Palo Alto High School Performing Arts Center

Production Systems Narrative – 50% Schematic Design
September 21st, 2010

The following narrative describes our recommended approach for the technical systems related to the education facilities for the Performing Arts Center at Palo Alto High School. With the emergence of broadly accessible media creation, and its inherent nature of merging the arts, it becomes more necessary than ever to provide students with the resources to experiment with the tangible and live arts foundations. The dramatist, musician and their audiences are aided and supported by the facilities in which they work. The performers are always accompanied by allied design and technical functions that are fields unto their own. The ultimate goal is to focus on the architectural design, technical operation and what it takes for audiences to have rich and captivating experiences, what it takes to inspire and support artists and theatre makers, what it takes to maintain financial viability for the project and the working facility, and what it takes to design and build a successful arts education and performance venue.

These recommendations are based on conversations with the architect and user group as well as assumptions made from experience on similar projects of this type, and incorporating new directions in theatre technology.

Overview

The ~600 seat theatre will host educational functions as well as hosting both local events and professional touring groups. Because of the wide variety of performance types that the theatre will serve (drama, amplified and un-amplified music, Broadway, dance, lecture presentations) the technical systems will be designed to support selective adaptation of the physical environment to suit each particular use. In a multi-purpose theatre, such as this, it is critical to make adjustments to the audience chamber by modifying the acoustic environment (see further details on this factor within the narratives provided by the acoustical consultant), and making physical changes to the threshold between the stage and the audience (reference below for a description of the orchestra pit lift and proscenium reduction system).

Stage

A stage is only partially the area seen by the audience. In order to allow for the circulation of actors out of view, the positioning of potentially hundreds of stage lights and the mounting and manipulating of scenic elements and stage draperies, a combination of backstage space, overhead access catwalks and rigging systems will be employed.

A space over the stage (“stage house”) is not only clear volume but a carefully integrated system that safely and effectively organizes the various elements it contains. Its contents include building and system-supporting steel, rigging, access ways, mechanical, electrical and fire protection. To provide for the most utility and safety, all of these elements are carefully coordinated to prevent obstacles to theatre operation and production design.

The assembly of the stage floor will serve the many purposes of the theatre. The floor will be resilient under foot for dance and for the resonance of sound, yet will be firm enough so that vibration is not transmitted laterally that would disrupt adjacent scenery. Because the top surface will take significant abuse, it will be provided as an inexpensive, somewhat sacrificial layer of ¼” double tempered masonite screwed down and painted flat black. This will allow individual panels to be replaced when needed. Below this layer will be two layers of plywood which provides the necessary mass of the assembly and the material into which screws can be used for anchoring scenery. The decking bears on 2x4 sleepers which in turn bear on firm neoprene rubber pads. The pads are shimmed level and bear on the structural concrete slab.

A mechanical pit lift will be employed at the orchestra pit, increasing access and functionality and allowing for additional seating as providing efficient lift mechanism to the new under stage storage area.

Fly Tower

Because much of the scenery, stage draperies and lighting are suspended overhead, they will be lifted or "flown". To provide for a stage where full height elements can be flown completely out of audience view, a clear volume at least two and a half times the proscenium opening height and identical in width to the entire stage area is required. In order to best prepare students for further academic and professional pursuits in theatre, and to progress their experience from what they might have encountered in high school, a facility with conditions and systems approaching a professional theatre will be provided.

A fly tower is not only volume but a carefully integrated system that safely and effectively organizes the various elements it contains. Its contents include building and system-supporting steel, rigging, access ways, mechanical, electrical and fire protection. To provide for the most utility and safety, all of these elements are carefully coordinated to prevent obstacles to theatre operation and production design.

Production Rigging Systems

Counterweight Rigging System

The single most physically complicated and expansive system is the counterweight rigging system which involves a series of pipes ("battens") running across the stage that are suspended with aircraft cable (a "line set") and rigged over pulleys ("blocks") to T-bar guided counterweight "arbors" at one side of the stage. As a pipe batten is loaded with scenery, an equivalent quantity of counterweight in the form of steel bricks is added to an arbor, thus balancing it and making the heavy loads easily manipulated by a manual "operating line".

The system will include ~35 operable linesets on 9" centers, including (5) battens that are dedicated for fixed electric battens and (3) orchestra shell ceilings, which will be driven by fixed speed power assist motors, providing for flexibility in where items can be hung, as well as the ability to hang objects from various shows at the same time. The system is operated on one side of the stage at the floor level and from a "fly gallery" catwalk at approximately the proscenium height. When the pipes are being loaded at the floor level, the arbors are at the top of the fly tower, and so loading the counterweight bricks occurs at a "loading gallery" catwalk. Steel configurations and anticipated live loads are documented in loading criteria sketches developed by the Shalleck Collaborative. The fly galleries will be provided with pin rails for ropeline rigging.

A proscenium fire safety curtain will be provided in compliance with the building code. This will be a "straight lift" curtain of fire resistive material that is held in place and retraced with an electric motor hoist controlled at stage level. Emergency "pull-pin" stations and signage will be provided.

Technical description:

- Each individual line set "truss batten" will be ~65' long and have a live load capacity of 30#/ln.ft, or approximately 2000# capacity. Diversity is taken for overall structural loading on the building to not exceed 50% of the total system capacity, which incorporates an accommodation for future capacity.

- Truss battens will be suspended by six to seven lift lines at 8'-0" to 11'-0" centers. The building steel, T-bar guides and arbor heights will allow the battens to travel from a low trim of 4'-0" above the stage to a high trim of 2'-0" below the grid deck.

- The rigging blocks are mounted under the roof steel across the entire stage area. So that the rigging blocks can be regularly inspected and so miscellaneous objects can be "spot" rigged with rope line, a full working "gridiron" is provided under the roof/rigging steel. The gridiron is a load rated walking surface typically made of open grating framed with steel purlins and channels configured to include "wells" through which the rigging lines pass.

Proscenium Reduction System

When the theatre is used for intimate dramatic productions, often a narrower proscenium opening is desired. To that end, a system of rigid tracked panels, integral to the proscenium arch, will be provided to close down the proscenium opening. An architectural finish to match the fixed proscenium will be provided. The operating proscenium range will be from 36' to 46' wide and the "hard" proscenium will be approximately 22'-24' high.

Variable Acoustics Systems

The theatre will be provided with Motor operated variable acoustics draperies and tracks for the adjustment of the reverberation for different kinds of uses within the theatre. The locations and extent of these draperies will be determined based on criteria established by the Acoustics Consultant.

Stage Draperies- FF&E

An inventory of stage draperies will be included. These would typically include a main drape, 4-5 pairs of black masking legs and borders, a mid and up-stage traveler, a cyc, and a scrim. All draperies would be certified inherently flame retardant. Draperies would be attached to drapery track or tied off to battens. The main drape, mid-stage and up-stage travellers would be manually operated with a handline off-stage.

Orchestra Pit Lift

The area of the orchestra pit represents a critical area of variable function. A means to vary the floor level of this area allows it to be used either to transport large elements to the trap room and basement (lowest setting), as a musicians orchestra pit (-8' below stage level), as additional audience seating (event with the audience floor level) and as a stage extension (highest). Any of these three functions may occur several times during a week, and so the time and labor required for changeover is to be considered. While this system requires greater initial capital cost, the changeovers can be done with a single operator in a matter of minutes.

By providing a simple means to extend the stage by use of a motorized lift, it will make the facility that much more useable for dramatic plays and larger orchestras. Extended stage area in this location will also create an improved acoustic condition for small ensembles by allowing them to play in the same environment as the audience.

A recessed orchestra pit is required to have wheelchair accessibility and two means of egress. An orchestra pit would be provided with an electro-mechanical lift (these systems are no longer hydraulic). To accommodate the lift mechanics, a machine pit would be excavated to an elevation 5' below the lowest stop.

Production Lighting Systems

Production Lighting Control

The understanding of the manipulation of light is key to understanding the manipulation of a mood of a scene. To provide for a system that will allow student experimentation, a complete control system consists of a control console, control electronics, dimmers and circuit outlet boxes ("distribution").

The computer control console is the user interface for programming cues. These consoles allow for channel patching, programmable cues and advanced control for lighting effects such as color changers and moving lights, it would interface with the sound system and would include peripherals such as a video monitor, handheld focus remote, and output via Ethernet and/or DMX protocol.

A data network would provide the means to run effects as well as providing control integration of the house lights. Lighting control data output and constant power will be provided at all lighting positions for advanced lighting effects such as color scrollers and moving lights. House light control would be both at the console and with simple wall stations. Simple presentations or concerts could be run though use of presets controlled at the wall stations without the use of the console.

The system would include all of the control elements described above and the following approximate quantities of 20A, 2.4kw dimmers for the following purposes:

(366) dimmers for production
(18) dimmers for concert lighting (800 μs Rise Time)
(24) dimmers for house lighting
(408) dimmers total

Dimmers are housed in (4) installation racks of (96) dimmers each, plus (1) partial rack with (24) dimmers, and located within an electrical room located remotely from the stage to provide acoustical isolation between the racks and the performance. In addition a relay control panel will be provided for work light and rehearsal light control from the control console or wall stations.

Circuit distribution would entail wiring in conduit from the dimmers to 3-pin wiring devices strategically placed at the lighting positions. The wiring device types will vary depending upon the specific lighting position. Pigtail or flush receptacle boxes and connector strips will be used for catwalk and box boom positions.

For the major overhead lighting positions on stage, motorized battens will be used. To distribute lighting circuits on these moving battens, several pipes will be designated as "fixed electrics". The "fixed electrics" contain permanently attached theatrical lighting connector strips (receptacles) with cable management assemblies permanently installed.

The orchestra shell ceiling panels (described below) will include permanent concert lighting fixtures that will be circuited to dedicated dimmers within the lighting control system. They will be controllable through the control console and through simple preset panels so a concert can take place without a lighting board operator present. The shell ceiling control circuiting will include a safety tilt sensor so that the lights will not be operable when the ceiling is in storage. For further flexibility, the orchestra shell circuits will be run through a "circuit interrupt" panel at the fly gallery, so these circuits can be used in conjunction with the rest of the production lighting circuits when not in use for the concert lighting.

Production Lighting Fixtures and Cable

An inventory of theatrical lighting fixtures (typically ellipsoidal, pars and cyc lights) plus stage extension cable and accessories would be provided. We would recommend using industry standard 2-pin + ground ("theatrical stage pin") plugs throughout. Two portable followspots would be provided. Advanced devices such as color changers or moving lights are <u>not</u> included; however these items may be rented or purchased on an as needed basis to allow students' access to the most commonly used fixtures used in the profession.

Architectural Lighting.

Control of architectural lighting in the audience chamber stage and adjacent technical and circulation areas, such as catwalks and vestibules, will be controlled by the production lighting control system. Architectural lighting in the audience chamber (designed by others) will be in two separate systems. There will be a dimmable system of low level (~12fc) incandescent house lighting for performance use, and a system of non-dimmable, brighter (~30-40fc), more efficient fluorescent task lighting for day to day use, rehearsals, maintenance and cleaning or for non performance events where brighter light may be required, such as test taking or assemblies.

Production Power

One 400A, 3-phase, 120/208VAC and two 100A, 3-phase 120/208VAC "company switch" power outlets will provide a generic power source to miscellaneous temporary systems. The 400A company switch will be at stage level and will be a purpose built device including a breaker, indicator lights, an industry standard "Camlok" connection panel with double neutrals and a protected connection chamber with lugs for "tails". A "cam-lock" connector will mate with that of a portable distribution panel that will provide power outlets of the various kinds typically used in theatre. The 100A switches will be at the catwalk and gridiron level and will have "pin and sleeve" connectors.

In addition to the company switches, various 20A and 30A single and 3-pahse power sources will be located throughout the technical areas for use with winches, followspots, moving lights and other large power drawing equipment

Wiring Infrastructure

A well designed wiring infrastructure is key to the success of the AV and Lighting Control Networks. To that end, a series of cable paths for portable or temporary cable will be provided to interconnect intermediate spaces within each larger space, as well as paths for connecting larger spaces together. This will be accomplished with cable trays, fire-rated cable pass-thru's, and large conduits as appropriate.

Orchestra Shell – FF&E

The acoustic performance and configuration parameters of the orchestra shell will be determined based on criteria established by the Acoustics Consultant.

So that the volume of the stage and fly tower does not present an acoustical sink when the stage is used for un-amplified music, an "orchestra shell" is provided to correctly shape the acoustical envelope. Two or three orchestra shell ceilings hang from the rigging system and are paired with portable wall "towers", effectively cutting off the upper and side volume of the fly tower and coupling the performance area with the volume of the audience chamber.

The ceiling units of the orchestra shell will be attached to motorized rigging battens that raise out of view after the ceilings are manually rotated to a vertical storage position. The towers provide 10'-12' of width each when deployed and are configured with side wings that act as stage entry doors and reduce the towers' width for storage. Each tower wall includes a counterweighted base that rolls and nests with the others to limit the storage space required. The towers will be stored off the stage proper in a dedicated area.

The design concept is based on the Wenger Corporation "Diva" shell. This is a high quality shell that allows for some customization.

Fixed Theatre Seating

Fixed theatre seating will be provided in the theatre. Seats would have upholstered and padded seats and backs, and the seats will "self-rise" when unoccupied providing required passing width. Tablet arms are not being provided. Seats would comply with all prevailing fire safety requirements.

The seating area in this space is required to have six to seven spaces for wheelchairs, each with a companion seat. Loose or "readily removable" chairs can be placed in the wheelchair positions and used if the wheelchairs are not present. In addition, 1% of the seating must be equipped with lift-up or swing-out armrests to provide "transfer" seating, and another 1% of the seating must have 24" of clear leg space in front of them for "semi-ambulant" seating. If the student/audience base includes a higher-than-average constituency of mobility-impaired members, it should be brought to the attention of the design team so further accommodations beyond code can be incorporated.

Approximately 600 seats will be provided, including ADA-compliant wheelchair seats.

AV Systems

Audio System

A well-designed audio reinforcement system is key to the enjoyment of theatrical events, and will allow students the opportunity to learn fundamental audio principals on a professional-grade system. A sound reinforcement system consists of loudspeakers, amplifiers, signal processing, a mixing console, and source equipment, such as microphones, CD players, computers, etc. For flexibility, a left/right loudspeaker system with possible addition of a center cluster will be designed for the main system, with a multi-channel surround loudspeaker system covering the house. The surround system may be used for theatrical or cinematic presentations. A subwoofer will also be installed for low-frequency content, as well as delay and fill loudspeakers for locations where the main system cannot adequately reach.

The mixing console will have 48+ inputs, and will be capable of handling large events, such as musicals or concerts. A computer-based multi-channel sound effects playback system will be provided to allow students to learn how to create multi-channel sound effects on a simple and widely-used platform.
For simple events not requiring an operator, an automixing system will be provided. This will allow a user to plug in a microphone and have a working system without assistance from an AV technician.
Two channels of wireless microphones will be provided, and will include both handheld and lavalier-style transmitters. A separate eight-channel portable wireless mic system will be provided for use during musical theatre presentations.

A separate cinema loudspeaker system will not be provided. Cinematic presentations will utilize the reinforcement & effects Left/Center/Right/Sub and Surround loudspeaker system described above.

Additionally, a network of audio lines and integrated patchbay will be provided.

Recording

A system for making simple DVD and/or CD recordings of live presentations for archival purposes will be provided. Mic positions will be located throughout the facility.

Intercom

A four-channel wired production intercom system will be provided for technical communications between the control room, AV rack rooms, other production spaces, and the backstage areas. Additionally, a single-channel wireless intercom system with four beltpack transceivers will be provided.

Program Audio

Audio program from the theatre will be distributed to backstage support spaces, such as dressing rooms, offices and (future) shop areas, as well as areas that may be used for overflow dressing rooms, such as the drama classroom and (future) band and (future) choral room.

Production Video

A production video system consists of a 1080p HD video projector, video switcher and source equipment, such as Blu-Ray, DVD & VHS players, computer and camera. The video switcher will be located in the control booth, and will accept any video signal. The standard-use video projection will be front projection with a single DLP (Digital Light Projection) projector.

Film projection is not included in permanent equipment or room accommodations. The Control Booth is therefore not currently envisioned as a “projection room” as defined by code.

Computer video inputs will be provided on stage to allow for PowerPoint-style presentations from portable laptops.

A modulated TV system, similar to cable-TV will be provided, allowing for distribution of on-stage video to backstage and support spaces, such as dressing rooms, offices and shop areas.

Additionally, a network of video lines and integrated patchbay will be provided.

Projection Screen

The projection screen will be a truss frame style, and will be suspended above the stage area on a rigging batten. The screen will be sized appropriately to allow audience members or students at the back of the theatre to read text and spreadsheet content.

Control System

A touchscreen control system will be provided to allow for control over the AV system. The touchscreen will be simple in it’s programming, and allow access to the most typically-used presets only. Touchscreens will be located in the booth and on-stage at the AV rack.

Assistive Listening System

As required by the building code and the ADA (Americans with Disabilities Act), compliant assistive listening systems will be provided for 4% of audience seating capacity. Receivers would be checked out in the lobby, and signage provided. Use of this system will require little or no input from the patron.

Portable Equipment

A complement of portable equipment, including cables, microphones, stands, portable loudspeakers, and other related items will be provided.

Production Power (AV)

One 100A, 3-phase, 120/208VAC "company switch" power outlet will provide a generic power source to temporary AV systems. A "pin and sleeve" connector will mate with that of a portable distribution panel that will provide breakered power outlets of the various kinds typically used in theatre.

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