	ls	15,000.00	15,000	
69.	***Total for Section A1.3 Slab-On-Grade***				***$156,600***	
72.	***A1.4 Basement Walls***					
74.	Cast in place concrete, 14" thick, including concrete, formwork, insulation, waterproofing, reinforcing steel and drainage	2,517	sf	61.00	153,500	
78.	***Total for Section A1.4 Basement Walls***				***$153,500***	

B SHELL

B1 Superstructure

84.	***B1.1 Structural Concrete***					
86.	Composite concrete slab on metal deck (measured elsewhere), including mesh reinforcing:					
87.	floors, 5" thick	13,270	sf	5.50	73,000	
	floors, infill/reconstruct	2,005	sf	6.60	13,200	
89.	roof, 6" thick	12,577	sf	6.00	75,500	to be confirmed
90.	roof at tie-in to existing roof	431	sf	7.20	3,100	
91.	stepped seating/balconies	3,411	sf	14.75	50,300	
92.	stage @ Lambert Hall	1,737	sf	7.50	13,000	
93.	stage @ Saengerhalle	581	sf	10.00	5,800	
95.	Acoustical premiums					
96.	M&E spaces				0	excluded
99.	***Total for Section B1.1 Structural Concrete***				***$233,900***	

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
101.	**B1.2 Structural Steel**					
103.	Structural steel framing					
	Roof:					
105.	at stage	17	tn		0	20 psf allowance
106.	at audience chamber	21	tn		0	22.5 psf allowance
107.	at balance of roof areas	70	tn		0	15 psf allowance
108.	premium for tie-in locations	1	tn		0	5 psf allowance
109.	Floor:					
110.	at stages	28	tn		0	25 psf allowance
111.	at stepped audience seating	58	tn		0	22.5 psf allowance
112.	at balcony	18	tn		0	25 psf allowance
113.	at balance of floor areas	57	tn		0	15 psf allowance
114.	Rigging beams	7	tn		0	allowance
115.	Misc. steel, pour stops, etc.	17	tn		0	1 psf allowance
116.	Curtainwall	15	tn		0	7.5 psf allowance
117.	Connections (15%)	46	tns			
118.	Total steel tonnage	355	tns	7,500.00	2,663,100	
119.	Cranage - included in rates above					
121.	Shear studs measured at concrete on metal deck only (allowed for 1 ea per 5sf of deck)	6,802	ea	7.50	51,000	
123.	Metal deck:					
124.	3", 20ga. galvanized	34,012	sf	8.50	289,100	
126.	Catwalks (per architectural layout) including handrails	246	lf	600.00	147,600	
128.	M&E dunnage	1	ls	25,000.00	25,000	
130.	Acoustic isolation joints	1	ls	35,000.00	35,000	
132.	Miscellaneous metals to include wall strengthening at orchestra screens	1	ls	110,000.00	110,000	
134.	Fireproofing	1	ls	120,000.00	120,000	
138.	***Total for Section B1.2 Structural Steel***				***$3,440,800***	
141.	**B1.3 Other Structure**					
145.	***Total for Section B1.3 Other Structure***				***$0***	
148.	**B1.4 Miscellaneous Structure**					

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
150.	Firesafing	1	ls	30,000.00	30,000	
154.	***Total for Section B1.4 Miscellaneous Structure***				***$30,000***	

B2 Exterior Enclosure

159.	***B2.1 Roofing***					
161.	Skylights					none shown
163.	TPO roofing including tapered insulation	13,008	sf	28.00	364,200	
165.	Remove steeple at Saengerhalle and repair roof	1	ls	10,000.00	10,000	
167.	Smoke hatches					assume not required
169.	Acoustic smoke hatches, 4' x 8'	3	ea	30,000.00	90,000	per scrub email
171.	Roof hatches and railings	1	ls	12,000.00	12,000	allowance
173.	Walking mats, ladders, etc.	1	ls	10,000.00	10,000	
175.	Rough carpentry	1	ls	23,000.00	23,000	
177.	Acoustic isolation	1	ls	25,000.00	25,000	
181.	***Total for Section B2.1 Roofing***				***$534,200***	

184.	***B2.2 Exterior Walls***					
186.	Brick cladding (assume 60% of new walls to be solid):					
187.	at new walls	8,662	sf	32.00	277,200	
188.	at existing brick cladding only to be repaired/replaced (30% of area) using salvaged brick	1,343	sf	15.00	20,100	
189.	clean and repoint balance of existing brick veneer at Lambert Hall	3,133	sf	20.00	62,700	per scrub email
191.	Backup to above comprising CMU, including waterproofing, insulation and reinforcing steel					
192.	8" units, grout filled solid, infill door and window openings	814	sf	43.50	35,400	
193.	8" units, grout filled solid, new exterior walls	5,647	sf	29.00	163,800	
194.	8" units, grout filled solid, at roof extension Lambert Hall	3,015	sf	35.00	105,500	
196.	Finish to rear of parapets	1,508	sf	28.00	42,200	

Houston Center for the Musical Arts
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Detailed Estimate **September 26, 2023**

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
198.	Copings	754	lf	35.00	26,400	
200.	Louvers	1	ls	20,000.00	20,000	allowance
202.	Caulking & sealing - solid walls above	1	ls	20,000.00	20,000	
204.	Acoustical isolation	1	ls	18,000.00	18,000	
207.	***Total for Section B2.2 Exterior Walls***				***$791,300***	
210.	***B2.3 Exterior Windows & Curtainwall***					
212.	Curtainwall (assume 40% of new walls are glass)	4,042	sf	125.00	505,300	
	Punched windows	1,732	sf	75.00	129,900	
216.	Restore existing wood framed windows, in situ, and install new aluminum framed glass protection, vented; extent of wood damage to be determined	1	ls	400,000.00	400,000	allowance - TBD
218.	Stained glass repair	1	ls	100,000.00	100,000	allowance - TBD
221.	***Total for Section B2.3 Exterior Windows & Curtainwall***				***$1,135,200***	
224.	***B2.4 Exterior Doors***					
226.	Doors, including frames & hardware:					
227.	- glazed at new lobby entry and Saengerhalle primary seating	12	lvs	7,500.00	90,000	
228.	- wood doors Lambert Hall entry	5	lvs	6,000.00	30,000	
229.	- balance of exterior doors	4	lvs	3,500.00	14,000	
230.	- overhead new loading dock	1	ea	15,000.00	15,000	
232.	Automatic door openers	4	ea	7,000.00	28,000	to be confirmed
236.	***Total for Section B2.4 Exterior Doors***				***$177,000***	
239.	***B2.5 Miscellaneous Exterior***					
241.	Exterior soffits/balconies	1	ls	5,000.00	5,000	
243.	Canopies					
244.	- at main entry	160	sf	400.00	64,000	
245.	- rear entry and loading dock	110	sf	125.00	13,800	

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

Detailed Estimate **September 26, 2023**

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
247.	Exterior signage					excluded - by owner
251.	***Total for Section B2.5 Miscellaneous Exterior***				***$82,800***	

C INTERIORS

C1 Partitions & Doors

258.	***C1.1 Partitions***					
260.	Glass walls	200	sf	85.00	17,000	
262.	Masonry:					
263.	8'' CMU wall - back stage Lambert hall	2,793	sf	16.00	44,700	
264.	8'' CMU wall - back wall Lambert hall	2,916	sf	16.00	46,700	audience chamber
265.	8'' CMU wall - Rehearsal rooms	4,328	sf	25.00	108,200	
266.	8'' CMU wall - Shaft walls	8,641	sf	25.00	216,000	
268.	Drywall, including insulation (partition type is assumed):					
269.	Lambert Hall, including building addition:					
270.	metal stud framing, 5/8'' Gypsum board, two layer on one side - perimeter walls	20,735	sf	12.00	248,800	
271.	metal stud framing, 5/8'' Gypsum board, two layer on each side - interior walls	12,335	sf	16.50	203,500	
272.	metal stud framing, 5/8'' Gypsum board, two layer on each side - balcony parapet	1,295	sf	16.50	21,400	
274.	Middle Building:					
275.	metal stud framing, 5/8'' Gypsum board, one layer on one side - perimeter walls	7,284	sf	9.75	71,000	
276.	metal stud framing, 5/8'' Gypsum board, one layer on each side - Interior walls	9,989	sf	12.00	119,900	
278.	Saengerhalle:					
279.	metal stud framing, 5/8'' Gypsum board, one layer on one side - perimeter walls	7,820	sf	9.75	76,200	
280.	metal stud framing, 5/8'' Gypsum board, one layer on each side - interior walls	4,271	sf	12.00	51,300	
281.	existing back wall to remain in audience chamber				0	ETR
283.	Acoustical isolation	1	ls	50,000.00	50,000	allowance
285.	Firesafing	1	ls	30,000.00	30,000	allowance
287.	Partitions not drawn	1	ls	100,000.00	100,000	allowance
290.	***Total for Section C1.1 Partitions***				***$1,404,700***	

Houston Center for the Musical Arts
Preliminary Design Estimate - FINAL

Detailed Estimate **September 26, 2023**

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
292.	**C1.2 Interior Doors**					
294.	Glass:					
295.	Prefinished aluminum storefront, vestibule door, double	2	pr	20,000.00	40,000	
297.	FOH:					
298.	wood veneer 1 3/4'' door, flush stained finish, grade 1 cylindrical locksets, lever handles, hollow metal frame, double	10	pr	3,300.00	33,000	
299.	wood veneer 1 3/4'' door, flush stained finish grade 1 cylindrical locksets, lever handles, hollow metal frame, single	27	lvs	1,650.00	44,600	
301.	BOH:					
302.	hollow metal 1 3/4'' door, grade 1 cylindrical locksets, lever handles, hollow metal frame, double	5	pr	4,000.00	20,000	
303.	hollow metal 1 3/4'' door, grade 1 cylindrical locksets, lever handles, hollow metal frame, single	58	lvs	2,000.00	116,000	
305.	STC rated doors:					
306.	Oversize , 8' wide, double	2	pr	11,000.00	22,000	
307.	Regular , 6' wide, double	2	pr	9,500.00	19,000	
308.	Regular , 3' wide, single	1	lvs	4,750.00	4,800	
310.	Door hardware				included	
312.	Premium for above:					
313.	Gasket and sealed	40	lvs	750.00	30,000	
315.	Overhead door, Loading dock	1	ea	20,000.00	20,000	
317.	Roll down shutter	2	ea	10,000.00	20,000	concessions & concierge room
319.	Automatic door openers	6	ea	7,500.00	45,000	
322.	**Total for Section C1.2 Interior Doors**				**$414,400**	

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Detailed Estimate **September 26, 2023**

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
	C2 Vertical Movement					
327.	***C2.1 Stairs***					
329.	Public:					
330.	Lobby feature stair, 6' wide 10'7.5'' rise, with railings in one side and wall rails in the other	127	lfr	600.00	76,200	
331.	1/4 landing stair, 4' wide with wall rails and 20' rise	160	lfr	500.00	80,000	
332.	Saengerhalle stair, 4' wide with wall rails and 10'8" rise	85	lfr	150.00	12,800	adj per scrub email
333.	Lobby steps, including railing	63	lfr	500.00	31,500	
335.	Back-of-house stairs:					
336.	1/2 landing stair, 4' wide with wall rail & railing and 44'6'' rise	356	lfr	225.00	80,100	
337.	1/2 landing stair, 4' wide with wall rail & railing and 33'6'' rise	268	lfr	225.00	60,300	
338.	1/2 landing stair, 4' wide with wall rail & railing and 20' rise	160	lfr	225.00	36,000	
340.	Miscellaneous ladders, etc.	1	ls	5,000.00	5,000	allowance
343.	***Total for Section C2.1 Stairs***				***$381,900***	
345.	***C2.2 Elevators & Lifts***					
347.	Public:					
348.	cab size 8'4''x 6'4'' with rise 33', 4 stops and front and rear openings	1	ea	225,000.00	225,000	
349.	premium for cab finishes allowance	1	ls	35,000.00	35,000	allowance
351.	Service:					
352.	cab size 8'4''x 5'9'' with rise 33', 3 stops and front opening only	1	ea	300,000.00	300,000	TBD
354.	Handicapped lift:					
355.	Lambert hall Lula, cab size 4'5''x 3'9'' with 20' rise, 2 stops front and rear openings	1	ea	35,000.00	35,000	
356.	Saengerhalle Lula, cab size 4'5''x 3'9'' with 9'6" rise, 2 stops front opening only	1	ea	30,000.00	30,000	
359.	***Total for Section C2.2 Elevators & Lifts***				***$625,000***	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
	C3 Interior Finishes & Fixtures					
365.	***C3.1 Public & Performance Spaces***					
367.	**Stage Lambert Hall**					
369.	Floors:					
370.	sprung flooring with hardwood finish	1,850	sf	40.00	74,000	
372.	Bases:					
373.	wood	196	lf	25.00	4,900	TBD
375.	Ceilings:					
376.	paint to exposed structure	1,850	sf	5.00	9,300	
378.	Walls:					
379.	painted gyp level 5 finish	5,880	sf	4.00	23,500	
381.	**Audience Chamber Lambert Hall**					
383.	Floors:					
384.	Axminster carpet	1,281	sf	15.00	19,200	
385.	Wood finish floor	2,660	sf	25.00	66,500	
386.	sprung flooring with hardwood finish	485	sf	40.00	19,400	orchestra pit
387.	stage filler panel apron	485	sf	40.00	19,400	filler panel elsewhere
389.	Bases:					
390.	wood - audience chamber	547	lf	25.00	13,700	TBD
391.	wood - orchestra pit	94	lf	25.00	2,400	TBD
393.	Ceilings:					
394.	multi layer drywall painted to underside of balcony	1,403	sf	25.00	35,100	under balcony slab
395.	balance, painted shaped drywall	3,480	sf	40.00	139,200	TBD
396.	shaped painted gwb, underneath catwalks	1,010	sf	30.00	30,300	
398.	Walls:					
399.	patch and paint	6,000	sf	25.00	150,000	TBD
400.	acoustic wall panels	1,129	sf	40.00	45,200	back wall
402.	Miscellaneous:					
403.	moveable railing	44	lf	300.00	13,200	orchestra pit
405.	Acoustical isolation:					
406.	2'' acoustic isolation joint covers	198	lf	100.00	19,800	
408.	Performance equipment accommodations	1	ls	50,000.00	50,000	allowance
	Balcony front					

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
411.	articulated wood treatment, historically influenced, acoustical diffusion	275	lf	400.00	110,000	balcony parapet
413.	**Stage Saengerhalle**					
415.	Floors:					
416.	sprung flooring with hardwood finish	400	sf	40.00	16,000	
417.	wood frame platform	190	sf	40.00	7,600	stage platform
419.	Bases:					
420.	wood	182	lf	25.00	4,600	TBD
422.	Ceilings:					
423.	patch and paint	1,475	sf	20.00	29,500	TBD, including beams
425.	Walls:					
426.	patch and paint	2,438	sf	25.00	61,000	TBD
428.	**Audience Chamber Saengerhalle**					
430.	Floors:					
431.	Existing porcelain to remain; clean	2,540	sf	2.00	5,100	adj per scrub email
433.	Bases:					
434.	paint existing wood	449	lf	5.00	2,200	adj per scrub email
436.	Ceilings:					
437.	patch and paint	8,425	sf	15.00	126,400	TBD, including beams
438.	acoustic reflectors (allow 6psf), shaped	762	sf	120.00	91,400	adj per scrub email
440.	Walls:					
441.	patch and paint	5,842	sf	25.00	146,100	TBD
442.	acoustic wall panels	440	sf	40.00	17,600	back wall
444.	Performance equipment accommodations	1	ls	25,000.00	25,000	allowance
	Balcony front					
447.	existing to remain				0	no work required
449.	**Lobby and public circulation**					
451.	Floors:					
452.	terrazzo / Axminster carpet - Balance of area	5,961	sf	25.00	149,000	
453.	Existing porcelain tile to remain; clean - Saengerhalle	479	sf	2.00	1,000	ETR
454.	Patch existing tile floor at Saengerhalle Lula	166	sf	50.00	8,300	
456.	Bases:					
457.	wood	1,788	lf	25.00	44,700	TBD

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
459.	Ceilings:					
460.	Acoustic plaster - Balance of area	5,961	sf	40.00	238,400	
461.	Exisiting to be painted - Saengerhalle	479	sf	4.00	1,900	ETR
463.	Walls:					
464.	paint drywall level 5 finish (patch exisiting partitions as needed)	21,165	sf	10.00	211,700	TBD
466.	Miscellaneous:					
467.	overlook railings	20	lf	400.00	8,000	TBD
469.	**Sound and light locks**					
471.	Floors:					
472.	Axminster carpet	210	sf	15.00	3,200	
474.	Bases:					
475.	wood	102	lf	25.00	2,600	
477.	Ceilings:					
478.	Suspended lay-in acoustical ceiling tiles, 2' x 2' exposed grid	210	sf	10.00	2,100	
480.	Walls:					
481.	acoustic wall panels	1,020	sf	40.00	40,800	
483.	**FOH Office**					
485.	Floors:					
486.	carpet	245	sf	5.00	1,200	
488.	Bases:					
489.	vinyl tile	64	lf	6.00	400	
491.	Ceilings:					
492.	Suspended lay-in acoustical ceiling tiles, 2' x 2' exposed grid	245	sf	10.00	2,500	
494.	Walls:					
495.	painted gyp level 5 finish	602	sf	4.00	2,400	
497.	**Ushers room**					
499.	Floors:					
500.	carpet	215	sf	5.00	1,100	
502.	Bases:					
503.	vinyl tile	60	lf	6.00	400	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
505.	Ceilings:					
506.	Suspended lay-in acoustical ceiling tiles, 2' x 2' exposed grid	215	sf	10.00	2,200	
508.	Walls:					
509.	painted gyp level 5 finish	636	sf	4.00	2,500	
511.	**Donor lounge**					
513.	Floors:					
514.	Axminster carpet	445	sf	15.00	6,700	
516.	Bases:					
517.	wood	91	lf	25.00	2,300	
519.	Ceilings:					
520.	acoustic plaster	445	sf	40.00	17,800	TBD
522.	Walls:					
523.	acoustic wall panels	1,001	sf	40.00	40,000	TBD
525.	**Bierstube**					
527.	Floors:					
528.	wood	975	sf	20.00	19,500	adj per scrub emial
530.	Bases:					
531.	wood	126	lf	25.00	3,200	adj per scrub emial
533.	Ceilings:					
534.	acoustic plaster	975	sf	40.00	39,000	TBD
536.	Walls:					
537.	acoustic wall panels	1,386	sf	40.00	55,400	TBD
539.	**Admin**					
541.	Floors:					
542.	carpet	750	sf	5.00	3,800	
544.	Bases:					
545.	vinyl tile	113	lf	6.00	700	
547.	Ceilings:					
548.	Suspended lay-in acoustical ceiling tiles	750	sf	10.00	7,500	
550.	Walls:					
551.	painted gyp level 5 finish	1,243	sf	4.00	5,000	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
553.	**Pantry**					
555.	Floors:					
556.	ceramic tile	150	sf	15.00	2,300	TBD
558.	Bases:					
559.	ceramic tile base	49	lf	20.00	1,000	TBD
561.	Ceilings:					
562.	Suspended lay-in acoustical ceiling tiles	150	sf	12.00	1,800	TBD
564.	Walls:					
565.	ceramic tile	519	sf	15.00	7,800	TBD
567.	**Concessions**					
569.	Floors:					
570.	porcelain tile	100	sf	15.00	1,500	
572.	Bases:					
573.	procelain tile	45	lf	18.00	800	
575.	Ceilings:					
576.	acoustic plaster	125	sf	40.00	5,000	
578.	Walls:					
579.	painted gyp level 5 finish	423	sf	4.00	1,700	
581.	**Concierge**					
583.	Floors:					
584.	terrazzo / Axminster carpet	100	sf	25.00	2,500	
586.	Bases:					
587.	wood	40	lf	25.00	1,000	
589.	Ceilings:					
590.	acoustic plaster	100	sf	40.00	4,000	
592.	Walls:					
593.	painted gyp level 5 finish	376	sf	4.00	1,500	
595.	**Public restrooms**					
597.	Floors:					
598.	porcelain tile	1,423	sf	20.00	28,500	
600.	Bases:					

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
601.	porcelain tile base	465	lf	25.00	11,600	
603.	Ceilings:					
604.	Suspended lay-in acoustical ceiling tiles	1,423	sf	12.00	17,100	TBD
606.	Walls:					
607.	painted gyp level 5 finish	2,232	sf	4.00	8,900	
608.	ceramic tile	1,488	sf	15.00	22,300	
609.	Additional mineral acoustic batts, per acoustician narrative	1	ls	5,000.00	5,000	allowance
611.	Toilet partitions:					
612.	standard, solid phenolic	18	ea	2,250.00	40,500	
613.	ADA, solid phenolic	3	ea	2,750.00	8,300	
615.	Glass and Mirrors:					
616.	restroom mirrors	6	ea	3,000.00	18,000	
617.	ADA restroom mirrors	4	ea	2,000.00	8,000	
619.	Toilet accessories	40	ea	850.00	34,000	
621.	Millwork:					
622.	surface countertop	1	ls	30,000.00	30,000	allowance
624.	Miscellaneous FF&E	1	ls	25,000.00	25,000	allowance
627.	***Total for Section C3.1 Public & Performance Spaces***				***$2,591,000***	
630.	***C3.2 Non-Public Spaces***					
632.	Floors:					
633.	carpet	2,875	sf	5.00	14,400	
634.	ceramic tile	2,811	sf	15.00	42,200	
635.	epoxy coating	775	sf	5.00	3,900	
636.	luxury vinyl tile	7,320	sf	7.00	51,200	
637.	none	500	sf	0.00	0	inaccessible rooms
638.	sealed concrete	3,365	sf	2.00	6,700	
639.	sprung floor, luxury vinyl tile finish	1,905	sf	45.00	85,700	rehearsal rooms
641.	Bases:					
642.	ceramic tile base	951	lf	20.00	19,000	
643.	none	1,385	lf	0.00	0	
644.	vinyl tile	2,801	lf	6.00	16,800	
646.	Walls:					
647.	articulated wood wall diffusion and absorptive panels	1,797	sf	50.00	89,800	rehearsal rooms
648.	acoustic wall panels	5,060	sf	40.00	202,400	noise sensitive rooms
649.	ceramic tile	1,076	sf	17.00	18,300	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
650.	painted gyp level 4 finish	41,803	sf	2.00	83,600	
652.	Ceilings:					
653.	suspended lay-in acoustical ceiling tiles	19,136	sf	10.00	191,400	
655.	Millwork:					
656.	concession	1	ls	5,000.00	5,000	allowance
657.	dressing rooms and green room	1	ls	8,000.00	8,000	allowance
658.	control room - counter	1	ls	8,400.00	8,400	allowance
659.	catering - stainless steel tables & racks				0	by owner
661.	Toilet partitions:					
662.	standard, solid phenolic	12	ea	2,250.00	27,000	
663.	ADA, solid phenolic	2	ea	2,750.00	5,500	
665.	Toilet accessories	25	ea	850.00	21,300	
667.	Glass and Mirrors:					
668.	restroom mirrors	6	ea	3,000.00	18,000	
669.	ADA restroom mirrors	2	ea	2,000.00	4,000	
670.	dressing room mirrors	3	ea	3,500.00	10,500	
671.	Control room window				0	excluded
673.	Window treatment, roller shades	259	lf	150.00	38,900	
675.	Interior signage - wayfinding/code required	1	ls	5,000.00	5,000	allowance
676.	Donor signage	1	ls	50,000.00	50,000	allowance
679.	***Total for Section C3.1 Public & Performance Spaces***				***$1,027,000***	

D MECHANICAL & ELECTRICAL SERVICES

D1 Mechanical

686.	***D1.1 Plumbing & Drainage***					
688.	***D1.11 - Plumbing Fixtures***				**242,800**	
690.	CSA listed, water conserving, commercial quality plumbing fixtures and fittings will be provided including:					
691.	- Water Closets: white vitreous china, wall mounted with top spud Flush valve	35	ea	1,500.00	52,500	
692.	- Lavatories vitreous china, undercounter type. Faucets will be	32	ea	1,500.00	48,000	
693.	- Shower basin and valves	6	ea	2,500.00	15,000	
694.	- Laundry sink stainless steel double compartment	1	ea	1,500.00	1,500	
695.	- Kitchenette stainless steel double compartment	1	ea	1,500.00	1,500	
696.	- Janitor mop basins in custodial closets (assume 1 for each floor)	3	ea	1,500.00	4,500	
697.	- Eyewash stations - assume one is each Janitorial room	3	ea	2,000.00	6,000	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
698.	- Electric Water Coolers: Two level, wall mounted, ADA compliant,	6	ea	3,000.00	18,000	
699.	- Additional fixtures like utility sinks and dressing room sinks	6	ea	1,500.00	9,000	
701.	Rough-ins for above fixtures	93	ea	750.00	69,800	
703.	Rough-ins to Catering	1	ea	5,000.00	5,000	
705.	Rough-ins for Bierstube	1	ea	10,000.00	10,000	
707.	Rough-ins for Laundry (2 dryers + 2 washing machine)	1	ea	2,000.00	2,000	
710.	***D1.12 - Domestic Water***				**335,300**	
712.	Domestic cold water is extended from the incoming water service to the building with central water meter and backflow preventer assembly, to fixtures and fittings throughout, as well as mechanical cooling systems make-up and general interior and exterior hose bibb coverage. All domestic cold water is thermally insulated. Booster pump is included.					
713.	- Water meter on incoming domestic water service c/w BFP	1	ea	20,000.00	20,000	
714.	- Domestic water packaged booster assembly	1	ea	25,000.00	25,000	
715.	- Welded steel break tank c/w solenoid valve arrangement 1,000 gallons	1	ea	20,000.00	20,000	
716.	- Gas fired domestic hot water heaters equal to A.O.Smith model BTH-150(A)	2	ea	20,000.00	40,000	
717.	- Recirculation pumps and expansion controls tanks	1	ea	5,000.00	5,000	
718.		1	ea	5,000.00	5,000	
	- Make-up water assemblies c/w water sub-meters & backflow preventers to HVAC systems					
719.	- Above grade domestic water copper type L piping c/w fittings & supports	3,000	lf	55.00	165,000	
720.	- Thermal insulation to above piping	3,000	lf	8.00	24,000	
721.	- Isolation, check and specialties	1	ea	10,000.00	10,000	
722.	- Trap seal primers - electronics	5	ea	2,000.00	10,000	
723.	- Thermostatic mixing valve assembly	1	ea	3,500.00	3,500	
724.	- Interior hosebibbs	10	ea	250.00	2,500	
725.	- Non-freeze hosebibbs	5	ea	550.00	2,800	
726.	- Miscellaneous items - drain valves, shock absorbers, water hammer arrestors	1	ea	2,500.00	2,500	
729.	***D1.13 - Sanitary Waste & Vent***				**212,600**	
731.	Provisional sum allowance for a complete system of sanitary waste and vent collection provided to serve plumbing fixtures, floor drains and equipment throughout the building. Condensate drainage is also provided to serve HVAC equipment piped to floor / hub drains throughout. Service connects to site sanitary sewer. Grease interceptor is included for kitchen catering area.					
732.	- Connect to outgoing storm sewer c/w cleanout	1	ea	2,000.00	2,000	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
733.	- Below grade PVC sanitary piping c/w joints, fittings	600	lf	40.00	24,000	
734.	- Trenching, bedding and backfill	600	lf	15.00	9,000	
735.	- Above grade cast iron sanitary piping c/w joints, fittings & supports	1,200	lf	65.00	78,000	
736.	- Above grade copper DWV or cast iron vent pipes c/w fittings & supports	1	ea	55,500.00	55,500	
737.	- Grease interceptor serving the Catering Kitchen			Not required		
738.	- Submersible pumps to serve elevator c/w alarm controls & floats	3	ea	5,000.00	15,000	
739.	- Floor drains and trap assemblies	30	ea	550.00	16,500	
740.	- Cleanout and line items	36	ea	350.00	12,600	
743.	***D1.14 - Storm***				**264,500**	
745.	Allowance for complete Primary and Secondary roof drainage system with interior leaders consisting of roof drains, terrace drains and areaway drains. including connection to outgoing site storm sewer service, below & above grade piping with joints, fittings and supports, cleanouts and line items.	40,685	sf	6.50	264,500	
748.	***D1.15 - Natural Gas***				**39,200**	
750.	A complete system of natural gas is provided to serve hot water boilers and domestic hot water heaters. Piping is extended from PRV / meters (allowance included in site utilities) to equipment throughout.	40,685	sf	0.35	14,200	
752.	Allowance to include a separate gas line for outdoor Generator including PRV, excavation, trenching, bedding and backfilling	1	ea	25,000.00	25,000	
874.	***D1.17 - Miscellaneous Works and General Accounts***				**219,000**	
876.	Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings	1	ea	219,000.00	219,000	
879.	***Total for Section D1.1 Plumbing & Drainage***				***$1,313,400***	

882.	***D1.2 Fire Protection***					
884.	***D1.21 - Standpipe***				**40,700**	
886.	Standpipe protection system c/w distribution mains and firehose cabinets are to be located in egress stairs as required to provide coverage in accordance with NFPA 14.	40,685	sf	1.00	40,700	
889.	***D1.22 - Sprinklers***				**348,400**	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
891.	Incoming firewater service c/w DCVA backflow preventor 6" dia.	1	ea	15,000.00	15,000	
893.	Centrifugal Fire pump (1000gpm@150Psi (125HP) c/w jockey pump and controller	1	ea	75,000.00	75,000	
895.	Fire pump header on building exterior c/w flow meter	1	ea	10,000.00	10,000	
897.	Fire department siamese connection.	1	ea	5,000.00	5,000	
899.	Allowance for a complete wet sprinkler system to ordinary hazard NFPA 13 standards consisting of supervised valve & alarm check valve assembly, sch.40 black steel piping c/w joints, fittings, supports, drops and/or sprigs, & upright/concealed sprinkler heads will be provided. Zone valves shall be provided at each level.	40,685	sf	5.00	203,400	
901.	Fire break tank, welded steel tank 2,500 gallons	1	ea	40,000.00	40,000	
904.	***D1.23 - Specialty Systems***				**0**	
906.	No work required			Info only		
909.	***D1.24 - Fire Extinguisher***				**2,500**	
911.	Individual fire extinguishers are provided to meet local codes and NFPA regulations. Extinguishers will be surface mounted in secondary areas and in cabinets in common (public) areas.	10	ea	250.00	2,500	
914.	***D1.25 - Miscellaneous Works and General Accounts***				**0**	
916.	Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings				Included above	
919.	***Total for Section D1.2 Fire Protection***				***$391,600***	

923.	***D1.3 Heating, Vent, Air Cond***					
925.	***D1.31 - Liquid Heat Transfer (Heating)***				**450,700**	
927.	Condensing type boiler - natural gas fired heating water boiler feeding heating water equal to Lochinvar Crest FCB1000N c/w chimney vent kit, acid neutralizer and drain, factory mounted disconnect and starters, BACNET control interface and accessories; Capacity 1,000 MBH output each	2	ea	40,000.00	80,000	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
929.	Boiler flue vents. Individual discharge vent pipes from each boiler, or a common flue for all boilers, will discharge above the roof, and terminate with a vent cap	2	ea	5,000.00	10,000	
931.	Heating water boiler pumps constant speed at each boiler injecting water into a secondary loop.	2	ea	5,000.00	10,000	
933.	Heating water pumps -variable speed horizontal end-suction pumps 60 GPM at 100' head, 5 HP, variable speed drives, located in the Lambert third floor pump room. Basis of Design is Xylem e-1510 1.5BC.	2	ea	14,000.00	28,000	
935.	Plant appurtenances such as air separator, automatic make-up water with backflow preventor, bladder tank and chemical pot feeder serving the heating water loop.	1	ea	25,000.00	25,000	
937.	Heating water distribution piping, Sch.40 black steel c/w insulation, f	40,685	sf	4.00	162,700	
939.	Shut down / isolation valving and accessories	1	ea	10,000.00	10,000	
941.	Hook-up connection assemblies:					
942.	- Boilers	2	ea	6,000.00	12,000	
943.	- Heating water circulating Pumps	2	ea	6,000.00	12,000	
944.	- Boiler pumps	2	ea	4,000.00	8,000	
945.	- Heating water plant appurtenances	1	ea	5,000.00	5,000	
946.	- VAV's with hot water reheat coils	38	ea	1,500.00	57,000	
947.	- Unit heaters	2	ea	1,500.00	3,000	
948.	- Air handling units	3	ea	6,000.00	18,000	
949.	- DOAS including heat tracing and weatherproof insulation	1	ea	10,000.00	10,000	
952.	***D1.32 - Liquid Heat Transfer (Cooling)***				**523,700**	
954.	Air-cooled chillers equal to Carrier model 30RB located on connector roof - 2x110Tons	2	ea	143,000.00	286,000	
956.	Variable primary horizontal end-suction pumps, 220 GPM at 110' head, 10HP, variable speed drives, located in the Lambert third floor pump room. Basis of Design is Xylem e-1510 2EB	2	ea	15,000.00	30,000	
958.	Plant appurtenances such as air separator, automatic make-up water with backflow preventor, bladder tank and chemical pot feeder serving the chilled water loop.	1	ea	25,000.00	25,000	
960.	Chilled water piping, Sch.40 black steel c/w fittings, supports and thermal insulation	40,685	sf	2.50	101,700	
962.	Shut down / isolation valving and accessories	1	ea	10,000.00	10,000	
964.	Hook-up connection assemblies:					
965.	- Chiller	2	ea	12,000.00	24,000	
966.	- Chilled water pumps	2	ea	10,000.00	20,000	
967.	- Chilled water plant appurtenances	1	ea	5,000.00	5,000	
968.	- Air handling units	2	ea	6,000.00	12,000	
969.	- DOAS including heat tracing and weatherproof insulation	1	ea	10,000.00	10,000	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
976.	***D1.34 - Air Distribution***				**1,991,800**	
978.	Equipment					
980.	AHU-1 serves Lambert front of house and is located in a mechanical room in the Lambert basement. It is designed to move 2,300 CFM with a 3HP fan on a variable speed drive. It will operate as a cooling-only VAV unit delivering air through 4" pressure class ductwork to (5) zones of control. Each zone of control will have a pressure-independent terminal unit with hydronic reheat control, and a space temperature sensor. Equal to Trane.	1	ea	30,000.00	30,000	
982.	AHU-2 serves Lambert house and is located on the connector roof. It is designed to move 15,000 CFM with a 15HP fan on a variable speed drive. It will operate as a single zone VAV unit, delivering air through low speed ductwork to high diffusers in the Lambert house and stage areas, and return air through the low seating, the four corners of the house, and through the wings of the stage. It will have a cooling coil with a hydronic reheat coil. Equal to Trane.	1	ea	150,000.00	150,000	
984.	AHU-3 serves most of the connector and the back of house spaces, and it is located in a mechanical room on the 2nd floor of the connector. It is designed to move 19,000 CFM with a 20HP fan on a variable speed drive. It will operate as a cooling-only VAV unit delivering air through 4" pressure class ductwork to (33) zones of control. Each zone of control will have a pressure-independent terminal unit with hydronic reheat control, and a space temperature sensor. Equal to Trane.	1	ea	190,000.00	190,000	
986.	AHU-4 serves Saengerhalle house and is located in a mechanical room in the Saengerhalle 2nd floor back of house. It is designed to move 8,000 CFM with a 10HP fan on a variable speed drive. It will operate as a single zone VAV unit, delivering air through low speed ductwork to high diffusers in the Saengerhalle house and stage platform, and return air through the corners of the house and stage. It will have a cooling coil with a hydronic reheat coil. Equal to Trane.	1	ea	80,000.00	80,000	
988.	AHU-5 services Saengerhalle front of house and balcony and is located in a mechanical room in the Saengerhalle 2nd floor front of house. It is designed to move 1,600 CFM with a 2HP fan on a variable speed drive. It will operate as a single zone VAV unit, delivering air through low speed ductwork to the balcony and front lobby areas and returning air through sidewall grilles. It will have a cooling coil with a hydronic reheat coil. Equal to Trane.	1	ea	32,000.00	32,000	

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990.	Single outside air pretreatment unit to provide outside air. Units is provided with a heat wheel designed to provide energy exchange between 4,600 CFM of outside air and 3,100 CFM of exhaust and relief air. Supply and exhaust fans will be plug fans with variable speed drives. The heat wheel will be total enthalpy 3 angstrom molecular sieve. The outside airstream is provided with a preheat	1	ea	160,000.00	160,000	
992.	Split systems to serve electric rooms, elevator machine rooms (if applicable), and data/IT closets. Split systems shall be LG model Multi V S.	3	ea	10,000.00	30,000	
994.	Unit heaters in unconditioned areas.	2	ea	2,500.00	5,000	
996.	Ductwork & Ductwork Devices					
998.	AHU-1 serves Lambert front of house - 2,300 CFM					
999.	- VAV Boxes with reheat coils	5	ea	1,500.00	7,500	
1000.	- Galvanized steel sheet metal distribution ductwork as per SMACNA standards	2,300	lbs	15.00	34,500	
1001.	- Acoustic duct lining (Linacoustic R300) / thermal insulation for abov	2,000	sf	5.50	11,000	
1002.	- Supply and return air terminals including linear grilles and diffusers.	2,300	cfm	3.00	6,900	
1003.	- Ductwork components such as dampers, turning vanes and access doors	1	ea	3,000.00	3,000	
1005.	AHU-2 serves Lambert house - 15,000 CFM					
1006.	- Galvanized steel sheet metal distribution ductwork as per SMACNA standards	15,000	lbs	15.00	225,000	
1007.	- Acoustic duct lining (Linacoustic R300) / thermal insulation for abov	12,800	sf	5.50	70,400	
1008.	- Supply and return air terminals including linear grilles and diffusers.	15,000	cfm	4.00	60,000	
1009.	- Ductwork components such as dampers, turning vanes and access doors	1	ea	18,000.00	18,000	
1011.	AHU-3 serves most of the connector and the back of house spaces - 19,000 CFM					
1012.	- VAV Boxes with reheat coils	33	ea	1,500.00	49,500	
1013.	- Galvanized steel sheet metal distribution ductwork as per SMACNA standards	19,000	lbs	15.00	285,000	
1014.	- Acoustic duct lining (Linacoustic R300) / thermal insulation for abov	16,200	sf	5.50	89,100	
1015.	- Supply and return air terminals including linear grilles and diffusers.	19,000	cfm	3.00	57,000	
1016.	- Ductwork components such as dampers, turning vanes and access doors	1	ea	22,000.00	22,000	
1018.	AHU-4 serves Saengerhalle house - 8,000 CFM					
1019.	- Galvanized steel sheet metal distribution ductwork as per SMACNA standards	8,000	lbs	15.00	120,000	
1020.	- Acoustic duct lining (Linacoustic R300) / thermal insulation for abov	6,800	sf	5.50	37,400	
1021.	- Supply and return air terminals including linear grilles and diffusers.	8,000	cfm	4.00	32,000	
1022.	- Ductwork components such as dampers, turning vanes and access doors	1	ea	9,000.00	9,000	
1024.	AHU-5 serves Saengerhalle front of house - 1,600 CFM					
1025.	- Galvanized steel sheet metal distribution ductwork as per SMACNA standards	1,600	lbs	15.00	24,000	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1026.	- Acoustic duct lining (Linacoustic R300) / thermal insulation for abov	1,400	sf	5.50	7,700	
1027.	- Supply and return air terminals including linear grilles and diffusers.	1,600	cfm	3.00	4,800	
1028.	- Ductwork components such as dampers, turning vanes and access doors	1	ea	2,000.00	2,000	
1030.	DOAS - Pre-treatment unit - 4,600 CFM					
1031.	- Pressure independent terminal units - supply to AHUs	5	ea	1,500.00	7,500	
1032.	- Pressure independent terminal units - Exhaust from washrooms	30	ea	1,000.00	30,000	
1033.	- Galvanized steel metal distribution ductwork as per SMACNA stand	5,000	lbs	15.00	75,000	
1034.	- Thermal insulation / acoustic lining for above ductwork	4,300	sf	5.00	21,500	
1035.	- Ductwork components such as dampers, turning vanes and access doors	1	ea	5,000.00	5,000	
1038.	***D1.35 - Exhaust Systems***				**91,400**	
1040.	Central washroom exhaust system with roof mounted exhaust fan, exhaust sheetmetal ductwork and grilles. Exhaust air is exhausted via a heat reclaim device. Kitchenette's are ducted to general exhaust. Mechanical and electrical rooms are provided with inline exhaust fan, intake and exhaust louvers, exhaust sheetmetal ductworks and grilles.	40,685	sf	2.00	81,400	
1042.	Allowance for catering kitchen exhaust. Non NFPA rate type.	1	ea	10,000.00	10,000	
1050.	***D1.37 - Support Systems and Works***					
1052.	***D1.37.1 - Noise and Vibration Isolation***				**32,100**	
1054.	Vibration isolators and ductwork silencers are provided to ensure quiet operation and to ensure noise levels from operation do not exceed desired limits. Approved manufacturers: Mason,	91,800	cfm	0.35	32,100	
1057.	***D1.37.2 - Mechanical Wiring and Starters***				**20,000**	
1059.	VFD's and motor starters. Installation, MCC's and Line and Load side wiring by Electrical Contractor	1	ea	20,000.00	20,000	
1062.	***D1.37.3 - Balancing and Commissioning***				**101,800**	
1064.	Balancing of air and fluid rates and setting of major equipment conditions to the air distribution systems c/w report	40,685	sf	1.25	50,900	
1066.	Commissioning of systems (support to third party commissioning agent) (manufacturers start-up of equipment included in equipment costs).	40,685	sf	1.25	50,900	
1069.	***D1.37.4 - Smoke Exhaust***				**0**	

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1071.	Heat actuated vented system for the stage by G.C. elsewhere in this estimate			Info only		
1078.	***D1.37.6 - LEED / Sustainability***				**0**	
1080.	Premium for LEED Gold / sustainable design initiatives compliance			Not required		
1087.	***D1.37.8 - Acoustic Treatments***				**40,700**	
1089.	Provision for duct lagging, vinyl wrap, sound traps and the like for	40,685	sf	1.00	40,700	
1096.	***D1.37.10 - Generator Support***				**0**	
1098.	No work required - Genset located outside.					
1106.	***D1.37.12 - Humidification***				**30,000**	
1108.	Wall mounted humidifier for AHU-3. Two piano storage rooms will also have a wall-mounted humidifier; Basis of Design is Dristeem Vapormist VM2.	2	ea	15,000.00	30,000	
1153.	***D1.38 - Miscellaneous Works and General Accounts***				**656,000**	
1155.	Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D co-ordination drawings	1	ea	656,000.00	656,000	
1158.	***Total for Section D1.3 Heating, Vent, Air Cond***				***$3,938,200***	
1161.	***D1.4 Controls***					
1163.	***D1.41 - Controls and Automation***				**605,000**	
1165.	Nat					
1166.	- Head end workstation	1	ea	20,000.00	20,000	
1167.	- AHU's	5	ea	30,000.00	150,000	
1168.	- Dedicated Air handling unit (DOAS)	1	ea	35,000.00	35,000	
1169.	- Split systems	3	ea	3,000.00	9,000	
1170.	- VAV's with hot water reheat coils	38	ea	3,500.00	133,000	
1171.	- Pressure independent terminal units (VAV's)	35	ea	3,000.00	105,000	
1172.	- Humidifiers	2	ea	4,000.00	8,000	
1173.	- Unit heaters	2	ea	3,000.00	6,000	
1174.	- Boilers	2	ea	5,000.00	10,000	
1175.	- Heating pumps	2	ea	6,000.00	12,000	
1176.	- Boiler pumps	2	ea	4,000.00	8,000	
1177.	- Heating water plant appurtenances	1	ea	3,000.00	3,000	
1178.	- Chillers	2	ea	8,000.00	16,000	

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1179.	- Chilled water pumps	2	ea	6,000.00	12,000	
1180.	- Chilled water plant appurtenances	1	ea	3,000.00	3,000	
1181.	- Motorized dampers	1	ea	15,000.00	15,000	
1182.	- Exhaust fans	1	ea	10,000.00	10,000	
1183.	- Miscellaneous plumbing equipment	1	ea	5,000.00	5,000	
1184.	- Miscellaneous electrical equipment	1	ea	10,000.00	10,000	
1185.	- Demand control ventilation / C02 sensors for all spaces	10	ea	3,500.00	35,000	
1188.	***D1.42 - Miscellaneous Works and General Accounts***				**0**	
1190.	Supervision, site office, head office overheads, submittals, clean up, small tools, rentals and the like, rigging and preparation of 3D				Included in above rates	
1193.	***Total for Section D1.4 Controls***				***$605,000***	

D2 Electrical

1198.	***D2.1 Services & Distribution***					
1200.	***D2.11 - L.V. Switchboard***				**201,400**	
1202.	1600A 277/480V main switchboard c/w main and feeder breakers	1	ea	199,700.00	199,700	
1204.	Utility meter cabinet	1	ea	1,700.00	1,700	
1207.	***D2.12 - Emergency Power***				**282,000**	
1209.	250kW diesel generator in a sound attenuated W/P enclosure located in the site with a fuel storage, critical grade muffler, etc…	1	ea	184,000.00	184,000	
1211.	200A 277/480V temporary generator connection point	1	ea	11,800.00	11,800	
1213.	200A 277/480V service entrance rated wireway	1	ea	5,700.00	5,700	
1215.	100A 480V 3P enclosed circuit breaker	2	ea	2,500.00	5,000	
1217.	225A 277/480V ATS-F c/w bypass feature - INCLUDED IN FIRE PUMP PACKAGE				Info Only	
1219.	100A 277/480V ATS-E c/w bypass feature	1	ea	22,100.00	22,100	
1221.	100A 277/480V ATS-O c/w bypass feature	1	ea	22,100.00	22,100	
1223.	100A 277/480V 42 cct power panel EHA c/w main breaker and SPD	1	ea	6,000.00	6,000	
1225.	100A 277/480V 42 cct power panel OHA c/w main breaker and SPD	1	ea	6,000.00	6,000	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1227.	30kVA 480 to 120/208V transformer OTA	1	ea	2,200.00	2,200	
1229.	15kVA 480 to 120/208V transformer ETA	1	ea	1,600.00	1,600	
1231.	100A 120/208V 42 cct power panel OLA c/w main breaker and SPD	1	ea	4,900.00	4,900	
1233.	50A 120/208V 42 cct power panel ELA c/w main breaker and SPD	1	ea	4,000.00	4,000	
1235.	125A 480V 3P power connection with line and load side wiring for fire pump	1	ea	4,900.00	4,900	
1237.	Metering point	1	ea	1,700.00	1,700	
1240.	***D2.13 - Distribution***				**198,300**	
1242.	225A 277/480V 42 cct power panel HA1 c/w main breaker and SPD	1	ea	6,900.00	6,900	
1244.	225A 277/480V 42 cct power panel HA2 c/w main breaker and SPD	1	ea	6,900.00	6,900	
1246.	150A 277/480V 42 cct power panel MA1 c/w main breaker and SPD	1	ea	6,100.00	6,100	
1248.	150A 277/480V 42 cct power panel MA2 c/w main breaker and SPD	1	ea	6,100.00	6,100	
1250.	225kVA 480 to 120/208V transformer PL-1 (HMT rated)	1	ea	17,200.00	17,200	
1252.	75kVA 480 to 120/208V transformer TAV (HMT rated)	1	ea	7,700.00	7,700	
1254.	75kVA 480 to 120/208V transformer TA1	1	ea	6,300.00	6,300	
1256.	75kVA 480 to 120/208V transformer TA2	1	ea	6,300.00	6,300	
1258.	30kVA 480 to 120/208V transformer TC (HMT rated)	1	ea	4,500.00	4,500	
1260.	800A 120/208V distribution breaker TDP c/w main breaker and SPD	1	ea	30,700.00	30,700	
1262.	250A 120/208V 84 cct double tub power panel LA1 c/w SPD	1	ea	10,400.00	10,400	
1264.	250A 120/208V 84 cct double tub power panel LA2 c/w SPD	1	ea	10,400.00	10,400	
1266.	250A 120/208V 42 cct power panel AV-1 c/w main breaker	1	ea	8,300.00	8,300	

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1268.	250A 120/208V 42 cct power panel AV-1A	1	ea	5,200.00	5,200	
1270.	200A 120/208V 48 cct lighting relay panel 1TLA c/w main breaker	1	ea	6,700.00	6,700	
1272.	200A 120/208V 48 cct lighting relay panel 1TLB c/w main breaker	1	ea	6,700.00	6,700	
1274.	100A 120/208V 24 cct power panel 1TLC c/w main breaker	1	ea	5,400.00	5,400	
1276.	100A 208V 3P enclosed circuit breaker	1	ea	1,700.00	1,700	
1278.	200A 120/208V company switch	1	ea	8,800.00	8,800	
1280.	100A 120/208V company switch	5	ea	7,200.00	36,000	
1283.	***D2.14 - Feeders***				**203,500**	
1285.	All life safety feeders will have a 2 hour fire rating, critical power feeders will be copper conductor with required ground and shall be installed in EMT conduit. Flexible conduit and cabling will be utilized for final connections to vibrating equipment.	40,685	sf	5.00	203,500	
1288.	***D2.15 - Motor Controls & Wiring***				**73,000**	
1290.	225A 480V 3P power connection with line and load side wiring including W/P disconnect switch for Chiller 1 and 2	2	ea	7,000.00	14,000	
1292.	The electrical division will install loose starters provided by the mechanical division and load and line side wiring for mechanical equipment. Final terminations to any vibrating equipment will be done using flexible conduit.	40,685	sf	1.45	59,000	
1295.	***D2.16 - Miscellaneous***				**38,150**	
1297.	A building grounding system to meet code requirements, and technical grounding system to meet the requirements of the production equipment shall be provided.	40,685	sf	0.40	16,300	
1299.	Allowance for arc-flash study, system fault current, and coordination	1	ls	15,000.00	15,000	
1301.	Disconnect and remove redundant electrical equipment	1	ls	6,850.00	6,850	

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1304.	***D2.17 - General Requirements***				**198,000**	
1306.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the like.	1	ls	198,000.00	198,000	
1309.	***Total for Section D2.1 Services & Distribution***				***$1,194,350***	
1312.	***D2.2 Lighting, Devices & Controls***					
1314.	***D2.21 - Lighting***				**979,470**	
1316.	General					
1318.	Lighting in the public areas are provide decorative ambient lighting achieved by the use of decorative recessed, wall mounted fixtures with energy efficient LED; lighting in the private room areas shall be provided by recessed direct / indirect fixtures. Lighting in storage, back of house and service areas shall be provided using standard suspended industrial LED fixtures.					
1320.	Exit lights and emergency lighting control are provide to meet code requirements. Emergency battery units with be provided in mechanical and electrical rooms.					
1322.	Supply and installation of LED fixtures within performance space	7,460	sf	43.95	327,870	
1324.	Supply and installation of LED fixtures within lobby	4,630	sf	37.05	171,540	
1326.	Supply and installation of LED fixtures within public circulation	2,800	sf	37.05	103,740	
1328.	Supply and installation of LED fixtures within balcony	2,105	sf	34.70	73,040	
1330.	Supply and installation of LED fixtures within bierstube area and concessions	1,100	sf	30.00	33,000	
1332.	Supply and installation of LED fixtures within dressing and rehearsal rooms	3,030	sf	18.50	56,060	
1334.	Supply and installation of LED fixtures within office/admin space and donor lounge	1,440	sf	16.20	23,320	
1336.	Supply and installation of LED fixtures within production space	870	sf	14.45	12,570	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1338.	Supply and installation of LED fixtures within washrooms	2,495	sf	11.60	28,940	
1340.	Supply and installation of LED fixtures within BOH space	5,180	sf	11.00	56,980	
1342.	Supply and installation of LED fixtures within service areas	6,365	sf	9.85	62,700	
1344.	Supply and installation of LED fixtures within basement	3,210	sf	9.25	29,710	
1347.	***D2.22 - Branch Devices & Wiring***				**235,980**	
1349.	General maintenance receptacles are provided throughout the facility. Receptacles for office, dressing rooms… will be provided to accommodate the specific usage of each area. 20A dimming circuits are provided in the performance areas to accommodate the production requirements. 50% of plug loads will be switched as per ASHREA 90.1 2013 requirements	40,685	sf	3.50	142,400	
1351.	A central programmable lighting control and dimming system for lighting control in the public areas are provided. Service and non public areas shall have lighting controlled by central LV switching and occupancy sensors.	40,685	sf	2.30	93,580	
1354.	***D2.23 - Heating***				**0**	
1356.	Electric heating is achieved by units supplied by the Mechanical. The electrical division will install, wire and terminate these unit (included above).				Info Only	
1359.	***D2.24 - General Requirements***				**243,000**	
1361.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the like.	1	ls	243,000.00	243,000	
1364.	***Total for Section D2.2 Lighting, Devices & Controls***				***$1,458,450***	

1367.	***D2.3 Systems & Ancillaries***					
1369.	***D2.31 - Fire Alarm System***				**195,300**	

	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1371.	Supply and installation of a complete addressable fire alarm system is provided in the facility to suit local code requirements. System will include central panel, annunciator, speakers/horns/strobes, heat/smoke detectors, pull stations... throughout.	40,685	sf	3.50	142,400	
1373.	Fire responders distributed antenna system	40,685	sf	1.30	52,900	
1375.	***D2.32 - Security System***				**91,500**	
1377.	The electrical division provides an infrastructure raceway system to accommodate security access and CCTV devices. It is assumed that this system will monitor exterior doors, provide access through security doors only and provide cameras to monitor the building perimeter only.	40,685	sf	2.25	91,500	
1379.	Supply, installation, and programming of security equipment - By OTHERS				Info Only	
1382.	***D2.33 - Communications***				**77,300**	
1384.	General					
1386.	The electrical division provide an infrastructure raceway system to accommodate a CAT 6 structured cabling system. Telephony, active hardware, and cabling will be provided By OTHERS.	40,685	sf	1.90	77,300	
1388.	Clock					
1390.	A clock system is not required. Time will be displayed by the information screens and/or PC devices.				Info Only	
1392.	***D2.34 - P.A. System***				**366,100**	
1394.	The electrical division provides a complete empty raceway infrastructure to accommodate a general paging system for non production paging throughout the facility. Supply and installation of Paging equipment included.	40,685	sf	1.50	61,000	
1396.	Audio/Visual - Performance					

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1398.	The electrical division provides a complete empty raceway infrastructure to accommodate the intercom, program audio/visual, assisted listening, integrated controls, portable equipment and performance lighting. A complete cable pass through system will provide routing for broadcast and recording cabling. The equipment costs are included in Architectural estimate. Supply and installation of performance lighting is by others	40,685	sf	7.50	305,100	
1401.	***D2.35 - Miscellaneous***				**0**	
1403.	Miscellaneous systems such as Night Delivery system, clocks, etc. are not required in the facility.				Info Only	
1405.	***D2.36 - General Requirements***				**146,000**	
1407.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the like.	1	ls	146,000.00	146,000	
1410.	***Total for Section D2.3 Systems & Ancillaries***				***$876,200***	

E EQUIPMENT

E1 Equipment

1416.	***E1.1 Performance Equipment & Seating (per Shalleck Collaborative narrative)***					
1418.	**Lambert Hall - Theatre**					
1419.	Rigging system	1	ls	200,000.00	200,000	
1420.	Onstage orchestra screens	1	ls	300,000.00	300,000	
1421.	Orchestra pit filler/stage extension platforms	1	ls	80,000.00	80,000	
1422.	Production lighting control	1	ls	140,000.00	140,000	
1423.	Fixed theatre seating	300	ea	650.00	195,000	
1424.	FF&E Systems:					
1425.	Stage draperies	1	ls	75,000.00	75,000	
1426.	Production lighting fixtures	1	ls	175,000.00	175,000	
1427.	Video wall, complete, installed	1	ls	250,000.00	250,000	adj per scrub email
1429.	**Sanctuary Building**					
1430.	Variable acoustics, motorized banners	1	ls	100,000.00	100,000	
1431.	Stage extension platforms	1	ls	25,000.00	25,000	
1432.	Production lighting control	1	ls	100,000.00	100,000	
1433.	Piano lift	1	ls	20,000.00	20,000	added per scrub email
1434.	- premium to install 3' deep lift pit in existing slab	1	ls	50,000.00	50,000	added per scrub email
1435.	FF&E Systems:					
1436.	Production lighting fixtures	1	ls	50,000.00	50,000	adj per scrub email
1439.	***Total for Section E1.1 Performance Equipment & Seating***				***$1,760,000***	

	Description	*Preliminary Design Estimate - FINAL* Quantity	Unt	Rate	Amount	*Remarks*
1441.	***E1.2 AV Equipment (per Shalleck Collaborative narrative)***					
1443.	**Lambert Hall - Theatre**					
1444.	Production A/V system	1	ls	450,000.00	450,000	
1445.	FF&E Systems:					
1446.	Portable A/V equipment	1	ls	50,000.00	50,000	adj per scrub email
1448.	**Sanctuary Building**					
1449.	Production A/V systems	1	ls	250,000.00	250,000	
1450.	FF&E Systems:					
1451.	Portable A/V equipment	1	ls	25,000.00	25,000	
1453.	**Balance of Spaces**					
1454.	Rehearsal room - medium	1	ls	30,000.00	30,000	
1455.	Rehearsal/Warm-up rooms	4	ea	15,000.00	60,000	
1456.	Conference room	1	ls	10,000.00	10,000	
1457.	Donor lounge	1	ls	10,000.00	10,000	
1458.	Lobby/Digital signage	3	ea	5,000.00	15,000	
1461.	***Total for Section E1.2 AV Equipment***				***$900,000***	

E2 Miscellaneous Equipment

1465.	***E2.1 Miscellaneous Equipment***					
1467.	Food service equipment	1	ls	25,000.00	25,000	allowance
1470.	***Total for Section E2.1 Miscellaneous Equipment***				***$25,000***	

F DEMOLITION & TEMPORARY CONSTRUCTION

F1 Demolition & Temporary Construction

1477.	***F1.1 Demolition***					
1479.	Demo entire addition, 30' high, two levels (no basement)	5,680	sf	16.00	90,900	adj per scrub email
1480.	Demo stage from reconstruction/reconfiguration incl limited pews	610	sf	5.00	3,100	
1481.	Demo stairs for relocation or removal (per flight)	4	ea	1,000.00	4,000	
1482.	Major gut, ground level, retain structural perimeter walls	7,060	sf	14.00	98,800	
1483.	Major gut, lower level, retain structural perimeter walls	5,253	sf	14.00	73,500	
1484.	Major gut, second level, retain structural perimeter walls	3,986	sf	14.00	55,800	
1485.	Remove and prep for infill door opening lower level	42	sf	5.00	200	
1486.	Remove and prep for infill punched windows balance of walls	140	sf	5.00	700	
1487.	Remove and prep for infill punched windows lower level	85	sf	5.00	400	
1488.	Remove and prep for infill punched windows west face	383	sf	5.00	1,900	

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1489.	Remove and prep for infill stained glass window	164	sf	50.00	8,200	window to be handed over to owner
1490.	Remove brick clad wall /prep for new addition at ground & upper level, clean brick for reuse on east and south face	1,235	sf	20.00	24,700	
1491.	Remove brick clad wall /prep for new addition at ground level, clean brick for reuse on east and south face	575	sf	20.00	11,500	
1492.	Remove brick cladding/prep for new addition at lower level, clean brick for reuse on east and south face	573	sf	20.00	11,500	
1496.	***Total for Section F1.1 Demolition***				***$385,200***	
1499.	***F1.2 Temporary Construction***					
	Temporary protection/coverings	1	ls	25,000.00	25,000	
1504.	***Total for Section F1.2 Temporary Construction***				***$25,000***	

G GENERAL REQUIREMENTS

1508.	***G1.1 Equipment & Rentals***					
1510.	Cranage and hoisting	1	ls	100,000.00	100,000	
1512.	Specialty scaffolding					
1513.	- theater	1	ls	30,000.00	30,000	
1514.	- lobby				0	assume not required
1518.	***Total for Section G1.1 Equipment & Rentals***				***$130,000***	
1520.	***G1.2 Project Overhead Items***					
1522.	Subguard	1	ls	430,000	430,000	1-1/2% allowance
1524.	Non-trade items:	1	ls	1,010,000	1,010,000	
1525.	- cleaning					
1526.	- sediment control					in site
1527.	- construction fence					in site
1528.	- dust control fencing					
1529.	- temporary roads					in site
1530.	- street cleaning					in site
1531.	- temporary heating/cooling					
1532.	- temporary protection of finishes					
1534.	Mockups	1	ls	100,000.00	100,000	TBD
1537.	***Total for Section G1.2 Project Overhead Items***				***$1,540,000***	

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	H SITEWORKS & UTILITIES					
1541.	**H1.1 Siteworks**					
1543.	***Site Prep***				**30,000**	
1545.	Site clearance, erosion control and sedimentation control	1	ls	30,000.00	30,000	
1547.	***Site Demolition***				**79,700**	
1549.	Remove pedestrian conc	214	sf	5.00	1,100	
1551.	Remove conc stair 6'-0'' w 6 rsrs	1	ea	1,500.00	1,500	
1553.	Remove conc stair, landing, ramps, knee walls	1	ls	10,000.00	10,000	allowance
1555.	Remove retaining wall at stair	22	lf	50.00	1,100	
1557.	Remove wood ramp	131	sf	5.00	700	
1559.	Remove trees courtyard	3	ea	2,500.00	7,500	
1561.	Remove canopy	1,600	sf	8.00	12,800	
1563.	Site demolition balance (mixture of hardscape & softscape)	1	ls	45,000.00	45,000	allowance
1565.	***Earthworks***				**11,200**	
1567.	Cut and haul				0	
1569.	Imported, compacted fill	39	cy	57.00	2,200	
1571.	Site grading and balance	1	ls	9,000.00	9,000	
1573.	***Paving/Curbing***				**191,400**	
1575.	50% cip sidewalk, 50% decorative pavers	6,194	sf	19.50	120,800	
1577.	Cip sidewalk	76	sf	8.50	600	
1579.	Gravel at service yard	551	sf	2.00	1,100	
1581.	Re-pave/stripe at catering loading	939	sf	10.00	9,400	
1583.	Re-pave/stripe at west staff/valet parking	3,917	sf	10.00	39,200	
1585.	Re-pave/stripe at east staff/valet parking	1,028	sf	10.00	10,300	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1587.	Repairs to perimeter paving/landscaping	1	ls	10,000.00	10,000	allowance
1589.	***Retaining Walls***				**180,300**	
1591.	Knee walls:					
1592.	wall, brick veneer both sides, 2' wide	862	sf	126.00	108,600	
1593.	limestone cap to wall	142	lf	250.00	35,500	
1594.	foundation for knee wall	142	lf	255.00	36,200	
1596.	***Fencing and Gates***				**0**	
1598.	Perimeter security fencing				0	excluded
1600.	***Stairs, Ramps and Railings***				**164,500**	
1602.	Ada ramp, concrete	76	sf	15.00	1,100	
1604.	Bronze railing	33	lf	500.00	16,500	allowance
1606.	Stair, cip steps with limestone treads, 10ft w, 9 rsrs, bronze rail both sides	2	ea	35,000.00	70,000	
1608.	Stair, cip steps with limestone treads, 10ft w, 5 rsrs, bronze rail both sides	2	ea	20,000.00	40,000	
1610.	Cip landing/porch with decorative pavers	893	sf	30.00	26,800	
1612.	Cip conc stair 6 rsrs, 4' w, galv rails	1	ea	6,500.00	6,500	
1614.	Cip landing	20	sf	8.50	200	
1616.	Galvanized railing	9	lf	375.00	3,400	allowance
1618.	***Landscaping***				**101,600**	
1620.	Tree protection, root pruning, etc.	1	ls	10,000.00	10,000	allowance
1622.	Sod for central turf for seating/events area	2,607	sf	0.75	2,000	
1623.	- premium for reinforced turf					excluded
1625.	Xeriscape, drought resistant, and native landscape plantings	6,617	sf	10.00	66,200	allowance
1627.	Topsoil assuming 6" depth	159	cy	85.00	13,500	
1629.	Planting mix				0	excluded
1631.	Mulch	6,617	sf	1.50	9,900	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1633.	***Miscellaneous***				**368,300**	
1635.	*Screen Wall at Utility Yard*					
1636.	8'' cmu screen wall with brick veneer one side	401	sf	40.00	16,000	
1637.	foundation	50	lf	255.00	12,800	
1639.	Custom canopy	1,200	sf	250.00	300,000	allowance
1641.	Waste containers	1	ls	2,500.00	2,500	allowance
1643.	Bollards	1	ls	10,000.00	10,000	allowance
1645.	Bike racks, etc.	1	ls	2,000.00	2,000	allowance
1647.	Site signage - code/identification	1	ls	25,000.00	25,000	allowance
1650.	***Total for Section H1.1 Siteworks***				***$1,127,000***	
1653.	***H1.2 Mechanical Utilities***					
1655.	***H1.21 - Water***				**50,000**	
1657.	Allowance for upgraded incoming water service	1	ea	50,000.00	50,000	
1660.	***H1.22 - Sanitary***				**50,000**	
1662.	Allowance for upgraded site sanitary service	1	ea	50,000.00	50,000	
1665.	***H1.23 - Storm***				**200,000**	
1667.	Allowance for upgraded site storm service and drainage to hardscape areas	1	ea	200,000.00	200,000	
1670.	***H1.24 - Natural Gas***				**75,000**	
1672.	Allowance to upgrade existing gas incoming service line to accommodate new generator and equipment	1	ea	75,000.00	75,000	
1675.	***H1.25 - Specialty Systems***				**20,000**	
1677.	Allowance for Irrigation to softscape at central turf area only	1	ea	20,000.00	20,000	

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	Description	Preliminary Design Estimate - FINAL Quantity	Unt	Rate	Amount	Remarks
1680.	***H1.26 - Miscellaneous Works and General Accounts***				**0**	
1682.	Included in above rates					
1685.	***Total for Section H1.2 Mechanical Utilities***				***$395,000***	
1688.	***H1.3 Electrical Utilities***					
1690.	**H1.31 - Site - Power**				**332,000**	
1692.	Allowance for Hydro connection and cable charge	1	ls	216,400.00	216,400	
1694.	Transformer concrete pad and grounding	1	ea	17,400.00	17,400	
1696.	Disconnect switch for meter	1	ea	900.00	900	
1698.	4 - 4" concrete encased PVC ductbank for primary cabling	100	lf	144.56	14,500	
1700.	6 - 4" concrete encased PVC ductbank for secondary cabling	120	lf	206.10	24,700	
1702.	#500 rwu90 secondary wire in above ductbank	2,080	lf	25.96	54,000	
1704.	#2/0 rwu90 ground in above ductbank	520	lf	7.94	4,100	
1706.	2 - 4" concrete encased PVC ductbank for generator	100	lf	84.80	8,500	
1708.	#3/0 rwu90 wire in above ductbank	440	lf	9.71	4,300	
1710.	#2 rwu90 ground in above ductbank	110	lf	4.55	500	
1712.	Generator control cabling	1	ls	6,000.00	6,000	
1715.	**H1.32 - Site - Communications**				**19,000**	
1717.	A concrete encased ductbank are provided for incoming communica	125	lf	116.00	14,500	
1719.	Exterior mounted CCTV camera rough-ins	1	ls	4,500.00	4,500	
1722.	**H1.33 - Site - Lighting**				**90,000**	
1724.	Energy efficient site lighting consisting of decorative exterior wall sconce and linear fixtures, pole mounted parking lot heads, Façade lighting, etc....	1	ls	90,000.00	90,000	

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	Description	*Preliminary Design Estimate - FINAL* Quantity	Unt	Rate	Amount	*Remarks*
1727.	**H1.34 - Site - General Requirements**				**0**	
1729.	Supervision, site office, head office overheads, submittals, premium of loss of productivity time, small tools, rentals and the				Included in above rates	
1732.	***Total for Section H1.3 Electrical Utilities***				***$460,300***	

Summary of Areas	*Preliminary Design Area GSF*
Lower Level	12,565 gsf
Ground Level	17,395 gsf
Second Level	10,725 gsf
Overall Gross Floor Area	***40,685 gsf***