UO EMU: 75% Schematic Design Pricing Narrative Outline:

1. **Introduction**

2. **Demolition narrative**

3. **Code Summary + Accessibility**
    a. Overview
    b. Approach
    c. Accessibility
    d. Code compliance analysis

4. **Building Exterior**
    a. Scope of exterior renovation
    b. Scope of new exterior construction

5. **Building Interior**
    a. Renovation
    b. New Construction
    c. Other components

6. **Lighting**
    a. Codes and Standards
    b. Design Criteria and Systems Description
    c. Interior Building: Renovation
    d. Interior Building: New Construction

7. **General A/V + Acoustics**
    a. Audio-Visual System Program
    b. Architectural Acoustics
    c. HVAC Noise Mitigation

8. **Food Service**
    a. Food Service Guidelines
    b. Equipment List & Estimate
    c. Equipment Loads

9. **Concert Hall Acoustics**
    a. Acoustics Design
    b. Noise and vibration control of mechanical, electrical and plumbing systems guidelines

10. **Performance Equipment**

11. **Sustainability**

12. **Parking**

13. Civil
14. Landscape
15. Structural
16. Mechanical
17. Plumbing
18. Fire Protection
19. Electrical
20. Low Voltage
21. Alternates

March 19, 2012

Cost Estimate #02 (75% Schematic Design)

1. INTRODUCTION:

The information provided for the 75% Schematic Design Cost Estimate #02 is intended to provide the University of Oregon and the design team with an initial forecast of the construction cost to renovate and expand the Erb Memorial Union (EMU). The information provided is schematic in nature. The plans, diagrams, and narratives are intended to be used for cost estimating only. The information provided and the Cost Estimate #02 is confidential, and must not be shared outside of the UO Management Group, the contracted cost estimator, the CMGC, and the contracted design team.

2. DEMOLITION

The entire 1972 addition will be demolished, see attached diagram. Specific goals for reuse and construction waste management are described in the Sustainability Initiatives section. Specific items to be salvaged include: large glulam railings, vertical grain fir ceiling grilles, brick veneer, aluminum skylight framing, and glazing if feasible. Selective demolition will occur throughout the existing 1950 & 1962 portions of the building as necessary to accommodate programmatic changes and systems upgrades. See floor plans for extent of partition wall changes and *Building Interior* section for intent at other existing historic elements, ceilings, floor finishes, etc. Most of the removed materials in these portions will simply be recycled, though some small percentage may be retained for reuse.

Site demolition will also be selective, refer to site plan & corresponding narrative section.

Remove existing exterior stair from the basement at the loading dock, this area will be filled in to improve the space for loading functions.

3. BUILDING CODE AND ACCESSIBILITY SUMMARY

a) OVERVIEW:
The new three story Central Hearth space connects the existing and new building volumes. The existing building is of Type IA construction and is fully sprinklered with standpipes in each stair well. Means of egress is provided by two fully enclosed interior stairs at far ends of the building and a Horizontal Exit to the 3 story space. The structure of the expansion is also of Type IA construction with non-combustible, non-load bearing interior walls. The three story space will be fully separated from the 1,000 seat concert hall by 2-hour construction. The new building portions are also fully sprinklered with standpipes in each stair enclosure and adjacent to each horizontal exit. Means of egress will be provided by two fully enclosed interior stairs at far ends of the North student bar and Horizontal Exits.

b) APPROACH:
The points below are intended to address the major code compliance issues identified by the University and the design team.

I. Fire Department access will be provided at multiple locations around the building and provide easy access to the roof. Access on the site would be via two new access drives off of 13th Avenue on the north and via the renovated loading dock drive on the southwest.

II. Shaft approach reduces the three story hearth space to a two story space and reduces or eliminates the need for smoke control. This approach requires 2-hour rated separation of the 3rd floor new and existing areas from the central space. This separation will need to be achieved in some areas by the use of fully-glazed partitions with deluge sprinklers and 90 minute rated doors. 2 hour rated separation from the existing building will require opening protection of openings in existing building.

III. Separating the central space from the existing areas, the performance space and 3rd floor of office area allows the space to be a horizontal exit and helps to alleviate some of the high occupant load exiting from the different program areas. The 1,000 seat concert hall has a main exit that discharges through the central space as well. Construction of the central space as a horizontal exit provides the required area through which the main exit may discharge to the building exterior.

See Code Plan drawings for more information.

c) ACCESSIBILITY:
Provide allowance for additional ramps as indicated on plans, and stair railing upgrades. Provide new hardware at existing doors to remain and at least 50% replacement factor for door panels. New ADA signage should be provided throughout addition and existing building (exit signs, building directory, room identification, building way finding). Assume all restrooms to receive accessibility upgrade and replacement of finishes, as well as some modification to walls and other infrastructure to meet current accessibility codes.

New construction portions will be fully accessible at all exterior entries because of the design approach to providing a consistent grade level. Interior spaces will require minimal ramping with all floor levels reachable via elevator. Stairs are not required to be accessible and areas of rescue are not required. Accessible seating in the Concert Hall is widely & equally distributed.

d) CODE COMPLIANCE ANALYSIS:
See attached document

4. BUILDING EXTERIOR

a) SCOPE OF EXTERIOR RENOVATION:
Existing Building: General intent is to provide a clean & visually restored exterior to the existing facades. Repair & replacement will be limited to areas that are damaged or degraded such that frequent maintenance would be required. The goal for the finished building is to make it durable and low-maintenance for another 30 years at minimum. Significant thermal & waterproofing upgrades are limited to roof areas that already require replacement.

I. Exterior walls:
- Clean entire masonry and limestone surfaces with low pressure washing & low-toxicity cleaning solution (Prosoco type restoration-cleaning products) as necessary including brick masonry, exposed concrete, stone, and site walls.
- Clean by hand around window openings
- Re-point 25% of existing wall areas with new mortar to match existing
- Provide allowance for crack repair and 5% replacement of masonry to match existing.
- Apply penetrating water & graffiti resistant sealer to all exterior masonry, concrete, and stone. To avoid variations in color sealer should be applied over the entire height of the exterior walls

- Remove all stone/precast copings, install SST & flexible flashings and reinstall copings. Replace all flashings at door & window openings and replace sealant as necessary.

II. Windows: Based on UO value engineering decisions during the previous round of pricing, no window replacement is included within the project scope. Replace sealant and badly damaged flashings at perimeter of existing windows.

III. Roof: Replace all existing roofing insulation & flashings.
Replacement Assembly to consist of:
- Fluid-applied hot rubber membrane
- Drainage mat
- 6" rigid board insulation
- Ballast
- Replace counter-flashings, terminations & transitions to facilitate future maintenance

IV. Outdoor terraces: Replace concrete topping & existing waterproofing/coating (fish bowl area above conditioned space, ballroom terrace):
- Fluid-applied hot rubber membrane,
- Drainage mat,
- Slip resistant concrete topping
- Replace all counter-flashings and area drains

V. Seat wall outside fish bowl: Remediate brick veneer failure/frost heave at existing seat wall.
- Remove and salvage existing masonry as possible.
- Install new fluid applied waterproofing and
- Reinstall masonry and augment new masonry to match existing as required.

VI. Fishbowl canopy & metal roof areas: Replace waterproofing & degraded metal finishes to restore original appearance.
- Replace existing roof assembly and damage/degraded underlayment materials.
- Install new sheathing/underlayment as necessary and new self-adhered waterproof membrane.
- Provide new pre-finished low-slope metal roofing, matching flashings and integrated gutters

VII. Loading dock & canopy: Expand & improve existing loading dock and replace existing concrete canopy with larger canopy as indicated on Site Plan.
- Replace existing dock with new concrete wall & deck surfaces to provide angled bays
- One bay to have hydraulic dock leveler
- One bay to have hydraulic lift platform to serve loads from the ground or low vehicles
- Provide new steel frame canopy structure with metal deck roofing & flashings to extend 8' beyond face of loading dock platform.
- Install stucco or fiber cement panel soffit to provide similar finish to existing
- Install 2'x2' basic skylight on curb at each loading bay
- Provide dry sprinkler system

VIII. Fountain court skylight: Replace existing skylight system and associated structure with solid infill.
- Remove existing truss framing and plastic glazing
- Provide new infill framing & deck per structural drawings
- Roof surface & waterproofing system to integrate with & match surrounding roof area

- Install 300sf of insulated translucent panel skylight, 50% of this area to be operable for natural ventilation. Intent is to maintain some sense of the type of space that's there currently, but in a much

IX. Craft center outdoor shelter structure: Cover outdoor area for kilns & other equipment with structured roof as indicated on site plan. Perimeter to provide visual transparency & security around dangerous equipment. Effective weather shelter, ventilation & ample daylight are important design aspects.
- Provide new posts, framing, and deck per structural drawings.
- Roof assembly to consist of new sheathing/underlayment, self-adhered waterproof membrane, and pre-finished low-slope metal roofing.
- Provide matching flashings, integrated gutter & downspout
- Install operable rain-sheltered heat relief vents as necessary above kilns.
- Provide dry sprinkler system
- Install 300sf of basic rectangular skylights near outside wall of craft center to permit daylight passage to the interior space.
- Provide enclosure for outdoor portion of dust collection system, as well as a vent stack structure for vertical vent piping required for kilns & associated equipment
- Perimeter of covered area to be enclosed with custom operable (sliding) metal mesh screen fence to provide security of outdoor equipment but allow visual clarity, air movement, etc.

X. West ground level entry & addition (near amphitheater, below Taylor Lounge): Provide visible entry point to the Hearth via the familiar pass-through path. Aesthetic intent is for simple glass beneath historic façade with original structure visible behind.
- Remove exterior ceiling, and brick cladding of columns & headers at existing exterior pass-through.
- Provide new thermally broken aluminum curtain wall system & entry doors along entire West edge of the building face. Include similar interior storefront infill with doors at middle row of columns to create vestibule.
- Where additional space is created at Holden Center/ Sustainability Center, match adjacent concrete wall & roof/terrace structure.
- Re-locate existing exterior storefront & entry door to new exterior face.

XI. Miscellaneous items:
- Exterior stair and terrace railings to be repaired as necessary and receive new paint

b) SCOPE OF NEW ADDITION:
Typical assemblies: As indicated on elevation drawing legends, assemblies described below indicate performance requirements for major exterior systems. (all components in order from inside to outside)

IRMA roof assembly
- Fluid-applied hot rubber membrane over simple-slope concrete deck or fully-adhered TPO membrane over metal deck & protection board
- Internal area drains
- Continuous drainage mat
- Rigid board insulation (R-40)
- Ballast
- Parapet terminations with pre-finished metal counter-flashings and copings

Terrace roof assembly
- Fluid-applied hot rubber membrane over simple-slope concrete deck
- Internal area drains
- Continuous drainage mat
- Rigid board insulation (R-30)
- Pedestal paver system with precast paver units
- Parapet terminations with pre-finished metal counter-flashings & copings
- Assume 10%of area will have fixed planter units with 24" soil depth

Low-slope metal roof assembly
- Self-adhered waterproof membrane over concrete or protection board
- 4" rigid board insulation
- Low-slope metal flashing/roofing panels with interlocked & sealed joints
- Matching metal flashings/terminations at perimeter

Concrete slab-on-grade at conditioned space
- Perimeter rigid board insulation (R-10) at all exterior vertical edges and 4' horizontally below slab
- Provide radon mitigation measures as required
- Install vapor barrier and/or dampproofing per campus standards

Concrete slab-on-grade at radiant floors
- Perimeter rigid board insulation (R-10) at all exterior vertical edges and R-15 continuous horizontally below entire area of slab containing radiant heating/cooling
- Provide radon mitigation measures as required
- Install vapor barrier and/or dampproofing per campus standards

New basement walls
- Metal stud interior furring
- Closed-cell sprayed foam insulation (R-15)
- Concrete basement walls against shoring
- Bentonite Sheet waterproofing

Brick veneer
- Metal stud framing or concrete structure
- Self-adhered waterproof membrane
- Rigid board insulation (R-15)
- Air space
- Brick veneer cladding, running bond with stainless steel ties and through-wall flashings
- Siloxane sealer

Limestone rain screen
- Metal stud framing or concrete structure
- Self-adhered waterproof membrane
- Rigid board insulation (R-15)
- Ventilated air space
- Stone veneer cladding with stainless steel furring/support system and through-wall flashings
- Siloxane sealer

Metal panel
- Metal stud framing
- Exterior gypsum sheathing

- Vapor-permeable weather-resistive adhered sheet membrane
- Air space
- Galvanized metal furring
- Pre-finished profile metal panel with exposed fasteners
- Matching flashings and closure pieces

Exposed concrete
- Metal stud interior furring
- Closed-cell sprayed foam insulation (R-15)
- Exposed structural/architectural concrete
- Siloxane sealer

Aluminum curtain wall – standard performance (backup wall assembly is provided)
- High-performance thermally broken clear-anodized aluminum curtainwall system
- Clear low-e double-pane glazing
- System U ≤ 0.45 (UNO)
- SHGC ≤ 0.34 (UNO)
- 12psf water resistance
-

Aluminum curtain wall – high performance
- High-performance thermally broken clear-anodized aluminum curtain wall system
- Clear low-e double-pane glazing
- System U ≤ 0.35 (UNO)
- SHGC ≤ 0.25 at south and west exposures (UNO)
- 12psf water resistance

Limestone spandrel panel
- Drained, insulated aluminum back pan
- Stone veneer cladding panels

Wood shadow box
- Metal stud furring
- fibrous cavity insulation,
- wood veneer or lumber,
- air space
- Aluminum curtain wall - Standard performance

Acoustic clerestory
- Aluminum window system with laminated clear interior glazing, canted inward
- Air space
- Motor operated black-out shades
- Air space
- Aluminum curtain wall - Standard performance

Interior shading system
- 6” deep horizontal wood slat panels.
- Aluminum curtain wall – high performance

Major Entry canopies
- Cantilevered architectural grade steel structure
- High-performance coating steel finish
- Stainless steel or aluminum system to capture under hung glass

- Clear laminated with fitted pattern

Secondary Entry canopies
- low-profile cantilevered architectural grade steel plate
- Continuous welds to be ground smooth
- High-performance coating finish

I. North Student Volume: This building volume is a primarily brick-clad façade with punched openings for glazing and a small amount of limestone spandrel. All cladding will be installed as a rain screen over continuous exterior insulation and minimal thermal bridges to create a high performance thermal envelope with minimal air leakage and long-term durability. The glazing is configured to maximize natural daylight to the student offices inside.

Roof: IRMA roof assembly
Wall: Brick veneer with punched openings, Aluminum curtain wall glazing – high performance with Limestone spandrel, Mechanical penthouse with Metal panel wall assembly, Bay window at multi-purpose auditorium consists of limestone rain screen for the extruded box element with aluminum curtain wall – standard performance assembly with wood shadow box infill.

II. Hearth & South Wall (central atrium space & conference room volumes facing South lawn): Intent for this large 3-story volume is to create a sense of visibility and unity for the diverse body of students. Maximizing thermal performance of the glazed South wall will be critical by tuning & shading the glazing system to provide maximum daylight with minimal heat gain. This wall is also intended to maximize views out to the South lawn and provide indoor/outdoor connection as weather conditions permit. The conference rooms located on this South façade attempt to maximize the sense of clarity, activity, and animation to both the indoor and outdoor open spaces. There is also a large specially-tuned skylight band that contributes significantly to the day lighting of this space throughout the year. Interior spaces facing this space will also attempt to maximize visibility and daylight connection to it.

Roof: IRMA roof assembly at main roof expanse above atrium volume
Shaped skylight system with integral fixed shading & reflective elements, see roof plan and sections. Low-slope metal roof assembly at protruding portions of conference room volumes on South façade
Wall: Limestone rain screen assembly for the extruded box elements with Aluminum curtain wall infill Wood shadow box and Interior shading system infill.
Remaining south façade glazing to be Aluminum curtain wall system with Spandrel panel

III. Concert Hall: The concert hall main volume is primarily a concrete structure that is shaped to provide superior acoustics and longevity for its use as a significant cultural landmark for the university into the future. It is largely a rain-screen stone veneer clad volume with limited areas of glazing to highlight important program aspects inside. Its thermal performance should be similar to the student bar. Adjacent lobby spaces are fully glazed volumes to connect visually to the outside, though some internal or external shading will be necessary to limit heat gain to these spaces.

Roof: IRMA roof assembly
Wall: Limestone rain screen at majority of main Concert Hall volume

Aluminum curtainwall with some variation of the Interior shading system at limited portions of South & West lobbies
Clerestory glazing shown at attic level of the concert hall to be Acoustic clerestory with Aluminum curtainwall

IV. Concert Hall Support Volume: This program along the North edge is intended to read as a largely glass volume from the outside, though its more private interior program will be concealed by an opaque wood 'shadow box' type of spandrel backing for most of the façade area. This visible wood element alludes to the instrumental quality of the space inside.

Roof: IRMA roof assembly
Wall: Support Volume façade comprised of Aluminum curtainwall with Wood shadow box
Basement walls & floor: waterproof per UO campus standards

V. Transition Volume (addition directly adjacent to existing building): This volume primarily contains conference & dining spaces, though it's exterior design & cladding systems are very similar to the student bar described previously.

Roof: IRMA roof assembly
Walls: Brick veneer wall assembly with punched openings for
Aluminum curtain wall system with Spandrel panel
Mechanical penthouse with Metal panel wall assembly
Dining terrace & coffee house at transition between Transition and South Wall volumes to be a combination of limestone rain screen, Aluminum curtainwall, Interior shading system, and Terrace roof assemblies.

Terrace railings to be minimal stainless steel cable rail system
Exterior stairs to consist of concrete treads, limestone-clad solid railing wall and stainless steel top rail to match terrace and complement existing building tube rails

VI. Bookstore Extension (addition at ground level just North of the Mills Center wing): This new volume is a prime corner for the project and the university. It is intended to be a very transparent and active retail space that will also include some kind of visual communication element for student media activity facing the most active corner of campus and the free-speech amphitheater. The façade will consist of exposed concrete and expansive areas of curtainwall glazing.

Roof: IRMA roof assembly
Wall: Primary structure to be Exposed concrete
Some exposed area will be concrete retaining wall against shoring, but exterior appearance will match the Exposed concrete wall assembly.
Aluminum curtain wall system with Spandrel panel at retail facades
Secondary entry canopy assembly along 50% of North Façade

VII. Primary Building Entries – North: These 'slots' are fully glazed expanses of curtainwall that define points of entry to the Central Hearth between the large building volumes along 13th Avenue. Large glass entry doors will provide maximum clarity between inside and out, and be sheltered by large cantilevered steel & glass canopies. High performance glazing combined with glass vestibules inside will be critical to maintain energy efficiency and thermal comfort for the hearth.

IRMA roof assembly
Aluminum curtainwall system with spandrel panel
Entry canopy assembly at both entries, see perspective views

Note: Hearth Volume and Primary Building Entries volumes will be connected directly to the North Student Volume, but must be isolated from the Concert Hall, Support Volume, South Wall, Transition Volume, and Existing Building volumes with seismic isolation joints. The Transition and Bookstore Extension volumes must also be seismically isolated from the Existing Building. The Support Volume must be structurally isolated from the main Concert Hall for acoustic reasons.

Fall protection: Provide roof anchors for roof maintenance & fall protection only at all roof areas; new & existing.
Where possible, wall mounted anchors (at mechanical penthouses or walls extending above a roof area) will be used. Otherwise, davit type anchors of typical layout will attach to new embeds or retrofitted to existing concrete roof slabs.
Assume that exterior façade maintenance will be served from the ground and no other maintenance equipment is necessary.

5. BUILDING INTERIOR

a) RENOVATION

Intent Narrative:
The intent of the interior renovation is to restore historical architectural elements while providing modernized and functional spaces. The renovation should provide clearer circulation, more open space and as much daylight as possible. All surfaces need to be cleaned or refinished to match the university quality standards.

I. Convenience Store/Bookstore (Under Mills Center): Shelled space – Drywall, taped and mudded. Concrete floors, Exposed construction ceilings. Stubbed out utilities.

II. Holden Center:
Floors: High quality commercial grade carpet tiles. Minimum 30%recycled content.
Base: Rubber base
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: 2'x4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Doors: Hollow metal door w/ paint finish. Fire rated and acoustical rated as per required.
Casework: Plastic Laminate
Signage: Vinyl window graphics

III. Craft Center Studios:
Floors: Polished concrete, with Slip Grip finish.
Base: Rubber Base
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: Painted Exposed Construction.
Casework: Plastic Laminate, AWS custom.
Signage: Vinyl window graphics

IV. McMillen Gallery:
Floors: High quality commercial grade carpet tiles. Minimum 30%recycled content.
Walls: Paint

Ceiling: Paint gypsum board, New ceiling tiles: USG Climaplus acoustical ceiling tile, with Fineline grid DXF.

V. Large Conference Rooms:
Floors: High quality commercial grade carpet tiles.
Base: 4" rubber base
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Glazed wall: Top/bottom aluminum channel, kynar finish, clear glass butt jointed, 50% obscured or vinyl graphic overlay.
Doors: Frameless glass door, top and bottom pivot.
Window coverings: Recessed blackout and sun control shades, Mechoshades or equal.
Recessed projection screen
Built-in AV capabilities. (See AV narrative for more info.)

VI. Card Office:
Floors: High quality commercial grade carpet tiles. Minimum 30%recycled content.
Base: Rubber Base
Walls: Painted gypsum wall board, level 4 finish to receive paint.
Ceiling: 2'x4'USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Storefront: Vinyl Signage

VII. Taylor Lounge Hallway:
Floors: Refinish Terazzo Floors.
Walls: Existing Brick to be left.
Ceiling: Acoustical plaster such as baswaphon to replace ceiling tile

VIII. Grand Stair:
Leave as-is.

IX. Fish Bowl Seating Area:
Floors: Polished concrete with Slip Grip finish.
Walls: Painted gypsum wall board, patch and repair where occurs, level 5 finish to receive paint.
Ceiling: 2'x4'USG Climaplus acoustical ceiling tile, with Fineline grid DXF. Painted gypsum board soffits around food vendors and perimeter.

X. Toilet Rooms:
Floors: 12"x 24" rectified ceramic floor tiles, non-porous, sanded grout.
Walls: 6"x12" glazed ceramic wall tiles, from floor to ceiling. Matching cove base. Sanded grout
Ceiling: Painted gypsum board, level 4 finish.
Toilet Room Accessories: Stainless steel, Bobrick Classic series or equal- seat cover dispenser, sanitary napkin disposal and toilet tissue dispenser.
Grab Bars: Bobrick B-6026 Stainless steel, 1-1/2" dia., 36" and 42".
Lavatories: Kohler Archer K-2355 under counter mounted lavatory, ADA compliant.
Faucet: Kohler K-13474 touch-less gooseneck faucet with infrared sensors, AC powered, water-saving vandal-resistant 0.5 gpm aerator. ADA compliant.
Urinal: Toto UT104E high efficiency urinal, 0.5gpf, with infrared sensor flush meter. ADA compliant.

Toilet: Kohler Kingston K-4325 1.28 gpf, high efficiency toilet bowl, top spud, with infrared sensors flush meter & manual flush ability.
Mirrors: Vision quality mirrors above lavatories.
Countertops: Caesarstone, ¾" thick, polished finish, drip edge. Matching 4" backsplash.
Toilet Compartments: Wall-hung stainless urinal screens. Ceiling-hung stainless pilasters, doors and panels.
Clothes Hook: Heavy-duty clothes hook with concealed mounting.
Baby changing stations, 1 per restroom.

XI. Food Service – Tenant Space:
Shelled space – Drywall, taped and mudded. Concrete floors, Exposed construction ceilings. Stubbed out utilities.

XII. Food Service – BOH – Commissary Space:
Floors: Quarry Tile
Base: Quarry Tile Cove Base
Walls: FRP
Ceiling: 2x2 washable ceiling panels and/or Washable gyp brd. Ceiling.

XIII. Staff Office:
Floors: High quality commercial grade carpet tiles. Minimum 30%recycled content.
Base: Rubber base.
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: 2'x4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Casework: Built-in PLam millwork w/ Plam countertop, AWS custom

XIV. Lounge Gallery:
Floors: Polished concrete, with Slip Grip finish.
Walls: Paint
Ceiling: Paint gypsum board, New ceiling tiles: USG Climaplus acoustical ceiling tile, with Fineline grid DXF where occurs.

XV. Storage/Utility Rooms/Janitorial Closets:
Floors: Polished concrete, with Slip Grip finish.
Base: 6" Rubber base.
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: Exposed construction, painted.
Note: Floor to ceiling wire Fencing at Storage Units with lockable gates.

XVI. Pre-Function Space:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XVII. Gumwood Room:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XVIII. Ballroom:
New ceiling to match existing. New lighting compatible with existing.

Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XIX. Ballroom Stage:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XX. Ballroom Storage:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XXI. Servery:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XXII. Maple Meeting Room:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XXIII. Oak Meeting Room:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XXIV. Hallway Adjacent to Ballroom:
New ceiling to match existing. New lighting compatible with existing.
Note: Existing ceiling, floor and walls should be preserved, restored or repaired if possible depending on the MEP scope.

XXV. Existing Elevator:
No Change.

XXVI. Small Conference Room (L3):
Floors: High quality commercial grade carpet tiles.
Base: 4" rubber base
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Glazed wall: Top/bottom aluminum channel, kynar finish, clear glass butt jointed, 50% obscured or vinyl graphic overlay.
Door: Frameless glass door.
Window coverings: recessed blackout and sun control shades, Mechoshades or equal.
Recessed projection screen
Built-in AV capabilities. (See AV narrative for more info.)

XXVII. S & ES Work Area:
Floors: High quality commercial grade carpet tiles, 60%, Rubber Floor 40%
Base: 4" rubber base

Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Window coverings: Recessed blackout and sun control shades, Mechoshades

XXVIII. Offices:
Floors: High quality commercial grade carpet tiles
Base: 4" rubber base
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Window coverings: Recessed blackout and sun control shades, Mechoshades

XXIX. Call Center:
Floors: High quality commercial grade carpet tiles
Base: 4" rubber base
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Window coverings: Recessed blackout and sun control shades, Mechoshades

XXX. Media Suite:
Floors: High quality commercial grade carpet tiles or Rubber Floor 50%, Polished concrete, with Slip Grip finish 50%
Base: 4" rubber base
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF in small office and work spaces. Exposed Construction, painted in open work rooms and large gathering areas.
Window coverings: Recessed blackout and sun control shades, Mechoshades
Note: Refer to acoustical consultant narrative for specific sound recording/isolation as it pertains to broadcasting and performance rooms.

b) NEW CONSTRUCTION

Intent narrative:
The new building interior is composed of student workspaces and amenities organized around the double loaded atrium. The light filled atrium is the hearth of the building; it connects the historical building to the new structure by means of various elements of vertical circulation. It allows for fluid movement and visual connection through the space. The open space promotes visibility of all programmatic elements from the hearth. (see and be seen) On the garden side, rooms are staggered to allow for natural light and views to the outside. The conference rooms and amenities on the south side are shaped as inhabitable 'window boxes' protruding through the glass façade. On the north side, the spaces are organized to provide a maximum of transparent frontage on the atrium. The glazed walls, operable partitions, bridges and grand stairs are intended to expose the student life activity to the hearth and showcase the dynamic flow in and out of the space. The quality of the space relies mostly on capabilities for natural light, views through to the garden and across the atrium, and the connectivity between the spaces.

I. Atrium, Public Hallways and Corridors:
Floors: Polished concrete, with Slip Grip finish.
Base: 1" x 6" limestone, sealed.
Walls: i. Volume/boxes: Limestone.

ii. Grand Stair: Smooth trowel Venetian plaster.
iii. Glazed walls: Top/bottom aluminum channel, kynar finish, clear glass butt jointed, 50% obscured or vinyl graphic overlay.
iiii. Drywall primary public spaces: smooth finish, level 5, painted.
Drywall secondary spaces where no raking light: smooth finish, level 4, painted.
Ceiling: Gypsum board painted 50%, Acoustical plaster 50% such as Baswaphon.
Casework: Solid surface on computer stations.
Built-in lounge seats: High quality textile upholstery treated with Durablock, Crypton or Nanotex. Wood veneer frame to match exterior wood species and finish. Wood veneer to be FSC certified and AWS premium grade A, no sap.
10' integrated entry mat at all entry doors & vestibules.
Grand Stair: Solid wood treads and risers (Possible reuse of glue-lam beams from existing building), brushed stainless handrails, steel trowel Venetian plaster guardrails.
Stepped seating: Solid wood treads and risers. (Possible reuse of glue-lam beams from existing building.)
Bridges: Polished concrete floor, glass guardrails.

II. a) Coffee House:
Shelled space – Drywall, taped and mudded. Concrete floors, Exposed construction ceilings. Stubbed out utilities.

b) Coffee House (Alternate to build-out, see attached list):
Floors: Polished concrete with Slip Grip finish.
Base: Hardwood base at wood walls, 1" x 6" limestone base at gypsum walls.
Walls Front of House: 2'x4' tile cladding over gypsum wall board @ 20% of wall areas. Wood panels made from reclaimed Doug Fir ceiling grilles from existing building at 80% of walls.
Ceiling: Acoustical plaster 50% such as Baswaphon
Enclosure at Atrium side: Roll down stainless steel security grill.
Casework:
Service counter: Solid surface at counter top and counter front.
Built-in banquettes: High quality textile upholstery treated with Durablock, Crypton or Nanotex. Wood veneer frame to match exterior wood species and finish. Wood veneer to be FSC certified and AWS premium grade A, no sap.
Exposed service area behind counter: subway tile walls, sanded grout, quarry tile floor.
Window treatment: Wood louvers per elevations.
Signage: Internally lit channel letters pin mounted to bulkhead. (At atrium only.)
Lighting: 50% specialty pendant lighting, 50% halogen downlights.

III. a) Pub:
Shelled space – Drywall, taped and mudded. Concrete floors, Exposed construction ceilings. Stubbed out utilities.

b) Pub (Alternate to build-out, see attached list):
Floors: Polished concrete with Slip Grip finish.
Base: Hardwood base at wood walls, 1" x 6" limestone base at gypsum walls.
Walls: Painted gypsum wall board, level 5 finish over 20% of walls. Wood panels made from reclaimed d. Fir ceiling grilles from existing building at 80% of walls.
Ceiling: Acoustical plaster on 30% of area, Wood panels made from reclaimed Doug Fir ceiling grilles from existing building at 80% of area.
Storefront (Atrium side): Full height wood framed glazing, solid wood double door with glass lights.

Storefront Patio Doors: Solid wood double door with glass lites.
Casework:
Service counter: solid surface at counter top and counter front.
Built-in banquettes: high quality textile upholstery treated with Durablock, Crypton or Nanotex. Wood veneer frame to match exterior wood species and finish. Wood veneer to be FSC certified and AWS premium grade A, no sap.
Exposed Kitchen: subway tile walls, sanded grout, quarry tile floor.
BOH kitchen: FRP walls, quarry tile floors, 2x2 washable ceiling panels.
Signage: internally lit channel letters pin mounted to bulkhead. (at atrium only)
Lighting: 50% specialty pendant lighting, 50% halogen down lights.

IV. Food Service Seating:
Floors: Polished concrete with Slip Grip finish.
Base: 1" x 6" limestone, sealed.
Walls: Painted gypsum wall board, smooth texture, level 5 finish.
Ceiling: Painted Gypsum Board soffit on 20% of area, level 5 finish. Acoustical plaster such as Baswaphon on 80% of area..
Lighting: Specialty pendent light over each table.
Casework:
Post-mounted tables: Solid surface top, stainless post.
Built-in banquettes: High quality textile upholstery treated with Durablock, Crypton or Nanotex. Wood veneer frame to match exterior wood species and finish. Wood veneer to be FSC certified and AWS premium grade A, no sap.

V. Conference Rooms (volumetric rooms at Atrium):
Floors: High quality commercial grade carpet tiles, min 30% recycled content.
Base: FSC solid wood base to match louvers and exterior wood.
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: Painted gypsum board soffit on 20% of area. Level 5 finish. Acoustical plaster such as baswaphon on 80% of area.
Doors: Frameless glass doors, top and bottom pivot.
Louvers: Wood louvers per elevations.
Interior glazing: Top/bottom aluminum channel, kynar finish, clear glass butt jointed, 50% obscured or vinyl graphic overlay.
Window coverings: Recessed blackout and sun control shades, Mechoshades or equal.
Recessed projection screen
Built-in AV capabilities. (Refer to AV narrative.)

VI. Typical Conference Rooms:
Floors: High quality commercial grade carpet tiles.
Base: 4" rubber base
Walls: Painted gypsum wall board, level 5 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Glazed wall: Top/bottom aluminum channel, kynar finish, clear glass butt jointed, 50% obscured or vinyl graphic overlay.
Door: Glass door w/ stainless rails, such as Herculite.
Window coverings: Recessed blackout and sun control shades, Mechoshades or equal.
Recessed projection screen
Built-in AV capabilities. (Refer to AV narrative.)

VII. Post Office:

Shelled space – Drywall, taped and mudded. Concrete floors, Exposed construction ceilings. Stubbed out utilities.

VIII. Multi-purpose Room:
Floors: ¾" hardwood T&G or endgrain hardwood panels over sprung floor system per consultant.
Base: 6" wood base.
Walls: Painted gypsum wall board, level 4 finish to receive paint, Fabric wrapped acoustical panels on 2 walls.
Ceiling: Painted exposed construction.
Glazed interior wall: Top/bottom aluminum channel, kynar finish, clear glass butt jointed, 50% obscured or vinyl graphic overlay.
Window treatment: Blackout capabilities, Mechoshades or black theatrical curtains.
Retractable projection screen & ceiling mounted projector.
Pantry Casework: Built-in P. Lam millwork w/ P.lam countertop, AWS custom.
Built-in AV capabilities. Refer to AV narrative.
Solid wood doors w/ aluminum casing, acoustical seals as required per consultant.

IX. Student groups / student organizations – open workspace:
Floors: Polished concrete with Slip Grip finish.
Base: 4" rubber base.
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: Painted exposed construction.

X. Student groups / student organizations – enclosed workrooms:
Floors: High quality commercial grade carpet tiles, min 30% recycled content.
Base: 4" rubber base.
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: 2' x 4' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Solid wood doors w/ aluminum casing.

XI. Outdoor Program and Club Sports:
Floors: Polished Concrete
Walls: Abuse resistant gypsum wall board, painted, finish level 4.
Ceiling: Exposed Construction, schedule 40 pipe grid anchored to structural deck, painted.
Solid wood doors w/ aluminum casing, stainless protective plate up to 48".

XII. Bike Center:
Floors: Polished Concrete
Walls: Abuse resistant gypsum wall board, painted, finish level 4.
Ceiling: Exposed Construction, schedule 40 pipe grid anchored to structural deck, painted.
Solid wood doors w/ aluminum casing, stainless protective plate up to 48".

XIII. Mediation Reflection Room:
Floors: Rubber flooring.
Walls: Gypsum wall board, painted, finish level4.
Ceiling: 2' x 2' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Solid wood doors with aluminum casing.

XIV. Concert Hall Back of House – General:
Floors: Polished Concrete with Slip Grip finish.
Walls: Painted impact resistant gypsum wall board, level 4 finish.
Ceiling: 2' x 2' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Solid wood doors w/ aluminum casing.

XV. Concert Hall Back of House – Green Room:
Floors: High quality commercial grade carpet tiles, min. 30% recycled content.
Base: Hardwood base to match wall panels
Walls: Wood panels. Wood veneer frame to match exterior wood species and finish. Wood veneer to be FSC certified and AWS premium grade A, no sap.
Ceiling: 50% Gypsum wall board, level 4 finish, 50% wood panels to match wall.
Solid wood doors w/ aluminum casing.

XVI. Concert Hall Back of House – Visible Exit Stair:
Treads and Landings: Concrete filled, painted metal pan stairs. Concrete treads and landings to be sealed.
Walls: Wood veneer panels to match exterior wood species and finish. Wood veneer to be FSC certified and AWS premium grade A, no sap.
Ceiling: Exposed construction, painted.
Handrails: Steel shapes, painted.
Solid wood doors with aluminum casing. Fire rating per code.

XVII. Concert Hall Back of House – Specialty Areas:
Refer to acoustic consultant's narrative.

XVIII. Toilet Rooms – Public:
Floors: 12"x 24" rectified ceramic floor tiles, non-porous, sanded grout.
Walls: 6"x12" glazed ceramic wall tiles, from floor to ceiling. Matching cove base. Sanded grout
Ceiling: Painted gypsum board, level 4 finish.
Toilet Room Accessories: Stainless steel, Bobrick Classic series or equal- seat cover dispenser, sanitary napkin disposal and toilet tissue dispenser.
Grab Bars: Bobrick B-6026 Stainless steel, 1-1/2" dia., 36" and 42".
Lavatories: Kohler Archer K-2355 under counter mounted lavatory, ADA compliant.
Faucet: Kohler K-13474 touch-less gooseneck faucet with infrared sensors, AC powered, water-saving vandal-resistant 0.5 gpm aerator. ADA compliant.
Urinal: Toto UT104E high efficiency urinal, 0.5gpf, with infrared sensor flush meter. ADA compliant.
Toilet: Kohler Kingston K-4325 1.28 gpf, high efficiency toilet bowl, top spud, with infrared sensors flush meter & manual flush ability. Mirrors: Vision quality mirrors above lavatories.
Countertops: Caesarstone, ¾" thick, polished finish, drip edge. Matching 4" backsplash.
Toilet Compartments: Wall-hung stainless urinal screens. Ceiling-hung stainless pilasters, doors and panels.
Clothes Hook: Heavy-duty clothes hook with concealed mounting.
Baby changing stations, 1 per restroom.
Solid wood doors w/ aluminum casing.

XIX. Public Counter / Ticketing:
Floors: High quality commercial grade carpet tiles, min. 30% recycled content.
Base: 4" rubber base

Walls: Painted gypsum wall board, level 4 finish.
Ceiling: 2'x2'USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Casework: Solid Surface counter top, with FSC wood veneer panel at façade of the counter.Wood veneer to be FSC certified and AWS premium grade, no sap.
Transaction window: glazing with speak through, stainless steel deal tray.
Solid wood doors w/ aluminum casing.

XX. Storage / Utility Rooms / Janitorial Closets:
Floors: Polished sealed concrete floor.
Base: 6" Rubber base.
Walls: Painted gypsum wall board, level 4 finish.
Ceiling: 2'x2' USG Climaplus acoustical ceiling tile, with Fineline grid DXF.
Painted hollow metal doors, aluminum frame.

XXI. Enclosed Exit Stairs:
Treads and Landings: Concrete filled, painted metal pan stairs. Concrete treads and landings to be sealed.
Walls: Painted impact resistant gypsum wall board, level 4 finish.
Ceiling: Exposed construction, painted.
Handrails: Steel shapes, painted.
Solid wood doors w/ aluminum casing. Fire rating per code.

XXII. Elevators – General:
Floors: Rubber flooring.
Walls: Stainless steel panel system, graffiti proof, such as Forms&Surfaces.
Ceiling: Stainless steel panel system, graffiti proof, such as Forms&Surfaces.

XXIII. Atrium Elevators:
Floors: Rubber flooring.
Walls: 50%Stainless steel panel system, graffiti proof, 50% glass.
Ceiling: Stainless steel panel system, graffiti proof, such as Forms&Surfaces.
Venetian plaster on outside enclosure.

XXIV. Other:
Water Cooler: Haws-Interior use; Haws-Exterior use.
Fire Extinguisher Cabinet: Watrous W-3113-C-G-L-V Recessed cabinet with 3/4" reveal, baked enamel painted steel (select color), door with 6" solar gray glass, silk screened letters. Special detention grade.

c) OTHER COMPONENTS

Concert Hall - Intent Narrative:
The overall intent for this signature performance space is to evoke a powerful, yet simple approach to materials & surfaces. The acoustical narrative clarifies the intent for wall & ceiling surface shaping while this section will describe the visual aesthetic & overall 'feel' of the space.
Much of the vertical wall surfaces will be the exposed structural & acoustically critical concrete mass with highly textured surface. The side arm & choir balcony niches make up the next major part of the scheme and will receive wood surfacing as will the performance platform. The main ceiling surface is intended to be a smooth, monolithic plaster surfacing of the acoustic assembly.

I. Concert Hall finishes:
Floors: High-level ground and stained concrete finish.
Walls: Primary shaped walls of deeply-textured board-form concrete. These walls will be punctuated randomly arranged deep recesses in the concrete. The tapered surround surfaces of these recessed areas will be clad in wood, and the center portion will be a 'slot' light box with backlight. See section views and lighting narrative.
Side arm and choir niches will have structural concrete or non-structural CMU substrate with salvaged/reclaimed wood surface cladding. A portion of the rear wall and balcony railing may receive a highly-textured or perforated wood cladding, see Acoustic narrative.
Ceilings: Primary shaped ceiling of built-up wood joist construction with smooth plaster finish. Adjustable canopy ceiling elements of shaped framing structure and nomex fabric.
Perimeter edge shaping at upper and niche ceilings to be shaped plaster.
Seating: Main floor seating will be monochrome upholstered theater seats.
Railings are comprised of simple glass panels and stainless steel stanchions and top rails.

II. Elevators, Existing:
Modernize and upgrade for reliability and refreshed aesthetic appearance.

i. South Freight -
Modernize equipment, rails, etc. as necessary to improve reliability & functionality.
Replace interior cab finishes.

ii. Central Passenger –
Modernize equipment & cab if necessary, update finishes

iii. Mills Center Passenger –
Replace/modify shaft, rails, etc. to extend service down to 440' floor elevation
Re-use equipment can cab if feasible.

III. Elevators, Typical New:
Provide new machine-room-less traction elevators to provide cost-effective, reliable service to new addition spaces.

i. Support volume freight – 5000lb capacity, sized to physically transport a grand piano.
Cab finishes to be durable but refined enough for passenger use by performers.

ii. Hearth passenger – 3500lb capacity.
High-end manufacturer standard finishes and lighting.

iii. Concert Hall passenger – 2500lb capacity.
High-end manufacturer standard finishes and lighting.

6. LIGHTING

a) CODES AND STANDARDS

The following Codes and Standards will be used in the design of the University of Oregon: Erb Memorial Union Renovation.

- State of Oregon Energy Efficiency Specialty Code
- IESNA Lighting handbook 9th Edition
- IESNA RP-1 American National Standard Practice for Office Lighting
- University of Oregon Campus Construction Standards, CSI Master Format, Third Edition May 2011

TABLE – LIGHTING RECOMMENDATIONS

Area	AMBIENT Illumination Level in footcandles	TASK Illumination Level in footcandles (LED task light)	Target Unit Lighting Power Allowance (w/sf)	Code Lighting Power Allowance (w/sf)
Office / Enclosed (w/ task lights)	20-30	50	.6	.97
Office Open (with task lights)	20-30	50	.6	.93
Conference Meeting	30-40	50	.7	1.11
Classroom / Lecture	30-40	--	.6	1.23
Lobby (Entry)	15-20	--	.85	1.28
Atrium	10	--	.4	
Lounge Spaces within Atrium	20	35	.8	
Concert Hall	Varies	--	varies	
Concert Hall Lobby	15-20	--	2.0	3.24
Retail	30-40	---	1.2	1.5
Dining Area	15-20	--	1.0	1.4
Restrooms	20	--	.6	.82
Stairs	5-10	--	.4	.49
Food Preparation	30 (50 at work zone)	--	.8	1.07
Corridor / Transition	5-10		.4	.41
Active Storage (refrigerated)	20	--	.35	.66
Inactive Storage	15	--	.25	.26
Electrical / Mechanical	25-30	--	.6	1.24

I. Recommended Exterior Illumination:
Entrances 2 – 3 fc
Pathways .8 – 1 fc Stairs / Ramp 1-2 fc

II. Code Required Light Levels:
Elevator Lobby: 10 fc (Code Minimum)
Emergency Egress: 1 fc average for all egress routes
Note: IBC requires rooms without natural illumination to be illuminated to provide an average illumination of 10 fc measured 30" AFF.

b) DESIGN CRITERIA AND SYSTEMS DESCRIPTION

Intent Narrative:
This narrative is divided into three areas: Exterior building lighting, Interior building lighting (new construction) and Interior building lighting renovation areas. A fixture schedule is provided for use in determining level of quality of luminaires to be provided.

I. Exterior Building Lighting:
The University of Oregon: Erb Memorial Union Renovation incorporates outdoor lighting to provide an environment that feels safe and secure to navigate in, while minimizing dark sky trespass and light spill into adjacent areas. Specifically the design is orchestrated to pool light at building entries to highlight the entrance location using light to reinforce way finding. Additional compact fluorescent, low wattage metal halide exterior equipment, and LED fixtures are proposed to be integrated into building canopies and the building architecture to highlight areas and provide for safe navigation. This strategy is used in combination with standard campus street lighting, specialty lighting at the retail entry area, flag pole uplighting specialty lighting at the south lawn terrace and concert hall entry plaza and foundation. Campus standard lighting will be provided at pathways and bicycle ways throughout the site. In addition, wall mounted lighting will be provided at the lighting dock and in the Craft Center court. Recommended illumination is used as a guide only. Fixture placement shall be governed by wayfinding and other site and architectural considerations.

II. Street Lighting (13th Avenue and University Street):
See Site Narrative for additional information. The design will incorporate campus standard street lighting along University Street and 13th Avenue. (Visco poles and LED luminaires). Where possible salvage existing campus poles, retrofit them with new lamps and internal reflectors to minimize dark sky tresspass, repaint poles and reinstall. Existing fixtures to remain shall also be retrofit with new optic package. Provide new globes throughout.

III. Campus Walkways / Plazas:
See Site Narrative for additional information. The walkways, and plaza areas adjacent to the building will be evenly illuminated by campus standard globe style fixtures to provide vertical illumination for safety while minimizing dark sky trespass.). Additionally, walkways will have a series of indirect pole mounted luminaries (*Fixture Type G-1*) to provide general illumination for safety with campus standard bollards integrated with the landscape elements to pool light at stairs and level changes *(Fixture Type G-3)*. Steplighting will be integrated with stairways where appropriate *(Fixture Type G-2)*. Walkways adjacent to the building façade will be illuminated by recessed fixtures in the soffits (*Fixture Type R-1)* or minimal wall lighting on the building facade (*Fixture Type G-2*).

IV. Main Entry at 13th Avenue and Amphitheater:
Building mounted lighting will be provided at the building entrance to supplement existing renovated campus stand lighting that serves to illuminate the amphitheater.

V. Retail Entry:
The retail entry on the north side of the building will be illuminated with specialty lighting integrated with glass shadow boxes to both light merchandise and provide additional lighting for safety. New low level lighting will be provides at the new walkways.

VI. Main Entry to Atrium and overhang at First Floor:
Interior lighting will be provided at the glass entrance to create a welcoming beacon announcing the concert hall. In addition, provide a series of downlights in the soffit between the first and second floors to pool light at the various student entries along the north bar.

VII. Concert Hall Entry Plaza and Fountain Lighting:
Provide uplighting of the sculpture / water feature to create a beacon at the Concert Hall entry. Lighting will also be provided at the glass entrance to create a welcoming beacon announcing the concert hall. Lighting will also be integrated in the wood shadow box wall to create a soft glow on the wood with the ability to change the color and intensity to announce an event. (LED color changing)

VIII. Emerald Axis (between Concert Hall and Carson Hall)
Provide internal illumination for the stairs to provide some supplemental lighting for the landscape. In addition, provide campus standard walkway lighting along the Emerald Axis.

IX. South Lawn and Promenade:
Provide lighting in the underside of the program "boxes" to illuminate entries and pool light on the south courtyard terrace. Provide low level bollards along the 1:20 walk and along the wall separating the reinforced lawn from the south wall.

X. Loading Dock and existing vehicle parking:
Provide energy efficient shielded illumination on the underside of the loading dock canopy, which is supplemented by wall mounted luminaries integrated with the site walls.

XI. Craft Center Outdoor Court:
The craft center covered area shall be illuminated with efficient shielded luminaires. The uncovered portion of the outdoor court shall be illuminated by wall mounted fixtures with step lights in the wall at the stairs and ramps.

c) INTERIOR BUILDING: RENOVATION

Intent Narrative:
Lighting in areas to remain largely unchanged shall be upgraded with new energy efficient ballasts and new super T8 lamps. Use of LED technology will be re-evaluated at the time the project is reinstated. The university is pursuing a grant for this work, so the work should be priced as a separate alternate. Areas where lighting will be renovated instead of wholly replaced include the Ballroom and Associated conference rooms in the existing building, the offices on the mezzanine level, The Mills Center, the Taylor Lounge, bathrooms on Level 53 and back of house mechanical spaces to remain.

d) INTERIOR BUILDING: NEW CONSTRUCTION

Intent Narrative:
The overall intent for the building lighting is that it serves as a unifying feature for the building – lighting should provide uniformity from floor to floor when viewed from the exterior. Spaces adjacent to exterior of the building (in daylight zones) are to be treated similarly with the primary illumination serving to brighten the ceiling using visible but architecturally neutral fixtures. Circulation spaces adjacent to the atrium to be lit with recessed or hidden / indirect sources. Visible decorative style fixtures will be limited to the lobby / atrium and other special areas, such as the "box" conference areas along the south wall.

Maximizing daylight in the interior environment (both work areas and public space) is a primary goal of this project. To that end ceilings will be shaped to maximize daylight and should have a minimum light reflection co-efficient of 80%. Care should be taken to minimize glare particularly in the atrium areas.

Sources for various lighting equipment will be evaluated by the design team and the most energy efficient, cost effective yet trusted and proven technologies will be specified for the project. Lighting will be selected to favor both energy efficiency and low mercury sources, while understanding cost premiums. Lighting in hard to reach areas will be limited. Where it is not possible to illuminate the space from fixtures reachable with a ladder / small lift, extremely long life sources will be selected.
See electrical narrative for building controls.

For the SD phase of the project, assume the project will incorporate a 3100 lumen super T8 lamp / ballast combination with a ballast factor of .71, except where noted otherwise. Use 3500K 85CRI lamps throughout. Low mercury lamps are to be used throughout. LED lamps are to have a color temperature of 3500 K with a variation of + /- 2 ellispses. Efficiency (and cost) of LED lighting will re-evaluated when the project restarts.

I. <u>Public Lobby Areas:</u>
The design of public spaces will incorporate the principle that people are attracted to lit surfaces to direct people towards important destinations in the lobby (elevators, information kiosk, etc.) creating movement and energy in the space**.** Provide increased brightness at entrance portals and interior foyers to provide a zone of transition when moving from the bright light of day into building interiors or the reverse at night. Illuminated surfaces are proposed to balance the brightness of daylight and avoid high contrast ratios between the daylit and non daylit parts of the space. Pool light at each elevator doorway from recessed lighting equipment located in the slot adjacent to the elevator wall. (Illumination levels enforced by Oregon inspectors is 10 fc at the threshold. Use light to emphasize selected objects in the room – artwork, building signage, and /or special features, while providing functional light for tasks at security areas and reception counters.

II. <u>Atrium:</u>
The atrium will be lit to appear to glow from within using fixtures that are designed to be integral with the skylights with an indirect component that washes the roof structure of the atrium to balance the brightness of daylight and avoid high contrast ratios between the roof and the skylight. Supplement with light from LED fixtures integrated with ramps and bridges above. Ambient lighting in the atrium will be provided by column integrated fixtures. In addition, the walls of the classroom "pods" will be illuminated with linear wallwashers (Winona, Ellipitar or similar) to provide vertical illumination in the space and

to elevate the potential contrast between the bright skylit area and the darker solid ceiling areas.

III. Conference Rooms:
Provide a combination lighting system to compliment multiple functions / sizes of rooms. Perimeter rooms should have a pendant mounted direct /indirect fixtures *(Fixture Type L-1)* similar to open office areas with dimmable downlights integrated between pendant fixtures *(Fixture Type R-3d)* Conference rooms along the south wall "boxes" shall include an allowance of $5000 for decorative lighting to be designed. Illuminate presentation walls using recessed wallwashers *(Fixture Type L-3)* Provide undercabinet illumination at built in cabinets. See narrative for open office area for fixture information.

Controls: Controls similar to enclosed office areas. See electrical narrative.

IV. Circulation Areas:
(Circulation areas include spaces adjacent to open office areas, corridors, upper floor elevator vestibules etc.)

Use energy efficient wall wash style luminaires to improve perception of brightness without increasing energy consumption. Linear wall wash luminaries serve to balance the brightness of windows opposite in areas adjacent to open office areas and to decrease the apparent length of corridors. Pool light at student union entries and illuminate walls at vertical circulation areas to encourage way finding by directing occupants visually to important areas. Provide direct illumination at office suite entries to provide focus and give punctuation between entry and remainder of corridor.

V. Open Office Areas:
Use pendant mounted linear direct/indirect luminaries Super T8 system with dimmable ballasts (*Fixture Type L-1*) to maximize overall brightness and enhance a feeling of spaciousness with direct component to supplement task lighting at workstations. Energy efficient direct / indirect luminaries will be used to reinforce a sense of visual clarity in the open office areas, by providing higher luminance on the ceiling and in the center of the room. Ceiling brightness also serves to balance the apparent brightness of the windows and reduce contrast ratios in the room. Fixtures should be circuited separately to allow for dimming of fixtures in the daylight zone using a daylight sensor. Dimming ballasts allow for maintenance of an even brightness and are preferred over a stepped dimming approach. Fixtures should be placed relative to the architecture of the space (i.e. in a regular rhythm relative to window), rather than in an even pattern or relative the furniture which could be changed. Architectural ceiling panels (or material) changes that respect the luminance pattern of fixtures are encouraged to reinforce the character defining spatial aspects provided by lighting. Fixtures will need to be carefully coordinated with radiant sails (where applicable) to ensure adequate reflectance is achieved. Excessive difference in ceiling brightness (which can cause veiling reflections in computer screens) needs to be controlled through the use of fixtures with an optical assembly that produces a batwing distribution and by maximizing ceiling height. Ceiling uniformity on adjacent surfaces consisting of like materials should have a brightness ratio of 4:1 maximum. Light levels should anticipate a task ambient approach will be used with fixtures built into the furniture.

Controls:
Luminaires in the daylighting zone will be controlled thru the low voltage system to provide automatic off control and will also include a P/E cell for zone controlled automatic daylight harvesting. Additionally, manual dimmers could be installed by zone to enable

occupants to further reduce the illumination level in their respective zones. Increasing the zone illumination level above the P/E cell set point would not be allowed. See electrical narrative.

VI. Enclosed Office Areas:

Enclosed office areas located on the perimeter of the building should employ a similar approach to open office areas. (See narrative above.) To minimize visual clutter in smaller offices, consider wall mounted luminaries. (*Fixture type L-2*). Consider additional fixtures to highlight walls for potential artwork, especially for larger / department head offices.

Controls:
A combination switching and dimming system will be used where the space type dictates. Manual switches, wall box dimmers and preset dimmer systems will turn lights on and off as well as provide manual dimming in some spaces. Occupancy sensors will turn light off automatically when the spaces are unoccupied. These devices can also be designed to have an automatic on protocol. There have been studies that indicate if some lighting turns on when the room is entered, most occupants will not adjust it. The strategy is that the occupancy sensor would turn on a reduced lighting load in the space and if more illumination is desired, the occupant has the ability to increase the level. The most cost effective means of accomplishing this scenario would be to dual level switch or step dim the space. The occupancy sensors will be provided with an additional set of contacts for use by the mechanical control system. See electrical narrative.

VII. Egress Stairs:

Illuminate enclosed stairs by washing end walls of stair or by backlighting stair itself. The normal lighting condition will be 10% output during non-occupied and non-emergency scenarios. (*Fixture Type L-6)*

The lighting system will brighten to full light output when triggered by occupancy sensors, door opening or power failure. Failure will be to full on. For stairs place a wall mounted luminaire at every landing.

Controls:
Occupancy sensors will be used to reduce light levels (to 10%) when the space is unoccupied. Stairs adjacent to glazing will be controlled by a daylight sensor so when daylight is present in adequate quantities electric lighting remains off. See electrical narrative.

VIII. Work Rooms / File / Copy:

Provide overall ambient illumination from recessed indirect non-planar fixtures in ceiling. (*Fixture Type L-5*). Work rooms that are adjacent to corridors or other open spaces may use a borrowed light from the adjacent space. Provide undercabinet fluorescent at work counters. (*Fixture Type L-7).*

Controls:
10 minute timed switches or occupancy sensors in conjunction with manual switches will be used. Downlights will be on and controlled by the relay system. Recessed lighting will be connected to local occupancy sensors. This strategy will eliminate the issue of compact fluorescent sources requiring time to “warm up”. See electrical narrative.

IX. Toilet Rooms:

A combination of linear fluorescent and compact fluorescent equipment will be installed. Over the fixture wall install a linear wallslot (*Fixture Type L-11*) with vanity fixtures designed to be integral with the mirror (*Fixture Type W-1*). Downlights (*Fixture Type R-4)* at vestibule and in deep sections of toilet rooms. Outside the toilet room illuminate wall niche with recessed wallwashers. *(Fixture Type R-6)* Occupancy sensors will be included that control the linear fluorescent lighting to mitigate CFL warm up issues. The down lights will remain on during building operational hours and be turned off at night by the relay system.

Controls:
10 minute timed switches or occupancy sensors in conjunction with manual switches will be used.

X. Back of House Areas:
Back of House areas include mechanical, electrical, telecom, maintenance, stairs and other ancillary spaces. These areas will be illuminated with functional, energy efficient luminaires either pendant or surface mounted depending on space conditions. *(Fixture type L-8)*.

Controls:
10 minute timed switches or occupancy sensors in conjunction with manual switches will be used.

XI. Concert Hall:
See theatrical narrative for performance lighting. The lighting listed below is intended for ambient and wayfinding / egress. Provide step lighting integrated with the seating for low level egress lighting. Provide linear fixture integrated with the wood wall to wash the wood in the side arms. Lighting will also be integrated with the punched window openings on the east wall and will be integrated with the ceiling reflector positions. Back of house lighting in the mechanical spaces will be as noted above. Green room and dressing room lighting will be surface mounted decorative lighting that provides a festive atmosphere that provides illumination directly on the face.

Controls:
Ambient and egress lighting shall be integrated with the performance lighting control system. Provide a minimum of 6 circuits.

XII. Retail:
Provide a combination of LED track fixtures to highlight merchandise and surface mounted direct indirect fixtures to provide general ambient. Wallwashers shall be provided at the exterior to of the space to illuminate wall mounted merchandise with specialty decorative lighting at the cash wrap to assist in wayfinding and highlight the sales area.

Controls:
Retail space should have a separate control system that provides a couple of settings: Bright / Typical Day. After hours when convenience store is still open, cleaning and fully closed are minimum settings.

XIII. Food Service:
Provide decorative ambient lighting (most likely pendants) that reinforce theme of the food service to supplement neutral background ambient lighting.

Controls:
Part of building system.

TYPE	CONTRACT OR PRICE	DESCRIPTION	LAMPS	FINISH	REMARKS
G-1	$4,118.13	**Pole Mounted Direct/ Indirect**	39 watt LED	Color to	
		Se'lux RSA 1 RP12 L40 3000 SP XX	3000 K	selected	
		or approved equal			
G-2	$435.45	**Ground Mounted LED Uplight**	(1) 6 watt	Black	
		Cooper Sanibel 301 6LED3021 xx BK LSL	LED		
			21 deg bm		
			3000 K		
		or approved equal			
G-3	$1,028.91	**LED Bollard**	18 watt LED	Color to	
		Se'lux Notch NT 3.5 L18 35 SP xx	3500 K	selected	
		or approved equal			
G-4		**LED Steplight**	11.2watt LED		
		BEGA 2384 LED BK	3000 K		
		or approved equal			
G-5	$2,569.17	**Light Column (Indirect)**	39 w T6 G12 M	Color to be	
		Se'lux EXR 8 R5 PC H039T6 830 SP xx REC	3000 K	selected	
		or approved equal			
L-1	$363.00	**Pendant Mounted Direct / Indirect**	(2) F32T8	white	Non - daylight zone
		Peerless BRM9 2 32 SPR SSH xx Ft Rxx xx GEB10 SCT	3500 K		Open Office areas
		Focal Point FTWS M1 2 T8 1C xx S J24 WH			* Emergency as required
					Fixture Length per plans.
		or approved equal			Verify suspension length

L-1D	**$507.00**	**Same as L-1 except with dimming ballast**	(2) F32T8	white	Daylight zone - Open office areas
		Peerless BRM9 2 32 SPR SSH 12 ft R12 xx ADEZ SCT	3500 K		use Mark VII ballasts
		Focal Point FTWS M1 2 T8 1C xx D J24 WH			* Emergency as required
					Fixture Length per plans.
		or approved equal			Verify suspension length
L-2	**$363.00**	**Wall Mounted Fluorescent Direct / Indirect**	(2) F32T8	White	
		Peerless BRW9 2 32 WHR SSH xx Ft Rxx xx GEB10 SCT	3500 K		* Emergency as required
		Focal Point FTWW M1 2 T8 1C xx S J24 WH			Fixture Length per plans.
					Verify suspension length
L-3	**$369.51**	**Linear Wallwasher recessed asymmetric**	(1) F32 T8	white	Presentation walls at Classroom and office areas.
		Focal Point SEEM4 FSM4A CL 1T8 1C xx S G2 WH	3500 K		Verify ceiling grid type
		or approved equal			
L-3D	**$487.71**	**Same as L-3 except dimmable**	(1) F32 T8	white	Presentation walls at Classroom and office areas.
		Focal Point SEEM4 FSM4A CL 1T8 1C xx D G2 WH	3500 K		Verify ceiling type
		or approved equal			
L-4	**$348.36**	**Linear Fluorescent (4') recessed symmetric**	(1) F32 T8	white	Corridors /elevator lobbies / open office circ.
		Focal Point SEEM 4 FSM4 FLXP 1T8 1C xx S G2 WH	3500 K		Verify ceiling type
		or approved equal			
L-5	**$167.96**	**2 x 4 Recessed Direct / Indirect**	(2) F32 T8	white	Work Rooms and Classroom support areas
		Focal Point FLU 24 B 2T8 S xx G PS WH	3500 K		alternate in closed offices at interior
		Lithonia 2AV G 2 32 MDR MVOLT			Verify ceiling type
		or approved equal			
		or approved equal			
L-6	**$354.58**	**Surface mounted Stair Fixture**	(2) F32 T8	white	
		Cooper STAIRLITE 2 STL2 4 2F032 xx	3500 K		

		or approved equal			
L-7	**$93.31**	**Undercabinet Fluorescent**	(1) F32 T8	white	
		Lithonia 2UC 132 MVOLT GEB10	3500 K		
		Metalux 8632EB			
		Columbia UC 48 1 32 E U			
		or approved equat			
L-8	**$55.99**	**Two lamp Fluorescent Strip (wire guard w/ assym. refl)**	(2) F32T8	white	Back of House
		Lithonia C 2 32 MVOLT GEB10RS with WGCASR	3500 K		
		Metalux 1424-REB1with wireguard			
		Columbia CS 4 2 32 E U CSWG4			
		or approved equal			
L-9	**$39.81**	**One Lamp Fluorescent Strip (Side Mount)**	(1) F32 T8	white	In light coves
		Lithonia SM 1 32 MVOLT GEB10	3500 K		
		Metalux			
		Columbia			
		or approved equal			
L-10	**$386.93**	**2 Lamp Linear Direct (6") Dimming (8'-0")**	(2) F32T8	white	Lecture Halls and Multipurpose room
		Focal Point FAV6 FL 2T8 1C xx D G2	3500 K		Verify ceiling tile
		NeoRay 7A 696 R 2 T8 ETG xx DB SI S22			NOTE: All L-10 fixtures are Dimming.
		or approved equal			
L-11	**$337**	**Fluorescent strip in built in enclosure**	**(1) F32T8**	white	Provide fill in section at mitered corner and at end
		Neoray 71 1 T8 xx 120 EB S62	3500 K		See detail. At Elevator lobbies
		or approved equal			
R-1	**$149.30**	**Recessed Downlight**	(1) F26 TRT	Clear Alza	Exterior Downlight
		Gotham AF 1/26 TRT 6CB LD CGL MVOLT	3500 K		
		Portofolio			

		or approved equal			
R-2	**$159.30**	**Recessed Washlight**	(1) F26 TRT	Clear Alza	Exterior Downlight
		Gotham AFW 1/26 TRT 6CB LD CGL MVOLT	3500 K		
		Portofolio			
		or approved equal			
R-3	**$115.95**	**Recessed Downlight (Horizontal Lamp)**	(2) F18 DBX	clear alzak	Typical at Corridors
		Lithonia Gotham AF 2/18 DTT 6AR LD MVOLT	3500 K		
		Portfolio C6218 6251 LI			
		Edison Price DPLX 218/6 xx COL			
		or approved equal			
R-3B	**$118.44**	**Same as R-3 except 26 watt**	(2) F26 DBX	clear alzak	
		Lithonia Gotham AF 2/26 DTT 6AR LD MVOLT	3500 K		
		Portfolio			
		Edison Price			
		or approved equal			
R-3C	**$129.64**	**Same as R-3 except 42 watt**	(2) F42 TRT	clear alzak	
		Lithonia Gotham AF 2/42 TRT 8 AR LD MVOLT	3500 K		
		Portfolio			
		Edison Price			
		or approved equal			
W-2	**$300.00**	**Wall Sconce at Toilet Room Vanity**	(1) F32 T8	white	
		Shaper 608	3500 K		
		or approved equal			
X-1	**$152.00**	**Edge Lit Exit sign**	LED	Brushed	Front of House
		Lithonia Precise LRP x GC xx 120/277		Aluminum	
		or approved equal			

X-2	**$71.00**	**Surface Mounted Exit sign**	LED	White	Back of House
		Lithonia Quantum LGM S W x G 120/277			
		or approved equal			

7. GENERAL A/V + ACOUSTICS

a) AUDIO-VISUAL SYSTEM PROGRAM

b) ARCHITECTURAL ACOUSTICS

c) HVAC NOISE MITIGATION

LISTEN ACOUSTICS™
acoustical and audio/visual systems engineering

University of Oregon EMU
75% SD Audio-Visual System Program
March 16, 2011

The following document provides descriptions of the functionality of the audio-visual systems associated with the U of O EMU Project. Upon review, coordination and approval by U of O and the Architect, these descriptions will be used to develop the specific design documents for the described systems.

General Notes:

- Listen Acoustics will work with the Architect, CMET, and UO Information Services to provide complete AV systems programming, design and documentation
- All designs will be per UO AV Standards and Guidelines, Third Edition, May 2011
- All AV equipment shall be Owner furnished, unless otherwise directed in the design.

Ground Level:

Atrium/Lobby

System Functionality:

The Atrium will support presentations in various locations using portable projection and audio equipment. Provision for power and data connectivity will be provided. Provision for input panels and routing of AV inputs and outputs to control and equipment locations will be provided.

Video Media: Portable Bluray/ DVD, and computer video, and document camera via cart-mounted or otherwise portable projection. If possible one larger projection screen will be permanently located on a presentation wall.

Audio: The system will provide speech reinforcement and playback of audio sources via portable speakers. Potential additional permanently mounted speakers will be explored.

Operation:

Typical control will be at the portable equipment itself. Built-in system operation will be via a touch screen control panel and audio/video controllers located at logical presentation control locations.

Equipment Locations:

- ☐ Wall (or possibly floor) boxes will be provided at strategic locations, with conduit pathway, power, data routed to remote rack and control locations.
- ☐ If possible given the architectural design, a large projection screen will be located at the a "front wall" area for presentations
- ☐ Speakers will be located throughout the atrium to provide background music and potentially speech reinforcement in certain areas

404 NW 10th Ave
Suite 200
Portland, OR 97209
P: 503-241-5255
F: 503-213-6232

www.listenacoustics.com

1100 Dexter Ave N
Suite 100
Seattle, WA 98109
P: 206-223-1390
F: 206-260-7171

System Components Overview:

Audio System

- ☐ Power Amplifiers: Sufficient power amplification to power the speakers will be included.
- ☐ Audio Processor: The processor will provide speaker sound quality, protection, and equalization.
- ☐ Speakers: The presentation and background speakers will be capable of reproducing audio sources and in some areas reinforcing speech.

Video System

- ☐ Video Sources: Bluray/DVD, Document Camera, CATV, local computer, and Laptop sources.
- ☐ Inputs for laptop video will be provided via portable interface boxes.
- ☐ All control functions will be provided via the touch screen control and on the front of audio and video consoles.
- ☐ Source Selector/Switcher: All video equipment outputs will route through a switcher to allow selection of desired source for projection.
- ☐ Computer/Laptop Interface: A local laptop will be able to be projected on the large screen via a computer video interface.
- ☐ Video Projector: The video projector will be capable of projecting in full room daylight (the best results occur if the windows are darkened).
- ☐ Screen: The screen will be motorized to retract when not in use. The projection screen will have a 16:9 aspect ratio, with a maximum vertical height appropriate to the height of the space.

Small Conference Rooms

System Functionality:

These rooms will serve as multimedia presentation spaces for a variety of small group meetings, presentations, lectures, and other group functions. These rooms will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A LCD flat panel monitor will be located on the end wall.

Audio: Through the LCD speakers

Operation:

Operation will be via a wall mounted remote control

Equipment Locations:

An LCD panel will be mounted at the front of the room. A floor box will allow connection of Laptop video and audio.

System Components Overview:

Audio System

- ☐ Speakers: The LCD speakers will be capable of reproducing audio sources.

- □ Audio conferencing will be provided via the phone system.

Video System

- □ Video Source: Inputs for laptop video will be located in a floor box.
- □ Source Selector/Switcher: The wall remote will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ LCD Flat Screen monitor: The LCD flat screen will be capable of projecting in full room daylight.

Medium Conference Rooms

System Functionality:

These rooms will serve as multimedia presentation spaces for a variety of small group meetings, presentations, lectures, and other group functions. These rooms will utilize UO standard presentation podiums and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen or LCD flat panel monitor will be located on the end wall, depending on size requirements for each space.

Audio: Through two front speakers, and potentially via overhead speakers if warranted

Operation:

Operation will be via control at the lecture podium

Equipment Locations:

A projection screen or LCD panel will be mounted at the front of the room. A floor box will allow connection of Laptop video and audio.

System Components Overview:

Audio System

- □ Speakers: The front speakers will be capable of reproducing audio sources.
- □ Audio conferencing will be provided via the phone system.

Video System

- □ Video Source: Inputs for laptop video will be located in a floor box.
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ LCD Flat Screen monitor: The LCD flat screen will be capable of projecting in full room daylight.
- □ Projection screen/Projector: 3000 lumen minimum projection light output will be provided

Large and Extra-Large Conference Rooms

System Functionality:
These rooms will serve as multimedia presentation spaces for a variety of larger group meetings, presentations, lectures, and other group functions. These rooms will utilize UO standard presentation podiums and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers if warranted

Operation:
Operation will be via control at the lecture podium

Equipment Locations:
A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System
- □ Speakers: The front speakers will be capable of reproducing audio sources.
- □ Ceiling Speakers will provide voice reinforcement.
- □ Audio conferencing will be provided via the phone system.

Video System
- □ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Craft Center

System Functionality:
The craft Center will have background music, video playback with audio, and voice reinforcement. The rooms will utilize UO standard presentation podiums.

Video Media: Computer video from a laptop source. A projection screen will be located on the "front" wall

Audio: Distributed, overhead speakers

Operation:
Operation will be via control at the lecture podium

Equipment Locations:
A floor box will allow connection of Laptop video and audio. Video projector will be located at the ceiling.

System Components Overview:

Audio System
- □ Speakers: The ceiling speakers will be capable of reinforcing speech and playback of audio sources.

Video System
- □ Video Source: Inputs for laptop video will be located in a floor box and at the presentation podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ LCD Flat Screen monitor: The LCD flat screen will be capable of projecting in full room daylight.
- □ Projection screen/Projector: 3000 lumen minimum projection light output will be provided

Computer Center

System Functionality:
These rooms will serve as multimedia presentation spaces for computer presentations, lectures, and other group functions. These rooms will utilize UO standard presentation podiums and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from local computers and a presentation laptop source. A projection screen or LCD flat panel monitor will be located on the end wall, depending on size requirements for the space.

Audio: Through two front speakers, and potentially via overhead speakers if warranted

Operation:
Operation will be via control at the lecture podium

Equipment Locations:
A projection screen or LCD panel will be mounted at the front of the room. A floor box will allow connection of Laptop video and audio.

System Components Overview:

Audio System
- □ Speakers: The front speakers will be capable of reproducing audio sources.

Video System

- □ Video Source: Inputs for video will be located in a floor box and at the podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ LCD Flat Screen monitor: The LCD flat screen will be capable of projecting in full room daylight.
- □ Projection screen/Projector: 4000 lumen minimum projection light output will be provided

Media Center

System Functionality:
This room will serve as multimedia presentation space for a variety of larger group meetings, presentations, lectures, and other group functions. These rooms will utilize UO standard presentation podiums and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers if warranted

Operation:
Operation will be via control at the lecture podium

Equipment Locations:
A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System

- □ Speakers: The front speakers will be capable of reproducing audio sources.
- □ Ceiling Speakers will provide voice reinforcement.

Video System

- □ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Pub and Coffee House

These areas will likely follow the design standard and budgets of the commercial tenants.

Holden Center

No AV is planned for this space at this time.

Level 1:

Multi-Functional Auditorium

The Multi-functional Auditorium will serve as an event space and a multimedia presentation room for classes, meetings, banquets, informal student social time, musical events, dance, and other large group functions.

The Audio systems will provide audio reinforcement of speech, music, and playback of Bluray/DVD, CD, TV, iPod and computer sources. Additional audio coverage will be provided in the lobby and ancillary spaces via ceiling speakers.

The basic video projection functions the room will be to project large screen video images from various video sources, including Bluray/DVD, cable TV, computer, and document cameras. The projection syste, will be front screen, large format.

Operation:

The goal of the system operation concept is to allow two types of operation: 1.) simple operation mode for a non-specialist, and 2.) advanced control by an AV specialist or trained staff. In the simple mode, the systems will be designed such that the majority of operations will be seamlessly integrated and easy to understand by the user, and only minimal adjustment will be necessary. For instance, up to four microphone inputs will be automatically mixed together and adjusted, and the overall level of the system will account for the number of microphones in use, so an operator will not need to constantly raise and lower the volume. The video switching will be automated, with operator over-ride to select the active input (e.g. laptop presentation, or Bluray/DVD playback). A touch-screen remote control will be integrated into the system which further simplifies the operation.

In the advanced control mode, the operator will have full control over all of the system parameters. This mode is essential for complex musical events, presentations, and meetings requiring multiple users and input types. Control for the advanced mode will be provided in a control booth location and via a rolling, locked rack stored in a secure location.

Equipment Location:

The speakers will be suspended at the front of the room, covering the seating/audience area. The video projector will be hung from the rear wall or in the booth, and will project on the screen at the front of the room. The fixed main equipment rack will be located in a storage room. The rack will house equipment not requiring user inputs, and will have a locking security door. A rolling portable rack for user-accessible equipment will be provided for both portions of the room, which will plug in at the control location at the rear of both of the rooms.

Hearing Impaired Systems:
The sound systems will have assisted listening systems sufficient to cover the required areas and nominal number of participants.

System Components Overview:

Audio System

- ☐ Microphones: A total of 48 wired microphone inputs will be provided in the wall input panels at the front of the main room, distributed along the front wall. In addition, 8 channels of wireless microphones will be provided. The smaller divided room will have 16 wired microphones and 4 wireless microphones.
- ☐ Audio Mixer: An automatic microphone mixer will provide level control of a small number of microphones without the need for an operator in both areas, and a function for combining both areas into one room. An additional fully-controllable 40 channel mixer will be provided for the main room and a 16 channel mixer will be provided for the smaller room to allow for trained staff operation of the systems.
- ☐ Power Amplifiers: Sufficient power amplification to power all speakers will be included.
- ☐ Audio Processors: The speaker sound quality will be optimized for the rooms, and the speakers will be protected from being damaged via the system audio processors.
- ☐ Main Speakers: The speakers will be capable of reproducing and reinforcing full-range audio sources. A sub-woofer is planned for deep bass reproduction, which can be eliminated if this is not a requirement for the room.
- ☐ Lobby Speakers: Sound from the will be available in the lobby via speakers mounted high on the wall or ceiling.
- ☐ Audio Recorder: Recordings of proceedings will be possible via a digital audio recorder.
- ☐ Input Panels: Input panels will be provided near the front of the main room and smaller room to facilitate video and audio source inputs.

Video System

- ☐ Video Sources: DVD, Document Camera, and Laptop sources. Inputs for laptop video will be located at the front of the main room, control room, and at the portable mix location.
- ☐ Source Selector/Switcher: All video equipment outputs will route through a matrix switcher or switchers to allow selection of desired sources for projection on the various screens. The switcher will allow for automated switching, or can be manually switched if the operator prefers.
- ☐ Computer/Laptop Interface: The presenter's laptop will be able to be projected on the large screen via a computer video interface. This device will either be a stand-alone device permanently-mounted as part of the input panel.
- ☐ Video Projectors: The video projectors will be capable of projecting with moderate lighting in the room. Each projector will be capable of projecting a different or the same image.
- ☐ Screens: The main screens will be motorized to retract into housings and/or the ceiling when not in use. The screens will be able to be viewed from most angles with minimal light drop-off. The size and type of screen will be developed in conjunction with the Architect in the Design Development phase.

- Additional video panels along all walls will be provided for small group interaction and viewing. These panels will be available for local laptop input, video game input, and DVD input via a simple wall input panel. Control will be via a simple wall control.

Remote Control System

- Wall-Mounted Remote: the remote control will be a touch screen remote with all AV system functions available and organized into logical, simplified operations.
- Control Brain: All AV components will be controlled by the central control unit(s), such that nearly all functions will be available for control, if needed. Macro functions will be programmed to do multiple operations with the touch of one button (for instance, pushing the "presentation mode" button can lower the screen, select the computer input as the default, and adjust the audio system).

Small, Medium, Large Conference Rooms

See ground level descriptions

Mezzanine/Mills Center Plan

Mills Center

System Functionality:

The AV for this room will provide multimedia presentation functions for a variety of larger group meetings, presentations, lectures, and other group functions. The room will utilize the UO standard presentation podium and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers

Operation:

Operation will be via control at the lecture podium

Equipment Locations:

A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System

- Speakers: The front speakers will be capable of reproducing audio sources.
- Ceiling Speakers will provide voice reinforcement.
- Audio conferencing will be provided via the phone system.

Video System

- ☐ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- ☐ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- ☐ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- ☐ Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Level 2 Plan

Small, Medium, Large Conference Rooms

See ground level descriptions

Concert Hall VIP Lounge/EMU Board Room

System Functionality:

This room will serve as a executive board room and for VIP group meetings, presentations, lectures, and other group functions. These rooms will utilize UO standard presentation podiums and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers if warranted

Operation:

Operation will be via control at the lecture podium

Equipment Locations:

A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System

- ☐ Speakers: The front speakers will be capable of reproducing audio sources.
- ☐ Ceiling Speakers will provide voice reinforcement.
- ☐ Audio conferencing will be provided via the phone system.

Video System

- ☐ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- ☐ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- ☐ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.

- Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Pre-function Space

System Functionality:
The AV for this area will provide audio and video carryover from the Concert Hall.

Video Media: LCD panels showing information and live video from the Concert Hall

Audio: Live audio, background music, and announcements via overhead speakers

Operation:
Operation will be via control at a locked control location and from the Concert Hall control room

System Components Overview:

Audio System
- Speakers: The speakers will be capable of reproducing audio sources.

Video System
- LCD Flat Screen monitors: The LCD flat screens will be capable of projecting in full room daylight.

Gumwood Room
System Functionality:
The AV for this room will provide multimedia presentation functions for a variety of larger group meetings, presentations, lectures, and other group functions. The room will utilize the UO standard presentation podium and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers

Operation:
Operation will be via control at the lecture podium

Equipment Locations:
A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System
- Speakers: The front speakers will be capable of reproducing audio sources.
- Ceiling Speakers will provide voice reinforcement.
- Audio conferencing will be provided via the phone system.

Video System

- □ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Ballroom

System Functionality:

The AV for this room will provide multimedia presentation functions for a variety of larger group meetings, presentations, lectures, and other group functions. The room will utilize the UO standard presentation podium and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers

Operation:

Operation will be via control at the lecture podium

Equipment Locations:

A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System

- □ Speakers: The front speakers will be capable of reproducing audio sources.
- □ Ceiling Speakers will provide voice reinforcement.
- □ Audio conferencing will be provided via the phone system.

Video System

- □ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Oak and maple Rooms

System Functionality:

These rooms will serve as multimedia presentation spaces for a variety of small group meetings, presentations, lectures, and other group functions. These rooms will utilize UO standard presentation podiums and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen or LCD flat panel monitor will be located on the end wall, depending on size requirements for each space.

Audio: Through two front speakers, and potentially via overhead speakers if warranted

Operation:

Operation will be via control at the lecture podium

Equipment Locations:

A projection screen or LCD panel will be mounted at the front of the room. A floor box will allow connection of Laptop video and audio.

System Components Overview:

Audio System

- □ Speakers: The front speakers will be capable of reproducing audio sources.
- □ Audio conferencing will be provided via the phone system.

Video System

- □ Video Source: Inputs for laptop video will be located in a floor box.
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ LCD Flat Screen monitor: The LCD flat screen will be capable of projecting in full room daylight.
- □ Projection screen/Projector: 3000 lumen minimum projection light output will be provided

Level 3 Plan

Small Conference Rooms

See descriptions for ground floor conference rooms above

Multipurpose Rooms

System Functionality:

The AV for these rooms will provide multimedia presentation functions for a variety of larger group meetings, presentations, lectures, and other group functions. The room will utilize the UO standard presentation podium and will provide audio conferencing through the phone system, separate from the AV system.

Video Media: Computer video from a laptop source. A projection screen will be located on the end wall

Audio: Through two front speakers, and via overhead speakers

Operation:
Operation will be via control at the lecture podium

Equipment Locations:
A projection screen will be mounted at the front of the room. A floor box will allow connection of UO Podium video, control and audio.

System Components Overview:

Audio System
- □ Speakers: The front speakers will be capable of reproducing audio sources.
- □ Ceiling Speakers will provide voice reinforcement.
- □ Audio conferencing will be provided via the phone system.

Video System
- □ Video Source: Inputs for video inputs and outputs will be located in a floor box and at the presentation podium
- □ Source Selector/Switcher: The podium remote control will allow switching of video sends.
- □ Computer/Laptop Interface: A laptop will be able to be projected on the screen via a computer video interface.
- □ Projection screen/Projector: 6000 lumen minimum projection light output will be provided

Information Video Displays

System Functionality:
LCD screens will be provided for information display in specified locations throughout the building.

Video Media: Computer video from a desktop computer at the equipment closet or reception desk will provide content to the LCD screens

Operation:
Operation will be via a handheld remote and content will be controlled via the computer.

Equipment Locations:
LCD panels will be mounted on the wall. A remote wall box will allow connection of computer video.

System Components Overview:

Video System
- □ Video Source: Inputs for video will be located in a wall box.
- □ Source Selector/Switcher: The LCD remote will allow switching of video sends, if needed.

- Computer Video Interface: Computer video will be able to be shown on the LCD via a computer video interface.
- LCD Flat Screen monitor: The LCD flat screens will be capable of projecting in full room daylight.

General Infrastructure Requirements

Conduit, Power, and Grounding will follow UO Technology Standards guidelines.

LISTEN ACOUSTICS™
acoustical and audio/visual systems engineering

University of Oregon EMU
75% SD Architectural Acoustics Narrative
March 16, 2011

This report presents design narrative recommendations for architectural acoustics in the University of Oregon EMU project. The report presents the recommended criteria for each space in the building, and describes the preliminary recommended measures to achieve these criteria based on the most recent drawings and sketches.

General Notes:

- See the attached plan markups for wall type indications for all areas. Where no wall is indicated, a standard wall is acceptable. Upgraded doors are indicated with red circles. These doors will either be acoustical door/frame systems (in the most critical doors), or upgraded door seals on solid core wood or metal doors.
- Careful attention will be given to the acoustical performance of each wall surface, ceiling plans, and floor finish, per UO Campus Standards, Third Edition May 2011
- Listen Acoustics will work with the Architect and CMET to provide a complete acoustical analysis and recommendations.
- All indicated upgraded "door seals" should include the following seals:
    - Perimeter seals: Pemko 290_S
    - Door Bottom: Pemko 412_N or 412_PKL
- ACT ceilings should be NRC 0.9 or above, unless otherwise indicated. If the design does not call for University of Oregon standard products, Armstrong Optima is the recommended standard of performance.
- General Floor Ceiling Recommendations: The floor/ceiling system should provide minimum STC 50. The floor surface material should either be carpet, rubber or other soft surface to avoid footfall noise to areas below. If soft surfaces are not planned for the floor, then an additional ceiling hung below.
- All acoustical panels should be 1" minimum thickness "Hardside" panels by Kinetics (NRC 0.9 minimum).
- For rated acoustical walls: back to back outlets should be spaced more than 24" apart and putty pads (Hilti CP 617) should be used on all outlets, mudrings, etc., in the walls.
- All acoustical walls should extend to structure above ACT ceilings, and below raised access floors.
- ACOUSTICAL WALL TYPES:
    - Wall Type 1 (yellow on attached plan markups): Rated STC 60+. Options:
        - Double metal stud with 2 layers gwb both sides (total 4 layers) and batts in both cavities;
        - Single 6" metal stud with two layers both sides, batts in the cavity and RSIC clips on one side;
        - 10" CMU/Concrete.

404 NW 10th Ave, Ste 200
Portland, OR 97209
P: 503-241-5255
F: 503-213-6232

www.listenacoustics.com

1100 Dexter Ave N, Ste 100
Seattle, WA 98109
P: 206-223-1390
F: 206-260-7171

- Wall Type 2 (red on attached plan markups): STC 50: 2 layers 5/8" gwb both sides, 6" studs, batts in cavities.

- Wall Type 3 (green on attached plan markups): STC 45+: 2 layers gwb one side, one layer gwb other side, 6" studs, batts in cavity. If the wall includes glazing, use minimum1/4" glass, ¾" air space, 1/8" glass.

Exterior Glazing:

We will be conducting ambient site sound measurements on all sides of the proposed building. Some level of upgraded walls, ceilings and glazing may be recommended at certain areas, depending on the use of the interior space and adjacency to noise.

Ground Level:

Atrium/Lobby

The Atrium/Lobby will be an active public space with considerable potential sound reverberation. Designing an appropriate amount of absorption into the space is of paramount importance to providing a pleasant and functional space. Given the extent of glass and hard surfaces planned for this space, finding areas to treat with acoustical materials will be a challenge. The target reverberation time is 1.5 to 1.8 seconds, which will require careful design to allow for absorptive panels on the walls, windows and ceiling.

Ceilings: The ceilings will need absorption for a minimum of 80% of the ceiling area. Like treatment:

- Acoustical Plaster system: Sonex AFS, or Phonstop. Product looks similar to gwb, but absorbs 70% of sound
- Acoustical glass film on skylights.

Other options:

- Spray-on acoustical material
- Banners or baffles hung from the ceiling
- Acoustical panels attached to the underside of the ceiling

Not likely, but may be an option:

- Acoustical Metal Deck with NRC >0.8, such as Epic Metal ERA
- Wood slat system or equivalent with 50% minimum open area. Use 2" duct liner above wood slats, NRC 0.9 or above.

Walls*:*

- Walls will need to have absorptive panels where space is available, with a target of covering 30-40% of at least two walls. Of note: A new acoustically absorbent material, which is transparent and can be placed over glass, will be considered for adding to potential acoustical absorption locations.

Floor

- Adding carpet in specific areas will help reduce footfall noise and will help to control overall reverberation

Small Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- One wall should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Medium Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Two walls should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Large and Extra-Large Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Three walls should have at least 40% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Offices

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:

- Director or executive level doors to offices should be solid core with upgraded seals

Open Offices and Open/Closed Office Areas (e.g. ASUO Student Government, Cultural Forum, Sustainability Center, Women's Center)

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:

- If privacy is required, doors to interior offices in these spaces should be solid core with upgraded seals

Hallways

Ceilings: Acoustical tile NRC 0.9 or above.

Alternate Ceilings:

- Wood slat system or equivalent with 50% minimum open area. Use 2" duct liner above wood slats, NRC 0.9 or above.
- Attached acoustical materials

Craft Center

Ceiling: Acoustical tile NRC 0.9 or greater;

Floor: Hard surface

Walls*:*

- Provide acoustical panels on two walls minimum, covering 40-60% from above desk height to 8' AFF.

Computer Center

Ceiling: Acoustical tile NRC 0.9 or greater;

Floor: Carpet

Walls*:*

- Provide acoustical panels on two walls minimum, covering 30-40% from above desk height to 8' AFF.

Media Center

Ceiling: Acoustical tile NRC 0.9 or greater;

Floor: Carpet

Walls*:*

- Provide acoustical panels on three walls, covering 30-40% from above desk height to 8' AFF.

Call Center

Ceiling: Acoustical tile NRC 0.9 or greater;

Floor: Carpet

Walls*:*

- Provide 70" dividing walls between call stations
- Provide acoustical panels in each call booth, covering all of exposed wall surface
- Provide acoustical panels on all walls, covering all available exposed surface (minimum 60%) from above desk height to 8' AFF.

Pub and Coffee House

These areas will likely follow the design standard and budgets of the commercial tenants, but the following are recommended mitigation measures to allow for the best possible acoustics:

Ceiling: Acoustical tile NRC 0.9 or greater;

Alternate Ceiling Options:

- Banners or baffles hung from the ceiling
- Acoustical treatment attached to the underside of the ceiling
- Wood slat system or equivalent with 50% minimum open area. Use 2" duct liner above wood slats, NRC 0.9 or above.
- Spray-on acoustical material

Walls*:*

- Provide acoustical panels on three walls, covering 30-40% from between 3' and 8' AFF.

Holden Center

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Two walls should have at least 30% coverage with acoustical panels.
- Consider either acoustical curtains for glass walls, or acoustical glass absorption materials

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Level 1:

Food Service/Dining (New and Existing)

These areas will likely to be quite loud from student activity, and will need significant absorption on the ceilings and partially on walls.

Ceiling: Acoustical tile NRC 0.9 or greater;

Alternate Ceiling Options:

- Acoustical plaster system
- Banners or baffles hung from the ceiling
- Acoustical treatment attached to the underside of the ceiling
- Spray-on acoustical material

Walls*:*

- Provide acoustical panels on available wall surfaces, covering 30-40% from between 3' and 8' AFF. These may need to be tack-able acoustical panels.

Multi-Functional Auditorium

This space will be used for lectures, small group performances, multimedia presentations, and other group functions. The acoustics within the space will need to accommodate a wide variety of uses, so the target acoustical performance is reverberation time of 0.6-1.0 second.

Ceiling:

The ceiling will be generally high in this space to accommodate the reverberation time goals. Reflectors above the presenter/performer area at the front are desirable. Suspended acoustical reflectors will be utilized for this purpose. Above the reflectors, the ceiling will be mostly absorptive, with 50%+/- acoustical material coverage. Absorption Options:

- Banners or baffles hung from the ceiling
- Acoustical treatment attached to the underside of the deck
- 2" duct liner stick-pinned to the deck
- Spray-on acoustical material

Walls*:*
Walls will be a combination of diffusive, absorptive, and reflective panels. Articulation of the walls in plan and section will be required to evenly distribute sound to all areas. Variable acoustics solutions will be studied to allow for appropriate reverberation time for specific uses.

- Provide acoustical panels on side walls, covering 30-40% from between 3' and 16' AFF.
- Curtains may be used on lower and upper walls in sections, deployable for events requiring additional absorption.
- Provide diffuser panels on side walls between 3' and 16' AFF covering 40%+ of the wall
- The rear wall will be 80%+ absorptive above the seating using acoustical panels
- Behind the movable seating, 2" duct liner will be installed on the wall.

Windows*:*

- Windows to the hallway will be STC 50+, which will require dual in-series window systems, using laminated glass.
- Windows to the exterior will be more fully defined after the site noise study is complete. It is likely complex systems , using two dual pane systems in series, will be required, with and overall STC 60+ rating
- Interior surfaces of windows will likely require absorptive material such as acoustic film or acoustic acrylic facing on surfaces not subject to wear.

Multicultural Center

Ceiling: Acoustical tile NRC 0.9 or greater;

Floor: Carpet

Walls*:*

- Provide acoustical panels on three walls, covering 30-40% from above desk height to 8' AFF.

Small Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- One wall should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Medium Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*
- Two walls should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Large and Extra-Large Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*
- Three walls should have at least 40% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Offices/Mods

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:
- Director or executive level doors to offices should be solid core with upgraded seals

Mezzanine/Mills Center Plan

Mills Center

Ceilings: Acoustical Tile, NRC 0.9 or above. Alternate is to add acoustical panels to ceiling by attaching directly to the ceiling.

Walls*:*
- Two walls should have at least 30% coverage with acoustical panels.
- Consider either acoustical curtains for glass walls, or acoustical glass absorption materials

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Offices

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:
- Director or executive level doors to offices should be solid core with upgraded seals

Open Offices

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:
- If privacy is required, doors to interior offices in these spaces should be solid core with upgraded seals

Facilities and Maintenance

Ceiling: Acoustical tile NRC 0.7 or greater. Alternate is hung banners or baffles, or potentially spray on absorption.

Doors:
- The entry doors near the office areas will need to be upgraded to acoustical doors for best results. Other options include creating a double door vestibule, or at bare minimum adding acoustical door seals.

Wood Shop

Ceiling: Acoustical tile NRC 0.7 or greater;

Level 2 Plan

Small Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*
- One wall should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Medium Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Two walls should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Large and Extra-Large Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Three walls should have at least 40% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Concert Hall VIP Lounge/EMU Board Room

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Three walls should have at least 40% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Resource Center for Student Organizations

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:

- If privacy is required, doors to interior offices in these spaces should be solid core with upgraded seals

Reflection Meditation Absolution Room

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Two walls should have at least 30% coverage with acoustical panels.
- Glass to areas below should be upgraded to STC 42 minimum

Floor: Carpet

Doors: Doors to the hallway should have upgraded seals at the perimeter and bottom

Pre-function Space (Existing)

Ceilings: Acoustical Tile, NRC 0.9 or above. *Respect historic design features.*

Floor: Carpet

Walls: Add acoustical panels or upgrade existing, using appropriate fabric to respect historic design features.

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Gumwood Room (Existing)

Ceilings: Acoustical Tile, NRC 0.9 or above. Alternate is to add acoustical panels to ceiling by attaching directly to the ceiling. *Respect historic design features.*

Walls*:*

- Add acoustical panels or upgrade existing, using appropriate fabric to respect historic design features.
- Two walls should have at least 30% coverage with acoustical panels.
- Consider either acoustical curtains for glass walls, or acoustical glass absorption materials

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Ballroom (existing)

Ceilings:

- Add acoustical panels to ceiling by suspension or attaching directly to the ceiling.
- Add acoustical reflectors for stage end of ceiling, extending 20'-30' into the ballroom.
- Respect historic design.

Walls*:*

- Add acoustical panels or upgrade existing, using appropriate fabric to respect historic design features
- Side walls should have at least 30% coverage with acoustical panels between 3' and 12' AFF.
- Rear wall should be 70%+ absorptive.

Floor: Carpet

Doors: Doors to the hallway and exterior exits should have upgraded bulb-type seals at the perimeter and bottom. Possible acoustical doors/frame systems required at exterior.

Oak and maple Rooms (Existing)

Ceilings:

- Acoustical Tile, NRC 0.9 or above. Alternate is to add acoustical panels to ceiling by attaching directly to the ceiling.
- Respect historic design.

Walls*:*

- Movable wall should be replaced with STC 50+ version.
- Add acoustical panels or upgrade existing, using appropriate fabric to respect historic design features
- Two walls should have at least 30% coverage with acoustical panels.
- Consider either acoustical curtains for glass walls, or acoustical glass absorption materials
- Glass to areas below should be upgraded to STC 42 minimum

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Level 3 Plan

Small Conference Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- One wall should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Multipurpose Rooms

Ceilings: Acoustical Tile, NRC 0.9 or above.

Walls*:*

- Two walls should have at least 30% coverage with acoustical panels.

Floor: Carpet

Doors: Doors to the hallway should have upgraded bulb-type seals at the perimeter and bottom

Legal Services and Student Advocacy

Ceiling: Acoustical tile NRC 0.7 or greater;

Floor: Carpet

Doors:

- If privacy is required, doors to interior offices in these spaces should be solid core with upgraded seals

Roof

Penthouses

- 8” minimum concrete is recommended for the penthouse floor. Additional hung gwb ceilings on isolators may also be necessary. Thicker concrete will reduce the need for ceilings below in most cases (12” thick recommended)
- We will calculate the anticipated sound levels in the areas below once the unit sound levels are sent to us.

Please call if there are any questions. We recommend meeting to discuss these recommendations and make changes as necessary to meet the project goals.

University of Oregon EMU
75% SD HVAC Noise Mitigation Narrative

March 16, 2011

This report presents SD recommendations for HVAC acoustics in the U of O EMU Project. The recommendations were developed using the most recent SD drawings. The issues in this report will be coordinated in the design phases and tracked through the project. Detailed calculations, analysis, and recommendations will be provided once HVAC design drawings have been created.

The format for this report is:

1. **Multi-Functional Auditorium Issues and Recommendations;**
2. **Atrium/Lobby Issues and Recommendations;**
3. **Conference Room/Ballroom/Meeting Room Issues and Recommendations;**
4. **Office, Open Work Area, and Mods Issues and Recommendations**
5. **Food Service/Dining Areas;**
6. **Acoustical Design Criteria and Goals;**
7. **Recommended Design Approach to Minimize Noise;**
8. **Guidelines for Specific Equipment Types;**
9. **What We Will Need from the Design Team for the Next Steps.**

1. Multi-Functional Auditorium Issues and Recommendations

The NC level of the Auditorium should be designed to perform at or below NC 25. Achieving this level of quiet will require careful analysis, design and coordination. Initial recommendations are as follows:

A. Select quiet fan units.

B. Locate fan equipment well away from the Auditorium. Do not locate any terminal units in the auditorium.

C. Plan for long, straight duct runs, with space for silencers for the main fans.

D. Plan for all supply and return ducts to be internally lined with 1" minimum thickness duct liner.

E. Diffusers should be designed to be NC 20 max.

2. Atrium/Lobby Issues and Recommendations

The NC level of the Atrium/Lobby should be designed to perform at or below NC 35-40. Achieving this level of quiet will require careful analysis, design and coordination. Initial recommendations are as follows:

A. Large Ventilation fans should be sized and located at least 30' away from the Atrium/Lobby so that sound mitigation measures can be implemented. Locating the fans at the top of the atrium will make it very difficult to reduce the sound levels.

B. If the fans are serving dual-duty as ventilation and smoke exhaust, consider using two fan systems rather than a dual-speed version. This will allow for more effective mitigation of the typical use system, and we will not need to mitigate the smoke system.

C. Select quiet fan units.

D. Plan for long, straight duct runs, with space for silencers.

E. Plan for all supply and return ducts to be internally lined with 2" minimum thickness duct liner.

3. Conference Rooms/Ballrooms/Meeting Rooms Issues and Recommendations

The NC level of these areas should be designed to perform at or below NC 30. Achieving this level of quiet will require careful analysis, design and coordination. Initial recommendations are as follows:

A. Select quiet fan units (fan coil, heat pump, etc.).

B. Locate equipment outside these rooms over a hallway or other non-sensitive space.

C. Plan for at least 20 feet of supply and 15 feet of return duct run with at least 2 elbows in each.

D. Plan for supply and return ducts from the terminal fan units.

E. Plan for all supply and return ducts to be internally lined with 1" minimum thickness duct liner.

F. Diffusers should be designed to be NC 25 max.

4. Office, Open Work Area and Mods Issues and Recommendations

The NC level of closed offices should be designed to perform at or below NC 35. Open offices should be NC 35-40. Mods should be NC 35. Initial recommendations are as follows:

A. Select quiet fan units.

B. Locate equipment outside closed Offices and Mods over a hallway or other non-sensitive space.

C. Offices and Mods: Plan for at least 10 feet of supply and 5 feet of return duct run with at least 2 elbows in each.

D. Open Offices: locate terminal units and FCU's above the open office areas, spaced evenly to spread sound.

E. Plan for supply and return ducts from the terminal fan units.

F. Plan for all supply and return ducts to be internally lined with 1" minimum thickness duct liner.

G. Open Office diffusers should be designed to be NC 30 max.

H. Closed office and Mod diffusers should be NC 30 or less.

5. Food Service and Dining Areas Issues and Recommendations

The NC level of the Dining Areas should be designed to perform at or below NC 40. Initial recommendations are as follows:

A. Select quiet fan units.

B. Locate units and VAV boxes outside of dining areas, if possible.

C. Plan for a moderate amount of straight duct runs.

D. Plan for supply and return ducts to be internally lined with 1" minimum thickness duct liner for approximately 30' beyond the main fan and 15' beyond the VAV boxes or equivalent.

E. Diffusers should be designed to be NC 30 max.

6. Acoustical Design Criteria

Noise Criteria (NC) Ratings

Noise levels in occupied spaces are typically identified using Noise Criteria (NC) ratings. The NC rating system uses octave band noise levels between 63 Hertz (Hz) and 8000 Hz to evaluate conditions in existing enclosed spaces and also to establish noise goals in mechanical system design. NC curves are based on human sensitivity to noise depending on listening and speaking activities. Lower NC values correspond to quieter environments.

Recommended NC Design Goals

The Noise Criterion (NC) level represents the background noise level design target. Mechanical (HVAC) and other systems should be designed to meet these levels. Table 1 presents recommended NC ratings.

Table 1
Mechanical Noise Design Criteria

Location	Preferred Range of Noise Criteria (NC)
Auditorium	25
Atrium/Lobby	35-40
Conference/Meeting Rooms	30

Private Offices/Mods	35
Open Office Areas	35-40
Dining Areas	35-40

7. Recommended Design Approach to Minimize Noise

There are several potential sources of noise in the mechanical systems. Typical noise control treatment for the primary noise sources are presented in the following sections. The recommendations are presented in general terms, and will be refined for the specific conditions and design requirements of the project when mechanical plans are available.

The key elements to implement are listed below:

1. **Size equipment areas for straight discharge conditions;**
2. **Select quiet equipment;**
3. **Provide ample duct sizes to slow velocities;**
4. **Minimize static pressure and obstructions which cause air turbulence;**
5. **Select appropriate diffusers and grilles.**

If these approaches are successfully implemented, noise mitigation is much less disruptive and less costly. Each of the key elements is discussed more fully below.

Equipment Room/Rooftop Conditions

Discharge conditions can play a major role in sound levels. By creating a straight, smooth discharge of not less than 3 duct diameters, excessive low frequency rumble is typically avoided. Elbows near the discharge need to be radiused at least 6" and should be oriented in the same direction as the fan wheel rotation so that the airflow does not need to change rotation vector. Also, longer, straighter duct runs, with gentle transitions are important in reducing turbulence and allowing for in-line silencers, if needed. Careful sizing of the mechanical rooms will allow for these conditions, as well providing space for the larger ducts recommended for lower velocities.

Penetrations through mechanical room/area walls require careful detailing to reduce sound leakage. The recommended penetration includes the following:

1. Leave ½" space around penetrating element;
2. Fill the entire length of the gap around element with fiberglass or fire stop;
3. Seal both sides with resilient non-hardening sealant.

Neither the supply ducts nor return ducts should contact the wall

Doors into the mechanical room should be heavy (solid core wood or metal) with seals around the entire perimeter. No openings should be made in the doors (grilles, etc). The door should be self-closing, and should open outwards so the negative pressure pulls the door tight.

The walls of the mechanical room need to reduce sound going to neighboring spaces. The exact wall type will depend on the proximity of sensitive areas. Typically, the wall will be not less than 2 layers of GWB on each side of metal studs, but often is two stud walls, each with 2 layers of

GWB. The floor should typically be concrete with a minimum of 4"-6" depth, and should have sufficient structural stiffness to minimize static deflection. Keep a 1-foot minimum clearance between the air handling units and the mechanical room wall to reduce coupling between the AHU's and the wall.

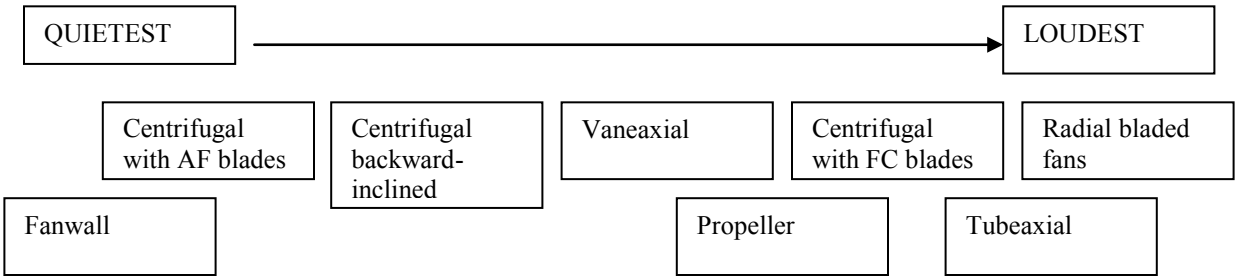
Selection of Equipment

Selecting HVAC equipment serving noise sensitive areas entails selecting the fan type, efficiency, static pressure, and inlet/outlet conditions to solve the noise problem at the source. Often, the added cost of the quieter equipment is more than offset by the savings in mitigation measures, not to mention saving time by avoiding changing the system design.

Fan Types:
Select the packaged air handling system with the lowest sound level. This may entail selecting a different type of fan. Certain fan types exhibit more desirable acoustical behavior than others, as shown in the chart below:

Chart 1

Relative Noise Level of Fan Types



Other Key Issues:

- Operate the fan at near-peak efficiency for lowest noise (typically).
- Obtain sound levels for packaged units, based on AMCA standard 300 or ASHRAE standard 68/AMCA 330;
- Minimize the use of inlet dampers on the units, which cause turbulence and result in excessive low frequency noise.

Duct Air Velocities

Reducing air velocities significantly reduces the potential for turbulent noise in ducts. Recommended ducted air velocities for the main supply ducts are shown below:

Table 2

Main Duct Velocities

Location	Velocity (fpm)
Auditorium	700
Atrium/lobby	1200

Conference Rooms	1000-1200
Offices	1000-1200
Mods	1000-1200
Open Offices	1200
Shafts	2000

At the diffusers, the recommended velocities (based on the target NC level) are shown in table 3.

Table 3

Diffuser Velocities

NC	Velocity (fpm)
15	250
20	280
25	325
30	380
35	450
40	650
45	800

It is recommended that the design reduce the overall speed at each duct split, to minimize regenerated noise.

Reducing Turbulence
To reduce noise caused by turbulent air flow, use radiused elbows, add airfoil turning vanes to 90 degree elbows, make sure duct transitions (expansions/contractions) are less than 15 degrees, and make sure no leakage is occurring at duct joints. Dampers are a major source of turbulence, and should not be placed near elbows, splits, diffusers, or other elements (basically, putting them in straight duct sections is best).

Selection of Diffusers and Grilles
When using manufacturer data in selecting the diffusers and grilles, select a product which is rated 5-10 points lower than the target NC. The exception to this is open plan offices, where more careful selection of diffusers is needed, to ensure a more even spectrum of background noise. This may require selecting a part with higher noise rating.

Locate turns, takeoffs, balancers, and dampers at least 6 feet from the outlet. Maintain an offset of the diffuser/duct of less than 1/8 of the duct diameter. A good method for ensuring appropriate offset is to use flex connectors at diffusers, and to specify and verify proper alignment.

Other Important Considerations

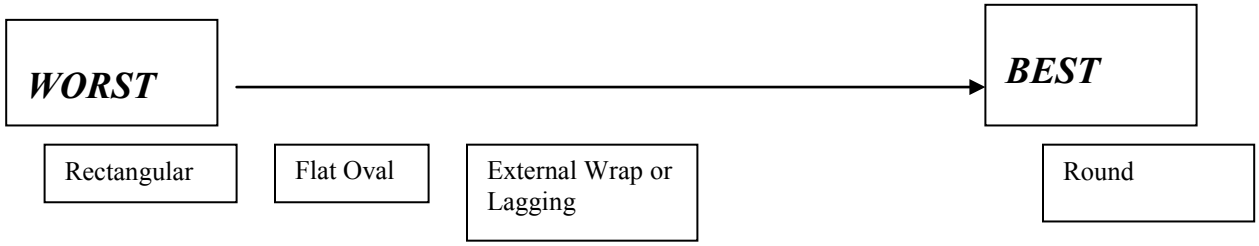
Crosstalk: Common ducts between spaces can allow sound to be transmitted through the ducts, thus bypassing the walls, etc. The best solution is to locate the main ducts over corridors or non-

sensitive areas, and extend individual lined ducts to each space. Also, return transfer ducts through partitions should be lined and should include at least one elbow. Transfer ducts above ceilings in rooms which do not have walls to structure should have a lined "boot" on the back of the grille. The boot should include at least one elbow, 3-5 feet of duct, and be lined with 1" duct liner.

Duct Breakout: To minimize sound transmitting through the walls of the duct into sensitive areas (especially those near the mechanical room), it may be necessary to change the duct type. The relative efficiency of ducts to keep noise inside the duct is shown below:

Chart 2

Relative Efficiency of Duct Breakout Rejection



Ducts over suspended ceilings are especially prone to breakout problems, and should be round ducts or ducts encased in sheetrock.

Vibration Isolation

We are currently reviewing the vibration isolation specification, and will provide a separate memo regarding modifications, if needed.

All mechanical equipment should be isolated from the structure of the building in order to meet the NC goals. Also, the structure supporting the units must be sufficiently stiff to minimize deflection, which often means adding additional structural members. Lighter, longer spans typically allow more vibration and noise into sensitive spaces, so massive and stiff structures are best.

Air handling units, and similar large units should be placed on vibration isolators as described in the specific notes below.

Ducts, pipes and other connecting members in the mechanical room need to be isolated using spring/neoprene hangers. This isolation system may need to be continued beyond the mechanical room into sensitive spaces, depending on the noise criteria. The sleeve detail described above is essential to minimizing vibration into walls.

Potential Mitigation Measures

If noise levels are still too high after following the guidelines above, additional mitigation measures can be employed. These measures include adding in-line silencers, creating sound plenums, lining ducts, and lagging the outside of ducts. Each of these options should be used for the appropriate application, to solve a specific problem.

7. **Guidelines for Specific Equipment Types**

VAV Boxes, Fan Coil Units, Fan-powered Boxes

1. The fan units should be sized to operate at medium fan speed if possible to minimize fan noise. Even more effective is to use variable speed drives (with appropriate critical band speed filters) will reduce noise significantly.

2. When balancing the system, care should be taken to leave dampers in the most open position possible to avoid rumble caused by turbulence.

3. There should be no contact between VAV, FC, FP units and walls, ceilings, or floors.

4. Avoid systems which may allow several units to completely shut off. A better solution is to use low speed idle settings.

5. Suspended units should be as high as possible in the plenum space, suspended from the deck with spring isolation hangers.

6. If a quiet box solution is available from the manufacturer, we recommend this option. Typically, this avoids breakout noise problems from the box, and reduces the discharge and inlet sound levels. Alternative solutions include encasing the box in gypsum wall board, and increasing the amount of duct lining.

Air Handling Units

1. AHUs should be mounted on spring isolators with 2”-3” (minimum) static deflection.
2. Keep a 1-foot minimum clearance between the air handling units and walls or floors to reduce coupling.
3. Air ducts should have flexible connections to the air handling units and should be resiliently attached to the structure using suspended hangers (or isolators underneath if run along the roof) with 0.75” static deflection within 50’ of the unit. In addition, all pipes and conduit connections to the air handling units should be flexible.
4. Sound traps (if necessary) should be located a minimum of three duct diameters from any elbow or fitting to minimize airflow turbulence.

5. Neither the supply ducts nor return ducts should contact the wall. A 1/2" gap within a penetration sleeve, sealed with resilient caulk should surround the ducts at the wall passage.
6. Penetrations of large ducts through ceilings or critical walls near sensitive areas may require duct wrap with KNM100 ALQ lagging material, or creating a sheetrock barrier to minimize noise directly adjacent to the penetration.

Pumps

1. Pumps should be mounted on concrete inertia bases, which in turn should be supported by spring isolators with 1" static deflection, and the entire system should placed on a 4" concrete housekeeping pad.
2. Neoprene flexible connectors should be used where pipe sections are attached to the pumps.
3. All piping at the pumps should be supported with vibration isolation in the form of either floor mounts or hangers.

Piping Systems

1. All pumped fluid, mechanical room piping, and all piping mains require vibration isolation in the form of either floor mounts or hangers with 0.75" static deflection.
2. Where piping passes through the walls, and slabs, no contact should be made between the pipes and the walls or slabs. The openings should be oversized for the full depth of the opening and lined with neoprene isolation. Resilient caulk can be used to provide an airtight seal at penetrations through walls.

Exhaust Fans

1. Fan ducts with exposure to noise-sensitive exterior areas may require a 2" duct liner to control exterior noise levels.
2. All vents terminating on the roof and exterior walls should be located away from rooftop mechanical equipment and have sound-muffling caps or hoods to keep direct sound from "funneling" in to the occupied space.
3. Vents should be isolated from each other to prevent a cross-talk effect from occurring between separate areas.

Chillers/Cooling Towers/Condensing Units

1. Chillers should be mounted on spring isolators with 2" (minimum) static deflection.
2. Screening for noise mitigation may be necessary given the size of the chillers used on this project.
3. Keep a 2-foot minimum clearance between the chillers and walls or floors to reduce coupling.

4. Pipes should have flexible connections to the chiller units and should be resiliently attached to the structure using suspended hangers (or isolators underneath if run along the roof) with 0.75" static deflection within 50' of the unit.

Elevator Considerations

Elevator Mechanical Room Equipment Noise

1. Install vibration isolation on elevator equipment utilizing 0.75" deflection neoprene mounts.

2. Ensure all connections to the elevator motor, including electrical, hydraulic (if used), and other connections, are resiliently attached with 0.75" deflection neoprene, and are resiliently sleeved through elevator room walls and floor/ceiling systems.

Elevator Car Noise

1. Noise from elevator counterweight and car guide rails will be transmitted into concrete walls via rail support brackets. Door opening mechanisms will add to these structure-borne noise. Special acoustical wall treatment such as double studs and/or multiple gypsum board may be needed for noise-sensitive areas adjacent to elevator noise sources.

Plumbing Considerations

Plumbing in walls of areas with NC of less than 40 need special consideration. Plumbing noise is transmitted by several paths and requires multiple solutions to achieve containment. Most of the airborne noise in plumbing systems is caused by turbulent water running through the pipes. Flow noise radiating from the piping runs can be minimized by decreasing velocity, increasing pipe diameter, reducing the number of pipe transitions (elbows, tees, etc.), and adding a barrier around the piping.

Noise is also transmitted from the piping runs to the rooms of the building if the pipes are in direct contact with large radiating surfaces (i.e., walls, ceilings, and floors). Such surfaces, acting as resonant elements, radiate the noise at more intense levels. Isolation of these piping runs from the structure provides significant noise reduction.

Supply Pipes

1. Supply and waste pipes should be isolated from structure and wall surfaces using a resilient material such as 1/2" neoprene or Armstrong Armaflex between the pipes and the structure of the enclosure containing them.

2. A noticeable reduction in noise level may be obtained by using proper-sized piping to lower the water velocity. Flow velocities on the order of 8 ft/sec or less have been found

to be acceptable. Specified flow capacity requirements can be met and a substantial reduction in noise can be obtained by using both pressure regulators and proper diameter piping in the plumbing system.

3. Noise in piping systems can occur when a rapidly closed valve abruptly stops a moving column of water and produces hydraulic shock (e.g., quickly closing a sink faucet). The resulting forward and backward water surge within the piping produces pounding noises called water hammer. Water hammer noise can be reduced by using water hammer arrestors on both hot and cold-water lines and should be included by the plumbing designer

Waste Pipes and Water Closets

1. Cast-iron waste pipes should be used to minimize sound transmission and vibration.

2. Allow sufficient wall thickness to ensure that waste pipes can be installed without contacting either wall surface.

3. Horizontal waste lines above suspended ceilings should be boxed out with 5/8" gypsum board.

4. All drain lines should be isolated at all floor and wall penetrations.

Boilers

1. Select quiet burner type: natural draft is the quietest, followed by induced draft and forced draft;

2. Vibration isolation of the boilers on either waffle pads or other isolators is important;

3. Provide sound isolating construction in the boiler room;

4. Provide muffler on the exhaust of all boilers/water heaters;

Transformers

Electrical transformers located near sensitive areas units will need to be analyzed for their sound creation potential. We will require sound ratings for these units, and will likely recommend vibration isolation measures and added wall material to reduce the potential for hum and other noise in units. The maximum-allowable NEMA sound ratings for transformer size are as follows:

Transformer Size (KVA)	**dBA @ 1 ft**
25-50	45
51-150	50
151-300	55

301-500 60

8. What We Need to Complete Our Analysis

We will need a complete set of mechanical drawings and equipment/diffuser schedules as well as the manufacturers sound levels for all equipment. All sound levels will need to have been obtained per AMCA Standard 300 or ASHRAE Standard 68/AMCA 330 for radiated and discharge sound levels (ARI standard 880).

We look forward to receiving a full set of mechanical plans and sound levels so we can complete our analysis and recommendations for noise control. If there are any questions, or if we can provide further information, please do not hesitate to call.

8. FOOD SERVICE

a) FOOD SERVICE GUIDELINES

b) EQUIPMENT LIST & ESTIMATES

c) EQUIPMENT LOADS

RICCA NEWMARK DESIGN
GUIDELINES FOR ASSISTING ARCHITECTS AND ENGINEERS
IN PLANNING FOR COMMERCIAL FOODSERVICE AREAS

TABLE OF CONTENTS

ARCHITECT - PLEASE NOTE

UNLESS OTHERWISE DIRECTED, WE DEPEND ON THE ARCHITECT TO DISSEMINATE THESE GUIDELINES TO ALL APPROPRIATE ENGINEERING CONSULTANTS, DIVISIONS, AND/OR CONTRACTORS.

I. PREFACE

A. PURPOSE

The purpose of this document is to open a dialogue with all the design team members, regarding how Ricca Newmark Design will approach the commercial kitchen equipment requirements of the project. In that regard, we have outlined:

1. Our understanding of the typical division of responsibilities, or the work required between the various design team members, and associated trades.
2. Our experience with minimum expected design standards for commercial kitchen surfaces, mechanical and electrical conditions, and other building conditions, that are outside our control or responsibility.
3. Our understanding of minimum standards that meet:
   a. Generally accepted codes, ordinances, and practices.
   b. National Sanitation Foundation (NSF) Standards.
4. We sincerely want to encourage communication from all team members, regarding specific methodology or products that may differ from those outlined here.
5. While we endeavor to remain informed on the latest codes, ordinances, and practices, and to develop our documents according to our best understanding of these requirements; we also are aware that these requirements may vary according to interpretations, and are continuously being revised and updated, with changing interpretations. Therefore, we solicit, and sincerely appreciate any assistance, where our documents may be in conflict with your understanding of applicable codes, ordinances, or practices.

B. USES

1. To prepare all design team members for the type of information that will be included in our contract documentation.
2. To provide preliminary planning information for materials and methods we have found to be successful.
3. To define our Basis for Design. Since our documentation is developed in accordance with the suppositions made in these guidelines, it is essential that we be made aware of alternative approaches which will be used, prior to start of our contract documentation.
4. The information in these guidelines should be reviewed for appropriate inclusion in the specifications of the Architects and Engineers, in order to become Contract requirements.

C. LIMITATIONS

1. Ricca Newmark Design' documents are intended to delineate commercial foodservice equipment and operational requirements only. They do not include non-foodservice related requirements, special requirements of the Owner, architectural or engineering requirements, or code requirements other than those directly related to the foodservice equipment included in our scope.
2. In order for our documents to be consistent with the overall Construction Documents package, we request that this office be notified of any changes to, or conflicts with, architectural or engineering requirements in the foodservice areas.
3. Information contained in these guidelines is of a general nature for the varied types of conditions, which affect commercial foodservice areas. Therefore, they may contain paragraphs and/or sections, which are not applicable to every project. Specific requirements will be determined as the project is developed, and drawings and specifications are completed.
4. **Ricca Newmark Design can not be held responsible for any damages to any foodservice equipment or Owner's property, due to any deviations from the suggestions or recommendations or information included in these Guidelines, or shown on our design drawings or associated drawing Notes.**

II. RICCA NEWMARK DESIGN' DOCUMENTS

A. Our documents are developed to provide data pertinent to commercial foodservice equipment, and related areas to the Architects and Engineers, for their use in preparing their Construction Documents.

B. Although our documents are primarily intended to form the basis for soliciting kitchen equipment competitive bids, and all information contained, regarding the building infrastructure to support that equipment, should be found in architectural/ engineering documentation; we highly suggest inclusion of our documents in the project Construction Documents sets, for supplemental information and clarification; with reference to our documents on the pertinent architectural and engineering documents.

III. GENERAL COORDINATION INFORMATION - ALL DIVISIONS

A. In general, our documents are developed with the understanding that the Kitchen Equipment Contractor will furnish the equipment set in place, ready for final utility connections by others. Other work divisions/contractors will design for, and furnish all services, material and labor necessary for rough-ins and final connections.

B. All designs, engineering, materials, and installations should be as required for commercial kitchen use.

C. In order to meet peak period demands, and to satisfy Health Departments and operational requirements, we highly suggest that all incoming services be sized with the capability of providing 100% of the utilities as indicated on our drawings.

D. All utility lines routed into or through equipment or counters should not interfere with the intended use of, or servicing of, the equipment. We invite queries from the site, to assist in routing of utilities through or around equipment.

E. The following abbreviations are applicable throughout these guidelines:

AGA	American Gas Association
AMCA	Air Movement Control Association
EC	Electrical Contractor/Division
EE	Electrical Engineer
GC	General Contractor/Division
GFCI	Ground Fault Circuit Interrupter
KEC	Kitchen Equipment Contractor/Division
MC	Mechanical Contractor/Division
ME	Mechanical Engineer
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PC	Plumbing Contractor/Division
RND	Ricca Newmark Design
SE	Structural Engineer
UL	Underwriters Laboratories

F. The following definitions are applicable throughout these guidelines and Ricca Newmark Design documents:

1. Furnish - supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
2. Install (set in place) - describes operations at Project site, including actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, finishing, curing, protecting, cleaning, and similar operations; ready for final utility connections by the appropriate (Sub)-Contractor.
3. Provide - furnish and install; complete, ready for intended use.
4. Foodservice area includes, but is not limited to, kitchen/bar/restaurant/banquet storage, prep, cooking, ware washing, serving/servery, and carts areas; and any other associated food areas.

G. Projects with existing equipment, which will be reused:
    1. Through years of experiences of reusing existing equipment, we have discovered in too many cases, that the utilities indicated on manufacturer's nameplates is incorrect, due to field modifications and repairs. And since Ricca Newmark Design is neither licensed nor qualified as electrical, plumbing, or mechanical engineers or contractors, we highly suggest that utility requirements for existing equipment to be reused, be obtained and verified from the actual equipment, by site inspection or testing as required, by the appropriate engineer or contractor.
    2. Disconnection of utilities for existing equipment to be relocated and/or reused; and disconnection and removal of existing equipment which will not be reused, should be as determined and designated by the Architect. This work is usually not part of the Kitchen Equipment Contract, since they are normally not under contract at the time this work is usually accomplished, and they are neither licensed nor qualified electrical, plumbing, or mechanical contractors.
    3. After disconnection by other trades, the KEC will be responsible for tagging and/or removing all existing foodservice equipment which will be reused; cleaning, renovating as specified, and resetting in place, ready for final utility connections by the appropriate (Sub)-Contractor.
    4. Only existing items in good working condition, or which require minor parts/repairs should be considered for reuse. We do not recommend reusing any items, which are in poor or bad condition, or require major parts/repairs. The cost to recondition these items and their reliability make them impractical for reuse. We would strongly recommend replacing these items with new items.

H. Extreme noise levels in commercial kitchen areas:
    1. Various commercial kitchen equipment and the associated areas can be extremely noisy and every method of sound isolation and sound limiting architectural, engineering and construction, and utility connections should be utilized.
    2. In general, dish washing rooms are very noisy. Sound levels of 85dB are not unusual for equipment such as dish machines and scraping / waste pulpers and/or extractors in dish tables and pot sinks, etc. Sound insulation of the entire room, and sound and vibration isolation of all final utility connections should be a primary concern.
    3. Compressor racks are usually very noisy and should not be located in areas where noise is of a concern.
    4. The design and installation of the duct work and fans for exhaust hoods over cooking equipment can have a serious effect on the noise levels generated at exhaust hood areas. Careful consideration should be given in engineering proper type transitions, bends, larger size ducts with lower static pressures, and vibration and sound isolation of the ducts and fans, etc.

I. Automatic activation of the exhaust hood(s) whenever cooking occurs, per 2006, and later, International Mechanical Code Section 507.2.1.1, is the responsibility of the engineers. Verify specific requirements with the local code authorities.

J. All (sub)contractors should refer to installation manuals and approved shop drawings at installation phase, for supplemental connections, interconnections, and complete installation requirements for the foodservice equipment included in this project; in addition to requirements shown on Ricca Newmark Design's documents.

K. When specified by RND and provided by the KEC, all cooking equipment exhaust hoods fire suppression systems are intended to function totally independent of any other equipment or requirements. They will be provided with mechanically activated (cable release) automatic gas shut-off valves, in lieu of electric solenoid valves, so they can not be affected by any outside influences such as electric power failure or shut-off, brown-outs, black-outs or any momentary break in electricity. However, these systems will be provided with 2 sets of normally open and 2 sets of normally closed electric signal contact points micro switches, for use by the engineers and other contractors, for activation or deactivation of equipment provided by them, such as fans, alarms, disconnects, etc., in case of a fire activation of the system. Any main or night time gas shut-off valves or controls would be in addition to this mechanical fire system gas valve, and is to be specified and provided as selected by the engineers; not part of the KEC package.

IV. ARCHITECTURAL COORDINATION INFORMATION

A. RESPONSIBILITY MATRIX

The following division of responsibilities is historically typical for foodservice areas. Unless we are specifically notified otherwise, we will base our documentation on these assignments.

RESPONSIBILITY MATRIX				
	Foodservice Equipment/Area	Designed/ Specified By	Furnish-ed By	Installed By
1	Floor Troughs	RND	KEC	GC
2	Trough Grating	RND	KEC	KEC
3	Corner Guards	ARCH'T/RND	GC/KEC	GC/KEC
4	Wall Flashing	ARCH'T/RND	GC/KEC	GC/KEC
5	Concrete Curbs	ARCH'T/SE	GC	GC
6	Lockers	ARCH'T	GC	GC
7	Conduit For Drink/Refn Systems	ARCH'T	GC	GC
8	Room Finishes	ARCH'T	GC	GC
9	Employee Restrooms	ARCH'T	GC	GC
10	General Area Fire Extinguishers	ARCHT	GC	GC

B. DESIGN STANDARDS

1. Design Information
   a. Ceiling Heights
      Minimum finished ceiling heights suggested are as follows:
      (1) Ideal clear ceiling heights for:
          (a) Kitchens 10'-0" (3048mm)
      (2) Where conditions limit ideal heights, the following are kitchen area minimums:
          (a) Kitchen areas at hoods 9'-0" (2743mm)
          (b) Walk-in cooler/freezer areas 8'-8" (2896mm)
              (If units can extend into ceiling to structure, the finished ceiling can be as low as) 8'-0" (2438mm)
          (c) Ceiling space above walk-in coolers/freezers should be kept clear of any obstructions, such as ducts, pipes, conduit, etc, for approximately 18”-24”, until after installation of walk-ins and components.
          (d) General kitchen areas 8'-0" (2438mm)
          (e) Over ice machines 9'-0" (2743mm)
      (3) Special heights for any oversized pieces of kitchen equipment will be noted on RND "Building Conditions" Drawings.
      (4) **Please note:** there should be adequate space above finished ceilings for mechanical and electrical work as required; including exhaust hood/ ventilator ducts.
   b. Floor Loads (Including corridors and access to areas.)
      (1) Foodservice Areas
          All foodservice and related areas, including dining rooms, bars, banquet rooms, kitchens, service areas, store rooms, etc., should have a designed floor loading to conform with local code requirements; with a minimum suggested live loading of 150 pounds per square foot (732.2 kgs/sq m).
   c. Openings
      (1) All service and supply doors and openings to or into foodservice areas should have 36" (914mm) wide clear openings, or larger as noted on RND drawings.
      (2) Equipment access to kitchens must be considered thoroughly. In general, openings and passages will be needed for a "cube" 8' x 8' x 8' (2400mm x 2400mm x 2400mm), or larger as noted on RND Drawings, for initial installation.

d. Correctional Facilities
   (1) Prison cell tray pass-through windows should be set at +42" (1067mm) AFF, to allow handcuffing of prisoners.
   (2) Windows in kitchen offices should be set at heights that permit maximum view of kitchen areas while seated.

e. General Design Information
   (1) Provide fire rated materials per code requirements, within 18" (457mm) minimum of hood/ventilators, exhaust duct, flues or vents. This 18" (457mm) dimension may be reduced by use of special insulation materials. (Verify with local authorities.)
   (2) All walls within 18" (457mm) minimum of heat producing equipment should be constructed of non-combustible materials, per code requirements. (Verify requirements of local authority.)
   (3) Provide in-wall reinforcement or backing for installation of brackets or gussets, to support wall mounted equipment furnished by KEC, and noted on RND drawings.
   (4) Provide wall, floor, ceiling and/or roof penetrations/sleeves and/or conduits, as required for beverage systems, CO2 gas, refrigeration and/or compressed air lines. (Sleeves through walk-in cooler/freezers by KEC). Conduits should be 6" (152mm) minimum, and 8" (203mm) preferred; verify and coordinate requirements with beverage system purveyor, refrigeration sub-contractor, etc. All conduit runs should extend as direct as possible between end points; and should have a smooth, continuous interior, with 24" (610mm) minimum radius bends (45 degree or 90 degree bends are not acceptable), and should terminate 2" (51mm) out of floor, wall, ceiling, roof and/or curb. Conduit bends should be a maximum of 180 degrees total, from start to finish, unless otherwise noted. Conduit pull boxes should be provided at a maximum of 95' (29m) center-to-center, unless noted otherwise. Pull boxes should be 18" x 18" x 12" (457mm x 457mm x 305mm) deep (minimum), with removable access covers. Verify code restrictions on use of PVC conduit in ceiling spaces and other areas. For information and source of conduit and pull boxes contact BeverageChase Systems at 800-547-2820 or www.beveragechase.com.
   (5) After installation of all lines, roof penetrations should be sealed to match the finished roof requirements, by the Roofing Division or the G.C. to insure proper integrity of the finished roof.
   (6) All penetrations through fire rated walls, floors, and/or ceilings should be sealed with fire stop material (similar to intumescent putty) after lines are installed.
   (7) Provide transit level floors or depressions as noted, free of projecting aggregate, for insulated walk-in cooler/freezer assemblies. Depression depth as noted on RND plans. If walk-in cooler/freezers with modular floors are to be installed prior to adjacent finished floors materials, a benchmark should be provided, indicating finished floor level surrounding cooler/freezers. Excess floor depressions around cooler/freezers should be filled with grout and finished floor materials, by the G.C. or building floor materials division. As required for specific projects, also provide tile setting beds and run finished floors and bases into and throughout walk-in cooler/freezers. All walk-in coolers and freezers must have insulated floors. Concrete slabs are not acceptable as insulation (4" [102mm] thick urethane walk-in floor equals 182" (4620mm) thick concrete, in insulation value). Modular insulated floor panels, integral with the walk-in assembly, are highly recommended and most effective; and will be specified unless otherwise directed. G.C. provided concrete slab with insulation built-in, is less desirable due to the coordination and complication of installation. No architectural walls, ceilings, décor, structural components or any details should be physically attached to, into, or rest on any walk-in wall, ceiling panel(s), or component thereof.
   (8) Provide pads and/or curbs on roofs and/or mechanical or service areas, for compressor racks. Provide pads and/or curbs for other equipment, as noted on RND drawings.

2. Walls/Ceilings/Floors Finishes
   These surfaces, which fall in the architect's scope, are subject to the architect's overall building standard of materials, budgets, and preference for specification. The following information is offered to assist in selecting appropriate finishes for various applications.
   a. Walls And Ceilings In Foodservice Areas - General
      Ceiling and wall surfaces for food preparation, serving, or washing areas, should be non-absorbent, smooth, easily cleanable, and usually light in color. Most health codes define "food preparation areas" to also include bars, service stations, salad bars, servery counters, etc. Decorative materials not clearly consistent with this requirement should be submitted to the local health jurisdiction for approval prior to use. Finish materials should be selected according to durability requirements of each particular area. Sound deadening material is highly recommended for noisy areas, such as kitchens, ware washing rooms, pulper or extractor locations, etc.
   b. Walls At Cooking Areas
      The following finishes have been found to be durable and desirable on walls back of cooking equipment:
      (1) Flashed with 20 gauge (1mm) stainless steel, with lock seams; from floor to ceiling and exhaust hood bottom. This is the most durable and easiest to clean.
      (2) Mud-set ceramic tile with matching color grout. Grout joints should be flush with the tiles. However, it should be noted that the grout is subject to deterioration from the constant heat and the cleaning required due to grease presence. We strongly advise against thin-set tile for this application.
      (3) Concrete block, properly filled, sealed, and finished smooth and easily washable. Glazed block with flush sealed mortar joints is generally acceptable.
      (4) In our experiences, we have found that FRP panels or epoxy enamel painted gypboard will not withstand the constant heat and abuse in these areas, and also may not be acceptable to local jurisdictions.
   c. Walls In Wet Areas
      The following finishes have been found to be durable and desirable on walls for "wet areas" of kitchens, including dish washing rooms, pot washing areas, prep sinks, can washing, etc.:
      (1) Flashed with 20 gauge (1mm) stainless steel, with lock seams; from floor to ceiling. This is the most durable and easiest to clean.
      (2) Mud-set ceramic tile with matching color grout. Grout joints should be flush with the tiles. However, it should be noted that the grout is subject to deterioration from the constant moisture, abuse, and cleaning required in these areas. We strongly advise against thin-set tile for this application.
      (3) Fiber reinforced plastic (FRP) panels such as Kemlite panels by Dyrotech Industries. Joints, seams, and edges should have moulding/ joint strips, and also be sealed.
      (4) In our experiences, we have found that epoxy enamel painted gypboard will not withstand the constant moisture and abuse in these areas, and is generally not acceptable to local jurisdictions.
   d. Walls In Other Kitchen Areas
      (1) Walls in remaining areas, including storerooms, service areas, and corridors used for set-up, and/or service, generally may be a minimum of gypboard with epoxy enamel paint, similar to Grid-Guard Epoxy Acrylic Enamel. (Verify with local jurisdictions.)
   e. Ceilings In Kitchens And Ware Washing Rooms
      (1) General
         Suspended lay-in grid ceilings are generally preferred over painted gypboard. If gypboard ceilings are used, adequate access panels must be provided. They are usually subjected to hose and/or pressure washing.

(2) Lay-In Ceiling Tiles
The tiles specified for suspended lay-in ceiling system must be washable, and should be high-density, non-perforated types, with hold-in clips, similar to Armstrong's "Ceramaguard" (plain surface, non-acoustical), or Health Zone Ultima.

(3) Acoustical Ceiling Tiles
Acoustical ceiling tiles must be washable and comply with health department standards. A NRC rating of 0.80 or higher is recommended.

f. Floors
Floor finishes for commercial food storage, preparation, and/or serving areas, including kitchens, service areas, bars, etc., should be selected according to the durability requirements of each particular area. (Verify product and color requirements, and acceptability with the local health department):

(1) Floor Finish Products Not Suggested
In our opinion, epoxy, acrylic, or urethane seamless floor products have proven unsuccessful for use in commercial kitchen applications, and should not be considered as acceptable, except as noted in (3) below.

(2) Quarry Tile Flooring (for light to heavy-duty usage installations)
Thick mud set quarry tile, with integrally coved base at all vertical surfaces. Grouting in commercial kitchens and associated areas should be a water-tight, super duty type. We suggest grout color to match tile. Grout joints should be flush with tiles. Wet areas and cooking areas should be provided with abrasive, anti-slip tiles. We strongly advise against thin-set tile for this application. Special installation requirements and materials may be necessary for tile flooring inside walk-in coolers and freezers; verify with manufacturers.

(3) Resin Seamless Flooring (for light to heavy-duty usage installations)
AcryliCon Industrial Flooring non-porous, quick drying, monolithic, ADA and OSHA compliant slip resistant, extreme high compressive strength, unique formula, overlay and coating flooring material, with optional Microban antimicrobial protection. The sub-floor must be a structurally sound material suitable for installation of this type material (verify with the manufacturer), and must be prepared as per manufacturer's recommendations. Installation must be by a factory trained and authorized contractor only. Special installation requirements and materials are necessary for areas below or adjacent to specific cooking equipment which can produce over 165º F on the floor; verify with manufacturer. This material has a 10 year delamination warranty, will not lose its plasticizers or high compressive strength; and is easy to repair or recoat. It could be considered a LEED material due to its long life span. It has a higher installation cost, but a very low whole life cost. Most projects installed since 1978 are still in heavy usage. AcryliCon is the only manufacturer with this special formula material. Contact 1-888-736-7550 or www.acryliconusa.com.

(4) Resilient Floor Covering (for light to medium duty usage installations)
Protect-All 1/4" (6 mm) thick, heavy duty, slip resistant, texture or ripple finish, high quality sheet PVC floor covering, made from 100% recycled polyvinylchloride, interlaced with strand reinforcements. Provide integrally coved base at all vertical surfaces. The sub-floor must be a structurally sound material suitable for installation of this type material (verify with the manufacturer), and must be prepared and maintained at a minimum temperature and moisture as per manufacturer's recommendations. Installation must be by factory trained and authorized contractors only. All seams and joints must be heat and chemically welded as per manufacturer's recommendations. All openings through the flooring material for utility pipes and conduits must be sealed as per manufacture's recommendations. This type flooring is not recommended below or adjacent to equipment which can produce an extended or continuous temperature exceeding 150° F (65.6°C) on the floor; such as below some specific cooking equipment, or in the aisle space around this specific cooking equipment, etc. Contact manufacturer, Oscoda Plastics, Inc. at 1-800-544-9538.

(5) Sheet Vinyl Safety Flooring (for limited light duty usage installations)
Altro Stronghold 30, 3 mm (0.12") thick, heavy duty, slip resistant, high quality vinyl sheeting with aluminum oxide and colored quartz throughout the thickness, silicon carbide grains in the surface layer, and a non-woven polyester/cellulose backing with glass fiber reinforcement; integrally coved base at all vertical surfaces. The sub-floor must be a structurally sound material suitable for installation of this type material (verify with the manufacturer), and must be prepared and maintained at a minimum temperature and moisture as per manufacturer's recommendations. Installation must be by factory trained and authorized contractors only. All seams and joints must be heat welded as per manufacturer's recommendations. All openings through the flooring material for utility pipes and conduits must be sealed as per manufacture's recommendations. Gulley edges must be utilized at all floor sinks and floor troughs. Clamping rings must be utilized at all floor drains and clean-outs. All coved bases should have cove formers and cap strips. Color #K30262 Russet is suggested below equipment which may subject the floor to momentary temperatures approaching 140° F (60°C). This type flooring is not recommended below or adjacent to equipment which can produce an extended or continuous temperature approaching or exceeding 140° F (60°C) on the floor; such as below some specific cooking equipment, or in the aisle space around this specific cooking equipment, etc. Contact manufacturer at 1-800-565-4658.

(6) Minimum Floor Product (for light to extra heavy-duty usage installations)
Sealed concrete should be used as the finished floor only when extreme budget problems exist, the Owner is made aware of disadvantages, and the health department will approve it. Use approved top-set vinyl or metal coved base moulding at all vertical surfaces. Top surface must be sealed per local health departments requirements, and will require resealing on a regular basis. Finish color, sealing material, and top-set coved base moulding should be approved by health department, for use in these areas.

(7) Seamless Flooring (for limited light duty usage installations)
BASF Building Systems Degadur R61 self leveling, skid resistant, decorative methyl-methacrylate overlay and coating resin flooring material, NSF Registered with Microban antimicrobial protection, and integrally coved base at all vertical surfaces. The sub-floor must be a structurally sound material suitable for installation of this type material (verify with the manufacturer), and must be prepared as per manufacturer's recommendations. Installation must be by a factory trained and authorized contractor only. Thickness should be approximately 3/16" (5mm) to 1/4" (6mm). Special installation requirements and materials are necessary for seamless flooring inside walk-in coolers and freezers, and below hot wet areas such as below kettles; verify with manufacturers. Contact manufacturer at 1-800-433-9517. Please be aware that this material has a very short life span, and is really not suggested.

(8) Waterproof Membrane
Regardless of the finished floor material, all food preparation, ware washing, serving, bars, etc. areas should be provided with waterproof membrane in floor.

(9) Sloping Of Floors
- (a) All floors should be sloped to drains to prevent any standing water, and as required by local health/building departments.
- (b) However, sloping of the floors should be gradual and without any excessive ridges or drops, in order to prevent hazardous or unstable conditions when rolling loaded food carts or for commercial kitchen equipment on casters.
- (c) Where ramps are required, slope should not exceed 1:12.

(10) Level Floor Areas
- (a) Provide level and smooth floors below flush floor mounted kitchen equipment such as roll-in ovens, roll-in refrigerators, roll-in proofers, etc., walk-in coolers and freezers, high density rolling shelving, etc.

(11) Walk-In Freezer Compartment

Freezer compartments over 600 square feet on slab-on-grade floor levels, should have freeze protection below the sub floor concrete below the insulated floor panels, as part of the building construction system. Wet areas such as New Orleans may require this for 300 square feet or less, and dry sandy soil areas such as in Wyoming may not require this at all. This requirement and method of freeze protection should be determined on each project by the engineer familiar with the specific installation and particulars, and code requirements. Suggestions for freeze protection are drainage/venting systems through the ground below the concrete, heat trace systems towards the bottom of the concrete, and/or refrigeration heat gain glycol systems towards the bottom of the concrete.

3 Food Shields (Sneeze Guards) And Self-Service Dilemma

Sneeze guards are designed to intercept the direct line between the “average” customer’s mouth and displayed (open) food and food containing devices, in order to minimize contamination by the customers. The National Sanitation Foundation (NSF) has established very restrictive dimensional standards for sneeze guards, which are enforced by virtually every Health Department. For all practical purposes, sneeze guards that conform to these Standards limits the average customer’s ability to comfortably reach displayed foods in self-service applications. On counters with soup wells or other containers requiring the use of ladles, the access behind or below these NSF sneeze guards greatly restricts the lift of these ladles. While we understand and agree with the Owner’s desire to fully accommodate the customer, and provide easy reach to all self-service food stations; as professional food facilities Consultants, we are mandated to design sneeze guards that conform to these standards, and in some cases this may reduce or restrict the reach of the customer.

C. ITEMS NOT INCLUDED IN KITCHEN CONTRACT

The following items are generally not included in kitchen equipment contracts, and should be selected and specified by the Architect, and provided by other than the KEC; as requested or required.

1. Staff lockers and benches.
2. Restroom equipment and fixtures. Wall and/or ceiling hung toilet partitions, and wall hung toilet fixtures are suggested in all foodservice areas, for ease of cleaning.
3. External wall corners in kitchen and serving areas should be provided with 16 gauge (1.6mm) stainless steel or high-impact plastic vertical bullnose bumper guards, similar to "Wilkinson Corner Guards". Height should be 4 feet (1219mm) AFF. (These can also be provided by the KEC. Notify RND if this is preferred source.)
4. Foodservice areas hand washing lavatories with wrist blade faucet, towel and soap dispensers. Include hose bibbs with mixing valves and vacuum breakers below each location. Stainless steel units are suggested. (These can also be provided by the KEC, if desired.)
5. Floor-type utility (mop) basins with service sink type faucets with hose bibb connections. Faucet should be mounted at +54" (1372mm) AFF, to allow washing of small trash receptacles. (These can also be provided by the KEC, if desired.)
6. Decorative finishes, cabinetry in public view, or bar tops and dies, service counters and shelving, backbars, cafeteria counter dies, bar glass storage etc.
7. Foodservice functional elements that have decorative implications should be selected and/or designed by RND, with materials/profile direction from the Architect and/or Interior Designer. These, for example, could include:
   a. Sneeze guards
   b. Tray rails
   c. Backbar undercounter refrigerators, storage areas
   d. Wine display cabinets
8. Required locations for security closures for service bars, issue counters, pass-through windows, etc., will be identified by RND; but should be designed and specified by the architects, and provided by the GC.
9. Emergency eye wash stations.
10. Drinking fountains.

11. Fire suppression system(s) specifically for the cooking equipment and associated exhaust hood(s) will be specified by RND and provided by the KEC. However additional portable fire extinguishers as required, are to be specified by the Architect and provided by the GC. And any building fire suppression system(s) are to be specified by the ME and provided by the MC.

D. FOODSERVICE EQUIPMENT REMOTE REFRIGERATION SYSTEMS
   1. All foodservice items included in the Foodservice Equipment Section 11400, with remote refrigeration system or components, will be specified by RND, and provided by the KEC and installed by the KEC's Certified Refrigeration Sub-Contractor, including interconnecting refrigeration lines. Remote refrigeration systems include any systems with condensing unit, compressor, and/or condenser located remotely from the refrigerated component, that are site assembled and not factory assembled.
   2. Refrigerated lines will be extended as straight as possible between components. However, exact lines routing, distances, bends, turns, sizes, etc can only be determined after a thorough examination of site conditions by the KEC's Certified Refrigeration Sub-Contractor; for items such as beams, columns, elevator shafts, stairways, previously installed plumbing, electrical, and HVAC lines and ducts, non-accessible ceiling or crawl spaces, and many other obstacles which might affect the routing.
   3. **PLEASE NOTE:** Compressor rack location(s) must be verified and coordinated with the Architect. Unless notified by the Architect, the rack(s) are engineered for 125 feet maximum horizontal distance between the rack and the furthest remote refrigerated item, plus no more that 25 foot vertical rise or drop. Distances beyond these limits will increase the size of the compressor(s)/rack(s), line sizes, and the cost of the equipment and installation, and Ricca Newmark Design **must** be notified prior to final issue of documents. Extreme horizontal distances up to 250 feet and vertical distances up to 50 feet are possible, but can double to triple the size of the compressor(s)/rack(s), and are extremely expensive and technical to install and maintain; and are not recommended.
   4. Compressor racks can be very noisy and careful consideration should be given to the installation location. Locations within buildings should have sound insulation in the walls, floor and ceiling. Locations outside buildings should consider rooms and other buildings adjacent to the compressor rack. Even the noise from a roof top location can affect adjacent buildings.

E. NOISE LEVELS IN COMMERCIAL KITCHEN AREAS:
   1. Various commercial kitchen equipment and the associated areas can be extremely noisy and every method of sound isolation and sound limiting architectural, engineering and construction should be utilized.
   2. In general, dish washing rooms are very noisy due to the type of equipment and operation. Sound levels of 85dB are not unusual for equipment such as dish machines and scraping / waste pulpers and/or extractors in dish tables and pot sinks, etc. Sound insulation of the entire room should be a primary concern.

F. All (sub)contractors should refer to installation manuals and approved shop drawings at installation phase, for supplemental connections, interconnections, and complete installation requirements for the foodservice equipment included in this project; in addition to requirements shown on Ricca Newmark Design's documents.

V. MECHANICAL DIVISION COORDINATION INFORMATION - VENTILATION SECTIONS

The benefits of proper ventilation of commercial kitchens include enhanced productivity of people working in comfortable environments, and increased performance and longevity of equipment. Ricca Newmark Design believes that economics taken in the amount of exhaust and supply of air in kitchens, are spent many times over in the cost of operating the facilities, over their life. The following guidelines for Mechanical Engineers in designing kitchen ventilation systems are intended to relate our goals for our client's operating effectiveness.

A. RESPONSIBILITY MATRIX

The following division of responsibilities is historically typical. Unless we are specifically notified otherwise, we will base our documentation on these assignments.

RESPONSIBILITY MATRIX

	Foodservice Equipment/Area	Designed/ Specified By	Furnish-ed By	Installed By
1	Filter Hoods	RND	KEC	KEC
2	Condensate Hoods	RND	KEC	KEC
3	Ventilators	RND	KEC	KEC
4	Control Panels For Water-Wash Ventilators Only	RND	KEC	KEC
5	Fire Suppression System (Kitchen Equipment)	RND	KEC	KEC
6	Fire Suppression System (Hood Ducts & Building)	ME	MC	MC
7	Fire Suppression System (General Building Type)	ME	MC	MC
8	Duct Collars	RND	KEC	KEC
9	Ducts And Duct Work	ME	MC	MC
10	Hood Fans, Controls, and Accessories	ME	MC/EC	MC/EC
11	Interconnections	ME	PC/EC	PC/EC
12	Duct And Canopy Insulation	ME	MC	MC
13	Pollution Control Assembly	ME	MC	MC
14	Fly Fans	ME	MC	MC
15	Air Conditioning	ME	MC	MC
16	General Air Movement	ME	MC	MC
17	Short Cycle Hoods	Not Advised	N/A	N/A

B. RESPONSIBILITIES NOTES & DESIGN STANDARDS

The following notes and design standards correlate to the "Responsibility Matrix" above:

1. Air-Conditioning of Commercial Kitchen.
   Except in locations of high average daily mean temp or typically high humidity, good continuous air-movement (see #2 below) has proven to be a more comfortable, healthy, and productive environment for kitchens, than air-conditioning them. Unless the economies of central building systems are persuasive, we do not favor the air-conditioning of kitchen; other than the exceptions noted above.
2. General Room Air Movement
   Some air movement through exhaust and supply, is needed in every room within kitchen usage. The following chart depicts the number of air changes per hour, including air exhausted through hoods, needed to insure efficient operation of equipment and a reasonably comfortable working environment:
   a. Air Changes Per Hour

Area	Minimum Air Changes Per Hour
Kitchen Production Areas (less walk-in coolers/freezers)	45 to 60
Storerooms	10 to 15
Offices	10 to 15
Locker Rooms	Bldg. Std.
Service Corridors	Bldg. Std.
Rooms with Ice Machines	45 to 60 & As Noted On RND Plans
3/4 HP & Larger Compressors	Air-Cooled - 1000 CFM / HP Water-Cooled – 200 CFM / HP And As Noted On RND Plans

b. Balance/Negative Pressure
   (1) General – Commercial Kitchens
   The exhaust and supply of air to kitchens should be balanced to produce a slight movement of air from public areas to kitchens. The negative pressure should not exceed .02" (0.05mm) W.G., or 5% between supply and exhaust.
   (2) Contamination Areas
   In most health care facilities, and some correctional facilities, full environmental separation is required between clean and soiled dish washing areas. In addition to the physical barriers involved, specific control of airflow between the two (always from clean to soiled) will be required.

c. Supply Air Notes
   (1) Powered vs. Passive Supply Air
   We have observed that passive supply air systems, i.e. those systems where supply air is expected to be drawn through grills, plenums, openings, etc. by the "vacuum" created by the exhaust hoods; do not, in fact, achieve the desired air movement. The result is reflected in inconsistent pilots, overworked compressors, reduced production of ice machines, and unacceptably uncomfortable working conditions, as well as ineffective capture of smoke, and heat by exhaust canopies. Therefore, we urge that all required supply air to kitchens be "pushed" or "powered" systems.
   (2) Supply Air Grill Locations
   The location of supply air grilles should consider the impact of accelerated cooling of hot foods, and the potential for soiling adjacent ceilings or walls. No supply air grills should be located in close proximity to exhaust hoods, or directed towards exhaust hoods. Refer to California Energy Commission P500-03-034F Design Guide - Improving Commercial Kitchen Ventilation System Performance.
   (3) Underfloor Air Distribution (UFAD) Systems
   Underfloor air distribution systems with floor or wall supply air grilles should not be utilized in any kitchen/food storage, preparation, or serving areas; or associated ware washing, etc. areas. In addition to the normal spills, the floors, walls, and equipment in these areas are normally cleaned by pressure cleaners and/or hoses and/or buckets and mops. Also, stationary or portable equipment in these areas could block the grilles.
   (4) 100% Tempered Supply Air
   100% of commercial kitchen makeup or supply air should be tempered and introduced into the space through evenly spaced ceiling or wall diffusers. Diffuser locations should be planned by the ME to minimize drafts and to enhance the complete turnover of the room's air, without any "stale-air pockets". Refer to International Mechanical Code, Section 508.1.1 Makeup air temperature and ASHRAE Standard 154-2003 Ventilation For Commercial Cooking Equipment.

3. Specific Ventilation Systems
   General Notes Regarding Exhaust Systems

a PLEASE NOTE: The grease produced by cooking equipment is broken down into three size categories of particulates: sub-micron (0.03 - 0.55 microns), steam (0.55 – 6.2 microns), and spatter (6.2 – 150 microns). When a commercial exhaust hood manufacturer list extraction rates of 65 - 95% (normal range), this refers to the "extractable" spatter size particulates only; which is approximately 35 - 40% of the total grease particulates generated by cooking equipment. This means that the remaining 60 - 65% of the grease goes through the filters and up the exhaust duct. The remaining spatter size grease particulates, not extracted by the filters, and some of the other smaller size particulates collects on the walls of the ductwork, the fans, and the roof; and must be cleaned regularly. Access for cleaning ducts and fans, and methods of collecting grease on the roof should be designed for, by the Mechanical Engineer. Due to the extreme small size of the sub-micron and steam size grease particulates, some of these may be blown out into the atmosphere by the fans; depending on the type fans selected, prevailing wind currents, and surrounding building structures. At this time, the only known method of extracting total grease produced by cooking equipment, is with various types of very expensive and high maintenance sophisticated exhaust hoods or pollution control assemblies. These special hoods could be specified by RND, if desired. But pollution control assemblies would have to be designed and specified as part of the overall ventilation and fan package system, by the Mechanical Engineer.

b Code Compliances And Design Standards
All exhaust hoods, ventilators, ducts, fans, filters, lighting, fire protection, etc. should comply with the latest editions of the International Mechanical Code (IMC), ASHRAE Standard Ventilation For Commercial Cooking Operations, FCSI White Paper For Commercial Kitchen Ventilation "Best Practice" Design And Specification Guidelines, NFPA-96, UL, NSF, local health, building, and fire authorities, and ASTM 1704 for exhaust hoods, as posted on the Fisher-Nickel web site www.fishnick.com . Since it is unlikely that any single design entity can anticipate all the local interpretations of those various regulations, the Mechanical Engineers are invited to alert RND to any areas where proposed systems may not conform.

c Canopy Mounting Heights
The mounting heights for the bottom edge of canopy type hoods are:

Minimum	6'-6" (1981mm) AFF (not recommended due to ADA)
Standard	6'-8" (2032mm) AFF (complies with ADA requirements)
Maximum	7'-0" (2134mm) AFF (may require exhaust CFM increase)

d. For proper capture, the recommended overhang horizontal distance between the inside lower edge of the exhaust hood canopy and the outer edge of the cooking equipment should be 12" minimum, and increased to 18" to 24" minimum for island type assemblies and extra heavy duty cooking equipment. Also, remember that most cooking equipment requires a minimum of 6" between it and the wall behind, for the utility connections; especially for gas piping and connections.

e. Exhaust systems for cooking equipment should be designed as a separate and individual system from all other type exhaust and HVAC systems. Ductwork should be provided with greaseproof welded joints, and with all horizontal ducts pitched, or graded, back to hoods or ventilators. Ventilators provided with grease cleaning facility, such as hot water, should be connected to individual exhaust fans. Exhaust fan design, with AMCA certification, should be selected to provide for all exhaust system losses, including grease and vapor extraction friction loss of selected hood or ventilator ducts, bends, transitions, etc.; so that velocity and quantity of exhaust at the hood meets the design intent.

f. The design and installation of the duct work and fans for exhaust hoods over cooking equipment can have a serious effect on the noise levels generated at exhaust hood areas. Careful consideration should be given in engineering proper type transitions, bends, larger size ducts with lower static pressures, and vibration and sound isolation of the ducts and fans, etc, to help reduce the noise levels.

4. Commercial Kitchen Hoods & Ventilators
   a. Filter Hoods - (IMC "Type I")

"Filter Hoods" refer to those exhaust hoods whereby grease and other particulates are extracted from the air by removable and washable stainless steel "baffle" or "centrifugal" filters. (Mesh filters are no longer acceptable).

b. Extractor Hoods - (IMC "Type I")
"Extractor Hoods" refer to those exhaust hoods whereby grease and other particulates are extracted from the air by specially designed removable and washable stainless steel "baffle" or "centrifugal" chambers. These are very similar in design to water-wash ventilators, but without the wash down or continuous water feature.

c. Water-Wash Ventilators - (IMC "Type I")
"Ventilators" extract through high velocity air directional changes through baffles, which throws out particulates by centrifugal force. The extracted matter is then periodically or continuously washed out of the system.

d. Condensate Hoods - (IMC "Type II")
"Condensate Hoods" are used to protect ceiling and surrounding areas, from high moisture content vapors such as over dish machines, urns, etc.; and do not normally require extraction filter devices, dampers, or fire protection systems.

e. Responsibilities
   (1) Canopies
   Stainless steel canopies, including duct collars, are specified by RND and furnished and hung by the KEC. As we are not engineers, we must select and rely on a specific exhaust hood manufacturer to provide RND with the engineering requirements for the canopies; such as CFM's, static pressures, duct collar sizes, etc; which is then inserted into our documents. Since all exhaust hoods specified by RND are required to be UL Listed, and each hood manufacturer must submit their individual hoods for UL Listing under various tests, any change to the selected manufacturer, such as multiple manufacturer requirements for government type projects or alternate manufacturer selected at bidding of project, may create changes to the requirements as shown on our documents, and possibly redesigning by the Mechanical Engineers.
   (2) Controls/Control Panels
   Because all exhaust systems must interface with overall building air handling; the switching, wiring, timing, etc., of exhaust systems must be designed and specified by the Mechanical/Electrical Engineer. Where water-wash ventilators are specified by RND, the control panels that operate the wash down timer and controls will be furnished by the KEC, with the ventilation canopies; and mounted according to RND location plans. All interconnections between panels, fans, fire controls, hood lights, etc., still must be designed and specified by the ME/EE.
   (3) Automatic activation of the exhaust hood(s) whenever cooking occurs, per 2006 and later, International Mechanical Code Section 507.2.1.1, is the responsibility of the engineers. Verify specific requirements with the local code authorities.
   (4) Exhaust ventilators utilizing continuous water type grease filtration should have non-rusting ductwork and welded joints, such as type 304 stainless steel.
   (5) Ducts/Fans
   All ductwork provided for dish washers/utensil washers should have permanent watertight joints and be graded back to washers. Exhaust ducts for adjacent ceiling grilles should be connected to separate ducts, or installed such as to preclude condensate drip through grille. No aluminum ductwork should be used in these areas, as ware washer chemicals will deteriorate the aluminum. Black iron should not be used, also. RND suggests the use of galvanized or stainless steel ductwork. Final connections to hoods/ventilators, etc. should be by the Mechanical Contractor. Duct collars on many hoods/ventilators are oversized to increase efficiency of unit, and may require transitions to exhaust ducts, to maintain a minimum required velocity in the ducts. Mechanical Contractor should provide transitions. Ducts for exhaust hoods in exhibition cooking areas and kitchens where the hood operation should be quieter, should have minimum velocities in the exhaust ducts, and larger ducts.

5. Special Conditions
   a. Ventilation for island type cooking equipment (such as exhibition cooking areas and front serving line cooking areas)
      Since exhaust hood functioning and efficiency in these areas can be significantly affected by many external factors, the hoods and surrounding areas and components must be evaluated and engineered very cautiously. Generally, these hoods require double to triple the amount of exhaust air volume as a hood against a wall, and can therefore seriously affect the overall HVAC design and equipment selection. A minimum of 95% make-up supply air must be provided for these hoods, in the general area, without creating a draft into, from or through the hood area itself. Any type of air movement from surrounding areas which might affect the air flow in the hood area, such as opening doors, HVAC air supply on one side of the room and return on the opposite side, windows (even serving windows), corridors, ceiling or room fans, exterior doors, etc., must be considered when using these type hoods. If total control of the air movement in the hood area cannot be guaranteed, then a shield on the front and sides of the hood, such as glass, should be considered from the bottom edge of the hood down to the floor or equipment. The more grease or smoke the cooking equipment can produce, the more important the above considerations are, with charbroilers being at the top of the list.
   b. "Compensating/Short-Cycle" Systems
      (1) Standard "compensating" hoods refer to short-cycle, short circuit, integral make-up air hoods; or any hood, which introduces make-up air inside the hood capture canopy. Through our experience on thousands of projects, the experiences and engineering of most of the major hood manufacturers, and independent testing labs, it has been proven that short cycling does not effectively capture smoke, combusted gas fumes, and grease-laden air. Many code jurisdictions now prohibit their use. In addition, ASHRAE Standard 154-2003 requires that any amount of make-up air introduced inside the hood canopy, must be added to and above, the minimum amount of exhausted air normally required by the hood. Therefore, we cannot endorse the use of short-cycle hoods on any project in which we are involved.
      (2) In rare cases, exhaust hoods may be designed to bring tempered supply air at a maximum of approximately 30% of the exhaust air, through a perforated perimeter supply plenum directed downward, on the exterior front of the canopy. These systems may be acceptable if the following conditions are met:
         (a) The distance to the lower edge of the hood canopy should not be less than 18”; and the bottom edge of the supply plenum mounted at the top edge of the hood canopy is recommended.
         (b) All supply air is tempered to within a 10 degree range of 70 degree F (6 degree range of 21 degree C).
         (c) The distribution is widely made, for gentle air motion velocity not to exceed 150 fpm.
         (d) The remaining 70% of make-up/supply air is provided as far as possible from the exhaust canopy.
   c. Special Ventilation Requirements For Solid Fuel Burning Cooking Equipment
      (1) Any cooking equipment which utilizes solid fuel (wood or charcoal) either as a primary or secondary fuel source, must have the exhaust system (hood, ducts, fan) separate from any other exhaust system. A few other examples of secondary solid fuel source would be a gas or electric fired char-broiler that uses hardwood chips just to enhance flavoring, or a gas fired meat smoker that uses wood chips, or a decorative open type gas pizza oven that uses wood for appearances only.
      (2) In addition, the only other cooking equipment allowed below the same exhaust hood is equipment not requiring automatic fire extinguishing equipment; which severely limits any cooking equipment.

d. Other Related Items

(1) Fire Protection

Fire protection will be required in all commercial kitchen cooking exhaust systems. The required protection and the normal division of responsibilities are:

(a) "Surface Protection" - Certain types of cooking devices (primarily those generating open flames or deep fat frying), require specific directional protection. This is specified by RND and installed by the KEC's sub-contractor.

(b) "Canopy/Canopy Plenum Protection" - Additional protection is required in the canopy and the canopy plenum. This again, is specified by RND and installed by the KEC's sub-contractor.

(c) "Duct Protection" - Any required protection upstream from the duct collar should be specified by the ME and installed by the MC.

(d) "Insulation" - The architects should provide insulation and required air space for cooking equipment exhaust ducts and hoods. All exhaust ducts should be provided with inspection doors conforming to the National Board of Fire Underwriter standards and local code requirements.

(e) Grouping and combinations of exhaust hood ducts and fans should be coordinated with normal coverage capabilities of fire systems protection requirements; by the Mechanical Engineer.

(f) Refer to section III. General Coordination Information – All Divisions, paragraph K. Exhaust Hoods Fire Suppression Systems for clarification of systems specified by RND and provided by the KEC.

(2) Fly Fans

Fly fans or air curtains are suggested at kitchen/dock entrances, as indicated on RND plans, and as required by local code authorities; and should be specified by the ME.

(3) Ventilation for Refrigeration Equipment

Refrigeration compressors must have adequate flow-through ventilation to function properly. The ME should provide the following minimums at locations shown on RND plans:

(a) Air-cooled compressors - 1000 CFM/Horsepower (472 L/s per HP)

(b) Water-cooled compressors - 200 CFM/Horsepower (94 L/s per HP)

Additionally, the ME should be alerted for small rooms that contain vending machines, ice machines, etc.; to insure that the room has adequate ventilation, to dissipate the heat produced by such equipment. It should be noted that louvered doors or wall louvers will not provide the required ventilation.

C. All (sub)contractors should refer to installation manuals and approved shop drawings at installation phase, for supplemental connections, interconnections, and complete installation requirements for the foodservice equipment included in this project; in addition to requirements shown on Ricca Newmark Design's documents.

VI. MECHANICAL DIVISION COORDINATION INFORMATION - PLUMBING SECTIONS

We find that precise, complete, and coordinated plumbing installations of the kitchen are critical to a successful project. Ricca Newmark Design wants to be involved in coordinating the inter-relation of plumbing to equipment, and offers the following notes as a starting point in that effort.

A. RESPONSIBILITY MATRIX

The following division of responsibilities is historically typical. Unless we are specifically notified otherwise, we will base our documentation and specifications on these assignments.

RESPONSIBILITY MATRIX				
	Foodservice Equipment/Area	Furnished By	Installed By	Connected By
1	**Sinks:**			
a	Floor Type Mop Sink And Rack	PC/KEC	PC/KEC	PC
b	Hand Sink: Complete With Soap And Towel Dispenser	PC/KEC	PC/KEC	PC
2	**Faucets:**			
a	Hand Sink	PC/KEC	PC/KEC	PC
b	Mop Sink	PC/KEC	PC/KEC	PC
c	Hose Bibb (With Mixing Valve)	PC	PC	PC
d	Hose Reel	KEC	KEC/PC	PC
3	**Drains And Waste Lines:**			
a	Floor Sinks	PC	PC	PC
b	Area Drains	PC	PC	PC
c	Direct/Indirect Waste Lines	PC	PC	PC
d	Walk-In Evaporator Drain Lines	PC	PC	PC
4	**Supply Piping**			
a	Stops/Shut-Off Valves At All HW & CW Supply	PC	PC	PC
b	In-Line Water Filters For Foodservice Equipment	KEC/ Vendors	PC	PC
c	Flex Connections: Water And Gas	KEC/PC	PC	PC
d	Pressure Regulators	PC	PC	PC
5	**Miscellaneous**			
a	Vacuum Breaker/ Backflow Preventors (General)	PC	PC	PC
b	Vacuum Breaker (Disposers)	KEC	PC	PC
c	Reducers	PC	PC	PC
d	P-Traps	PC	PC	PC
e	Grease Traps	PC	PC	PC
f	Compressors Water Cooling System	PC	PC	PC
g	Emergency Eye Wash Stations	PC	PC	PC

B. RESPONSIBILITIES NOTES

The following notes correlate to the "Responsibility Matrix", above:

1. Sinks
   a. All sinks intended for preparation/washing of food, washing of utensils, soaking of ware or linen, etc. will be furnished and set in place by the KEC. PC to connect all water service and drains.
   b. Unless noted otherwise, where "hand sinks" are indicated on RND Plans, furnish and install lavatory unit complete with wrist blade faucet, towel dispenser, and soap dispenser. Suggest units similar to Bobrick Mini Console model No. B-582 or Eagle model No. HSA10-FDP. Verify restrictions on maximum hot water temperature with local authorities.

c. Unless noted otherwise, furnish and install floor type mop sinks and service faucet with mixing valve and vacuum breaker, and mop hanging rank.

2. Faucets, Waste Lines and Miscellaneous
   a. Equipment Faucets
      KEC will furnish all foodservice equipment faucets. PC should install and connect.
   b. Hand/Mop Sink Faucets
      Unless noted otherwise, PC should provide all required faucets, foot treadles, and install. Service faucets for mop sinks should be mounted at +54" (1372mm) AFF.
   c. Hose Reel Units
      At locations indicated on RND Plans, hose reel units are furnished by KEC, complete with neoprene hose, pistol grip spray nozzle, shut-off valve, mounting plate, adjustable mixing valve and vacuum breaker. PC should provide service, piping, and install all components.
   d. Hose Bibbs
      PC should provide, mount and connect all hose bibbs indicated on RND Plans. As a minimum, hose bibbs will be required at all hand sink locations, and at the dock or trash area.
   e. Equipment Waste Fittings
      KEC furnished sinks are specified with 1-1/2" (40mm) waste connections, unless otherwise indicated. PC should install waste fittings that are furnished by KEC.
   f. Reducers, P-Traps
      PC should allow for, furnish and install all required traps. P-traps are required on all condensate drains from cooler evaporators. When waste fittings do not match drain line sizes indicated, PC should furnish and install suitable fittings to preserve required drain size.
   g. Direct/Indirect Waste Lines
      All wastes, direct or indirect, should be furnished and installed by the PC, unless noted otherwise on RND Plans.
   h. Walk-In Cooler/Freezer Evaporator Lines
      PC should furnish and install drain lines from walk-in cooler/freezer evaporators, to drain locations; with 1:3 (4"/12") pitch and "P" trap in end over floor sink. Drain lines should be 1" (25mm) minimum. Each evaporator should have a separate drain line.
   i. Vacuum Breakers/Backflow Preventors
      Plumber should provide vacuum breakers/backflow preventors as required by local codes.
   j. Grease Traps
      Grease traps should be located outside of the building, if at all possible. If they are intended to be located inside the building, verify Health Department acceptability, restrictions and/or requirements. Under no circumstance should they ever be located in any food service area, due to interference with kitchen operations, conflicts with kitchen equipment, and unsanitary health conditions. The sizing and design of grease traps should be by the ME. Equipment to be connected to a grease trap should be verified with the local authorities.
   k. Compressors Water Cooling System
      Normally all foodservice equipment refrigeration compressors will be provided air-cooled. However, if requested, and where practical, they can be provided water-cooled. PC should provide all water cooling system components, such as cooling towers, chillers, recirculating pumps, line runs, control valves, etc. These systems must be continuous operation, 24 hours a day, every day of the year. All foodservice equipment water-cooled compressors will be shown with supply and return cooling system connections, for connection to recirculating cooling systems. We STRONGLY advise against city water supply cooling and dumping the water, even if legal.

3. Supply Piping
    a. In-Line Water Purifiers
    PC to install in-line water filter-purifiers for steamers, beverage systems, coffee urns and ice makers (as furnished by KEC or Vendors). Coordinate installation location to insure it does not interfere with adjacent equipment installation, is protected from portable or adjacent equipment, has clear access for cartridge replacement and servicing, and is in compliance with local codes.
    b. Stops/Shut-Off Valves
    Stops should be furnished and installed by PC, on all hot and cold water lines at equipment. Provide all required shut-off valves. Chrome finish.
    c. Flex-Connectors
    Steam, gas and water services for portable and counter top appliances should be connected to equipment with approved stainless steel flexible hoses and quick-disconnect fittings. Gas fittings and hoses should be AGA approved for commercial kitchen equipment. Gas and water hoses should be covered with thick fire resistant plastic or poly coating, per Codes. These are furnished by the KEC for installation by the PC, unless noted otherwise.
    d. All water to steam producing equipment such as compartment steamers, boilers, or steam generators should have a water hardness no greater than 2.0 grains per gallon and pH between 7.0 and 7.5. Water not meeting this minimum may void the warranties on this equipment. Treated water is also highly suggested for ice machines, ware washing equipment, booster heaters, and water-cooled equipment; depending on local water conditions. The sizing and design of any water softening devices should be included in the scope of the ME work. RND will assist with loads and capacities of using equipment.
4. Drains/Floor Sinks
    a. Floor Sinks
        1. PC is responsible for the supply, installation and connection of floor sinks, with sediment bucket and flush top grate, as indicated on RND plans. All floor sinks should be set flush with the finished floor, or below floor level as indicated on RND plans; unless required otherwise by local codes. Local or plumber's "practice" of raising floor sinks above the finished floor, should not be acceptable.
        2. In general, floor sinks should have 2” (50 mm) minimum waste lines, unless provided for high volume waste or high flow equipment or areas such as dish/pot wash machines, multiple sinks, water wash hoods, can/cart wash areas, or cooking equipment such as kettles, tilt fry pans, steamers, etc. In these areas, floor sinks should have 4” (100 mm) minimum waste lines. Normally these high flow floor sinks will be indicated on RND plumbing drawings.
    b. Area Drains
    Unless specifically prohibited by local plumbing codes, floor sinks and floor drains (other than in the bottom of floor troughs) are to be set flush with finished floor. Where local code interpretation does not permit floor sink installation to be flush with finished floor, Plumbing Division to notify RND, for possible relocation of floor sinks/drains in hazardous locations; and provide additional flush floor drains in all kitchen areas.
    c. Recessed Trough Drains
    Where trough drains are indicated on RND plans, they are intended for a specific purpose and flow capacity. Any structurally necessitated alteration in location or depth should be cause for immediate notification of RND office, to coordinate alternatives. In that trough drains are also used as area drains for clean-up purposes, they must be set flush with the finished floor. If specified, the KEC will furnish a stainless steel pan to the G.C., for installation. The PC is responsible for setting the floor sink or drain to be flush with the bottom of the trough. The KEC will provide the removable grate that sets in the top of the stainless steel pan.

5. Utilities Distribution System
   If specified, pre-engineered, factory-fabricated utilities distribution systems that can include supply water, gas, steam/steam return and ventilator drains, will be supplied and installed by the KEC, ready for single-point final connections for each service, by the PC. Final plumbing connections from the distribution system to each item of equipment adjacent to the system, should be by the PC.

C. PLUMBING DESIGN STANDARDS

The following notes reflect our understanding of minimum acceptable standards, code, and design practices, for the plumbing support of kitchen equipment:

1. General
   a. All service lines for sewer, water, gas, vacuum, compressed air, thermal fluid, steam and steam condensate should be sized to provide full flow volume for all items supplied on respective mains and branches. Identify all lines and the service they provide, with appropriate color-coded labels.
   b. All service lines should be run in walls, ceilings, floors, or otherwise concealed, unless specifically prohibited by local Codes.
   c. Main gas supply line(s) for cooking equipment should be installed inside wall(s), and stubbed out of the wall at each equipment connection location; or stubbed out of the floor, if no wall is adjacent to the equipment. Seal and vent the wall, or whatever is required by local codes, to have a gas line inside a wall. No main gas line should be installed on the exterior of a wall back of cooking equipment, unless mandated by local codes with no alternative methods allowed. Each connection stub with valve, should be turned 90º to be parallel to the wall, as close to the wall as feasible. Coordinate direction of final connection, with KEC. This will decrease the distance between the wall and the equipment, thus reducing the hood overhang and depth, and associated supply and exhaust ventilation requirements; and increase cleanability of the wall.
   d. Fuel gas services should be sized to supply the required BTU indicated, at the equipment, at a low pressure of approximately 6"-9" (152mm – 229mm) water column. Provide pressure regulators as required; verify type with local codes.
   e. All horizontal-piping lines extended and connected to equipment from below, should be run at the highest possible elevation above the floor, to provide clearance for cleaning. No lines should lie on the floor.
   f. All exposed piping and fittings should be chrome plated or stainless steel. Tailpieces for sinks should be 17 gauge (1.4 mm) chrome plated flared brass tubing for connection to 1-1/2" I.P.S. (40mm) male thread fitting. "P" traps should be chrome plated brass, uniform code pattern.
   g. Design for and provide lines, fittings, valves, and all plumbing/waste components suitable for normal commercial kitchen temperatures. Typically: hot water temperatures of 140 -200 degrees Fahrenheit (60 – 93.3 degrees C), drain temperatures of 130 degrees Fahrenheit (54.4 degree C) to boiling temperatures (sometimes under pressure), and steam temperatures as per design pressures. Verify and coordinate with each Project.
   h. Water supply pressure to kitchen equipment should be 50 PSI (345 kPa). For pressures exceeding 50 PSI (345 kPa), provide pressure reducing valve(s). Minimum pressure should be no lower than 20 PSI (138 kPa); with the understanding that pressures lower than 50 PSI (345 kPa) will increase operational times.
2. Supply Piping
   a. All hot and cold-water service lines, except short branches extended and connected to fixtures, should be insulated to conform to accepted practice, and prevent condensation on cold water lines.
   b. Hot water supply should be 120 degrees Fahrenheit (48.9 degrees C) minimum at all food service sinks and equipment. Verify unusual requirements or restrictions with local authorities.
   c PC should blow out all lines prior to final connections.

3. Waste/Drains/Floor Sinks
    a. All waste lines shown on RND plumbing plans are designed to comply with the best known and generally accepted health and sanitary conditions and codes. Plumbing Engineer/Contractor should be responsible for verifying compliance with local health and building codes, making adjustments where required, and notifying Ricca Newmark Design.
    b. Adequate clean-out provision should be made for all waste lines, by means of plugged "T" fittings extended to accessible position.
    c. All vent piping for waste lines should be concealed wherever possible. Suggest use of loop-vents or air-gap vent assemblies for island fixtures; verify local codes.
    d. Indirect waste lines from kitchen equipment to floor sinks, should never be less than 1" (25mm) O.D., regardless of the connection size. Where connections are less than 1" (25mm) O.D., use a suitable fitting to connect.
    e. P-traps should be provided on all air-gap waste lines from walk-in cooler/freezer evaporators, at the floor sinks; to prevent backflow of air and humidity into coolers/freezers.
    f. Exposed floor drains at positions indicated, should be cast iron with polished nickel bronze grate. Floor drains used with indirect waste lines, should be verified with local codes, for acceptance.
    g. Floor sinks should be square type indirect waste receptor with nickel bronze rim and grate, acid resisting enamel interior and shallow aluminum bucket. Suggested units are Smith Series No. 3101 or 3151, Josam Super-Flo-Ceptor series, or Zurn equal.
    h. At self-contained steam kettles, provide chrome-plated fittings on safety valve terminal, installed for down discharge.
4. Steam Piping (where building steam or central plant steam is available)
    a. Wherever possible, all piping rough-ins should be stubbed-out of walls or columns.
    b. Identify all steam lines and the service they provide.
    c. All steam lines should be insulated to conform to accepted practice. All exposed lines at equipment should be covered with chrome plated or stainless steel sleeves.
    d. Blow out all steam lines before final equipment connections are made; especially lines to equipment with steam thermostat controls.
    e. Steam supply pressure for major kitchen areas and equipment should be 45 PSIG (310 kPa) minimum. Pressure reducing valves as required, will be provided with the equipment, by the KEC. Please note: many cities require an on-site steam engineer for pressures over 15 PSIG (103 kPa); verify with local authorities.
    f. Steam which comes in direct contract with food, food holding utensils, or food holding equipment must be potable steam.
5. Automatic activation of the exhaust hood(s) whenever cooking occurs, per 2006 International Mechanical Code Section 507.2.1.1, is the responsibility of the engineers. Verify specific requirements with the local code authorities.

D. All (sub)contractors should refer to installation manuals and approved shop drawings at installation phase, for supplemental connections, interconnections, and complete installation requirements for the foodservice equipment included in this project; in addition to requirements shown on Ricca Newmark Design's documents.

E. Refer to section III. General Coordination Information – All Divisions, paragraph K. Exhaust Hoods Fire Suppression Systems for clarification of systems specified by RND and provided by the KEC.

VII. ELECTRICAL DIVISION COORDINATION INFORMATION

The electrical support for commercial kitchen installations is complex and critical to the success of the project. Ricca Newmark Design wants to assist in any way possible, in clarifying the interrelation of electrical services to equipment and offers these notes as a start toward that clarification.

A. RESPONSIBILITIES MATRIX

The following division of responsibilities is historically typical. Unless we are specifically notified otherwise, we will base our documentation and specifications on these assignments.

RESPONSIBILITY MATRIX				
	Foodservice Equipment/Area	Furnished By	Installed By	Connected By
1	**General:**			
a	Disconnects	EC	EC	EC
b	Disposer Solenoids, Switches And Control Panels	KEC	EC/PC	EC
c	Infra-Red Food Warmers	KEC	KEC	EC
d	Magnetic Motor Starters	EC	EC	EC
e	Utility Distribution System	KEC	KEC	EC
f	Kitchen Equipment	KEC	KEC	EC
g	Plug Molding	EC	EC	EC
h	Exit Lights	EC	EC	EC
I	Fly Fans	MC	MC	EC
j	Communication/Computer Systems	OWNER	OWNER	EC
2	**Refrigeration:**			
a	Compressors	KEC	KEC	EC
b	Evaporators	KEC	KEC	EC
c	Ceiling Lights	KEC	EC	EC
d	Door, Jamb And Face Heaters	KEC	KEC	EC
e	Drain Line Heater Tape	KEC	KEC	EC
f	High/Low Temperature Alarm Systems	KEC	EC	EC
3	**Ventilation:**			
a	Hood Lighting	KEC	KEC	EC
b	Wash Down Control Panels For Ventilators Only	KEC	KEC	EC
c	Hood Exhaust/Supply Fans	MC	MC	EC
d	Hood Light Switches	EC	EC	EC
e	Fire Suppression Systems	KEC	KEC	EC

B. RESPONSIBILITY NOTES

The following notes correlate to the "Responsibility Matrix" above:

1. General:
   a. Disconnects
      EC should provide all disconnects or other devices as required by local codes. This also includes automatic fire control shut-off of all electricity in and below exhaust hoods. Disconnects should be located so that they do not interfere with placement of kitchen equipment, and should not be located behind equipment or below exhaust hoods. Proper code clearance should be provided at all disconnect switches. While the RND Foodservice Electrical Rough-In Plans include a column in the Schedule indicating disconnects (DISC) and the reference note B2, these are offered only as a helpful hint that there may or may not be a requirement for a disconnect. It is the responsibility of the Electrical Engineer to determine the actual requirement.
   b. Exit Lights
      Exit lights, conforming with codes, should be furnished and installed complete with lamps and wiring, by EC.

c. Magnetic Motor Starters
EC should furnish, install, and connect magnetic motor starters.
d. Communications/Computer Systems
The Owner should determine telephone, intercoms, P.O.S., computer, A/V and security systems requirements. EC should furnish and install required conduit. Phone company should furnish and install all equipment and wiring, including any required phone jacks.
e. Plug Moulding
At bar workboards, EC should provide service, junction boxes, wiring and plug moulding.
f. Infra-Red Food Warmer
Infra-red food warmers will be furnished and installed by the KEC. EC should provide service and make final connection.
g. Disposer Wiring
Disposers, solenoid, and manual reversing switch, water saver, or control panel with timing devices, are furnished by KEC, and installed and connected as required by EC/PC as applicable.
h. Utility Distribution Systems
If specified, pre-engineered, manufactured utility distribution systems that include electrical service, will be furnished and installed by the KEC, ready for single-point final connections by the EC. Individual final electrical connections of components and adjacent equipment should be by EC.
i. All Kitchen Equipment
KEC will furnish and set-in-place, all specified kitchen equipment. EC should rough-in all electrical service and make final connections, as indicated on RND drawings.

2. Refrigeration Support
a. Reach-in/Roll-in Refrigerators
Reach-in or roll-in refrigerators should have a separate circuit or individual disconnect switch for each unit.
b. Walk-in Coolers/Freezers
EC should provide service for refrigeration items, furnish and install disconnect switches, install timers where indicated, install ceiling lights where indicated (fixtures furnished by KEC), install magnetic starters, and wire all motors complete from disconnect switch wiring through starters to motors. Make final connections to door switches, alarms, door heaters, light fixtures, and evaporators inside cooler/freezers; with disconnect switches at evaporators. Penetrations for the required services should be through ceiling insulation wherever feasible, or otherwise at walls, just under ceiling insulation. No conduit should be run on building wall surfaces where insulation materials are to be applied. All penetrations are to be vapor tight. Inside of conduit, at point where it pierces the insulation, should be sealed using sealant placed in conduit. Seal remaining space between conduit and insulation. All conduits should be run above the compartment ceiling, not attached to interior ceilings.

3. Exhaust System Support
a. Exhaust Hood Lights
KEC will furnish exhaust hoods/ventilators, with light fixtures installed. Switches, wiring, and final connections should be by EC. Switch(es) should be located in a near-by wall, but not below the hood.
b. Wash Down Control Panels For Ventilators Only
Manufactured water spray type ventilators, when specified, will be furnished and installed by the KEC, with control panels. EC should provide service, make terminal block connections at control panels, and extend to fan motor starters, fire control system, and ventilators.

c. Hood Fire Extinguisher Systems
Provide service and install control wiring for hood/ventilator fire extinguishing systems. System furnished by KEC, with two sets of normally open and two sets of normally closed contact points, for use by the EC. EC should interconnect with control panels, hood/ventilators, fire systems, electrical panels, disconnects, and building fire systems as required. Refer to section III. General Coordination Information – All Divisions, paragraph K. Exhaust Hoods Fire Suppression Systems for clarification of systems specified by RND and provided by the KEC.

d. Exhaust Fans/Controls
The Mechanical Division will provide and install exhaust fans, wiring to fans and all controls. Wiring from fans to switches/timers, etc. should be by EC.

C. ELECTRICAL DESIGN STANDARDS

The following notes reflect our understanding of minimum acceptable standards, codes, and design practices for the electrical support of kitchen equipment:

1. Lighting and power panels should be selected with 20% (min.) spare circuit capacity, to permit expansion. Identify all circuits and the service they provide.
2. All circuit control switches, except for special application, should be circuit breaker type.
3. All conduits, with wiring, should be run in walls, ceilings, floors, or otherwise concealed, wherever possible.
4. All 3-phase electric equipment should be checked for possible unbalanced phase loading, to provide adequate wiring and breaker protection.
5. All receptacles should be NEMA sized and rated for service indicated on RND Plans. Provide matching cords and plugs, as indicated on RND Plans. Provide GFCI receptacles as required by NEC and local codes.
6. All equipment receptacles should be polarized. Provide standard U-slot duplex 3-wire grounding type receptacles for standard 120 volt outlets.
7. Duplex convenience receptacles indicated on RND Plans, relate to direct needs of the foodservice operation. Provide additional receptacles as required by code, requested by the Owner, required by equipment other than foodservice, or for general convenience.
8. Where applicable, breaker panels should designate breakers by RND equipment number and description, to coordinate with equipment service manuals.
9. Electrical panels and components locations should be coordinated with kitchen equipment placement. Refer to Kitchen Equipment Plan drawing (in addition to Kitchen Equipment Electrical Rough-In Plan), for placement of all equipment, including non-electric items such as shelving and portable equipment.
10. When floor penetrations are necessary for rough-ins, utilize larger size single conduit stubs for multiple circuits, wherever possible. This will reduce the number of floor penetrations and simplify floor sealing and cleaning.
11. Floor receptacles should be vapor-proof flush type.
12. As noted on the RND Foodservice Equipment Electrical Rough-In Plan(s) and Schedule(s), indicated foodservice equipment counter(s) or table(s) will be provided by the KEC completely pre-wired to a built-in accessible pull-box, with pigtails tagged with the identification and requirements of the equipment they serve; ready for multiple final connections by the EC. This will include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the specific counter or table, as noted on the RND Schedule. This will not include any circuit breakers at the counter(s) or table(s); or provide sufficient room for a circuit breaker panel. All circuit breakers and/or disconnects must be engineered and located by the EE and provided by the EC.

13. As noted on the RND Foodservice Equipment Electrical Rough-In Plan(s) and Schedule(s), indicated foodservice equipment counter(s) or table(s) will be provided by the KEC completely pre-wired with a built-in circuit breaker mini-panel; ready for a final connection by the EC. This mini-panel will include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the specific counter or table; and will include individual breakers for all electrical components included, and a main breaker for a single circuit incoming service connection. The incoming service size, voltage, and phase are to be determined by the EE, from the individual loads noted on the RND Schedule, as included in the mini-panel. KEC will be responsible for coordinating the mini-panel with this incoming service information.
14. Automatic activation of the exhaust hood(s) whenever cooking occurs, per 2006 International Mechanical Code Section 507.2.1.1, is the responsibility of the engineers. Verify specific requirements with the local code authorities.
15. Due to the fact that virtually every commercial kitchen and associated areas walls, floors and ceilings, and most of the equipment located in them, is pressure washed on a regular bases, it is strongly advised that all electrical components (J-boxes, conduit, outlets, switches, cover plates, light fixtures, panels, disconnects, etc) be vapor or water tight; even if not required by NEMA.

D. LIGHTING STANDARDS
1. Minimum Levels
Provide general lighting levels to conform to local code requirements. Where none are specifically stated, the minimum levels suggested, and as determined from the average Health Department Guidelines are as follows:

Area	Minimum Foot Candles
At surfaces of food preparation, cooking, serving, utensil washing surfaces, or work areas (36" [914mm] above floor)	50 (538 lux)
In storage areas and toilet areas	30 (323 lux)
In walk-in cooler/freezers, wait service areas, and all other associated areas not listed here.	30 (323 lux)
Dining and cocktail lounges (for cleanup purposes).	10 (108 lux)

2. Shielding
Shielding to protect against broken glass falling onto food, must be provided for all artificial lighting fixtures located over, by, or within food storage, preparation, service and display facilities, or areas where utensils and equipment are cleaned and stored.
3. All lighting should be high efficiency, low energy usage type wherever available.

E. All (sub)contractors should refer to installation manuals and approved shop drawings at installation phase, for supplemental connections, interconnections, and complete installation requirements for the foodservice equipment included in this project; in addition to requirements shown on Ricca Newmark Design's documents.

END OF GUIDELINES.

ricca newmark
design

University of Oregon
- Erb Memorial Union Renovation and Expansion -
Portland, OR

Budget Estimate – March, 2012

Item	Qty		Description	Price Each	Price Total
1	1	ea	REMOTE REFRIGERATION SYSTEM	6,957.50	6,957.50
2	1	ea	WALK-IN COOLER	7,314.23	7,314.23
3			Evaporator Coil, QTY(1), For Item #2, Part of Item #1.		Included
4	8	ea	COOLER SHELVING	348.89	2,791.10
5			Office Furniture, QTY (Lot), By Owner/Operator		By Owner
6	2	ea	CORNER GUARD	63.25	126.50
7			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
8	9	ea	DRY STORAGE SHELVING	442.75	3,984.75
9			Spare No.		Spare
10			Spare No.		Spare
11	2	ea	HAND SINK	957.44	1,914.88
12			Soap and Towel Dispenser, QTY (2), By Owner/Operator		By Owner
13	1	ea	ICE MAKER, CUBE-STYLE	8,214.93	8,214.93
14	1	ea	FLOOR TROUGH AND GRATE	1,397.20	1,397.20
15	1	ea	POT SINK	4,316.88	4,316.88
16	1	ea	WALL SHELF	748.32	748.32
17	1	ea	PREP TABLE WITH SINKS	4,175.14	4,175.14
18	1	ea	WALL SHELF	978.57	978.57
19			Spare No.		Spare
20			Spare No.		Spare
21	1	ea	REACH-IN REFRIGERATOR	7,046.17	7,046.17
22	1	ea	REFRIGERATOR, ROLL-IN	6,379.59	6,379.59
23	1	ea	PAN RACK CART	309.93	309.93
24	1	ea	WORK COUNTER WITH SINK	8,323.70	8,323.70
25	1	ea	HAND SINK	847.55	847.55
26	1	ea	WALL SHELF	1,611.76	1,611.76
27	2	ea	CONVEYOR OVEN	6,541.20	13,082.40
28	2	ea	CONDENSATE HOOD	1,585.19	3,170.37
29			Spare No.		Spare
30			Spare No.		Spare
31	2	ea	REF'D MAKE-UP TABLE	13,164.23	26,328.46
32	1	ea	WORK COUNTER WITH SINK	3,364.90	3,364.90
33	1	ea	WORK COUNTER	7,796.10	7,796.10
34	1	ea	WALL SHELF	921.01	921.01
35			Serving Counter, QTY (1), By Architect/G.C.		By Others
36			P.O.S. Equipment, QTY (2), By Owner/Operator		By Owner
37			Spare No.		Spare
38			Spare No.		Spare
39	Spare No.		Spare		

Item	Qty		Description	Price Each	Price Total
40			Spare No.		Spare
41			Spare No.		Spare
42			Spare No.		Spare
43			Spare No.		Spare
44			Spare No.		Spare
45			Spare No.		Spare
46			Spare No.		Spare
47			Spare No.		Spare
48			Spare No.		Spare
49			Spare No.		Spare
50			Spare No.		Spare
51	1	ea	REMOTE REFRIGERATION SYSTEM	13,282.50	13,282.50
52	1	ea	WALK-IN COOLER	6,074.53	6,074.53
53			Evaporator Coil, QTY(1), For Item #52, Part of Item #51.		Included
54	1	ea	WALK-IN FREEZER	5,915.14	5,915.14
55			Evaporator Coil, QTY(1), For Item #54, Part of Item #51.		Included
56	8	ea	COOLER SHELVING	348.89	2,791.10
57	4	ea	CORNER GUARD	63.25	253.00
58			Spare No.		Spare
59			Spare No.		Spare
60			Spare No.		Spare
61	8	ea	DRY STORAGE SHELVING	442.75	3,542.00
62			Office Furniture, QTY (Lot), By Owner/Operator		By Owner
63			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
64	1	ea	WALL SHELF	287.82	287.82
65	2	ea	HAND SINK	957.44	1,914.88
66			Soap and Towel Dispenser, QTY (2), By Owner/Operator		By Owner
67	1	ea	POT SINK	3,652.75	3,652.75
68	1	ea	WALL SHELF WITH UTENSIL RACK	605.61	605.61
69			Spare No.		Spare
70			Spare No.		Spare
71	1	ea	WALL FLASHING	2,032.80	2,032.80
72	1	ea	DISHWASHER	18,576.70	18,576.70
73	1	ea	CONDENSATE HOOD	1,976.34	1,976.34
74	1	ea	WALL FLASHING	1,626.24	1,626.24
75	1	ea	SOILED DISH TABLE	12,397.02	12,397.02
76			Glass Rack Shelf-Ceiling Mount, QTY (1), Part of Item #75.		Included
77	1	ea	FOOD WASTE COLLECTOR	8,137.25	8,137.25
78	1	ea	PRE-RINSE UNIT	233.53	233.53
79			Spare No.		Spare
80			Spare No.		Spare
81	1	ea	WORK TABLE WITH SINK	2,404.14	2,404.14
82	1	ea	WALL SHELF	402.94	402.94
83	1	ea	ICE MAKER, CUBE-STYLE	9,455.26	9,455.26
84	1	ea	FLOOR TROUGH AND GRATE	1,397.20	1,397.20
85	1	ea	WORK TABLE WITH SINKS	5,414.84	5,414.84
86	1	ea	WALL SHELF	1,381.51	1,381.51
87	1	ea	WORK TABLE	2,036.60	2,036.60
88			Spare No.		Spare
89			Spare No.		Spare
90			Spare No.		Spare
91	1	ea	20 QT. FOOD MIXER		Existing
92	1	ea	FOOD SLICER	8,128.00	8,128.00

Item	Qty		Description	Price Each	Price Total
93	1	ea	FOOD PROCESSOR, ELECTRIC	4,419.95	4,419.95
94	1	ea	EXHAUST HOOD	34,060.13	34,060.13
95	1	ea	FIRE SUPPRESSION SYSTEM	6,198.50	6,198.50
96	1	ea	EXHAUST HOOD		Included
97	1	ea	WALL FLASHING	1,138.50	1,138.50
98	1	ea	WALL FLASHING	1,138.50	1,138.50
99	1	ea	HOOD CONTROL PANEL	3,542.00	3,542.00
100			Spare No.		Spare
101	1	ea	SALAMANDER BROILER	3,859.07	3,859.07
102	1	ea	WORK COUNTER	3,967.04	3,967.04
103	1	ea	GRIDDLE	9,430.04	9,430.04
104	1	ea	REFRIGERATED BASE	7,860.97	7,860.97
105	2	ea	6-OPEN BURNER RANGE	16,533.76	33,067.51
106	1	ea	POT FILLER FAUCET	254.58	254.58
107			Spare No.		Spare
108			Spare No.		Spare
109			Spare No.		Spare
110			Spare No.		Spare
111	1	ea	SPREADER	1,320.67	1,320.67
112	1	ea	FRYER BATTERY, GAS	25,658.00	25,658.00
113			Dump Station, QTY (1), Included in Item #112, Fryer.		Included
114	1	ea	COMBI OVEN ASSEMBLY	20,521.66	20,521.66
115	1	ea	STORAGE SHELVING	390.89	390.89
116			Spare No.		Spare
117			Spare No.		Spare
118			Spare No.		Spare
119			Spare No.		Spare
120			Spare No.		Spare
121	1	ea	WORK COUNTER WITH SINK	6,340.18	6,340.18
122	2	ea	REF'D MAKE-UP TABLE	13,164.23	26,328.46
123	1	ea	WORK COUNTER WITH SINK	4,356.66	4,356.66
124	1	ea	HAND SINK	847.55	847.55
125			Bar Top and Die, QTY (1), By Architect/G.C.		By Others
126			Serving Counter, QTY (1), By Architect/G.C.		By Others
127			P.O.S. Equipment, QTY (2), By Owner/Operator		By Owner
128			Spare No.		Spare
129			Spare No.		Spare
130			Spare No.		Spare
131	4	ea	HEAT LAMP	166.10	664.40
132			Serving Counter, QTY (1), By Architect/G.C.		By Others
133			Bar Top and Die, QTY (1), By Architect/G.C.		By Others
134			Access Door, QTY (2), Specified by Arch/Interior Designer, Provided by G.C.		
135	1	ea	DRIP TRAY	200.00	200.00
135	1	ea	BEER DISPENSING TOWER	1,046.65	1,046.65
136			Trash Recetacles, QTY (LOT), By Owner/Operator.		
137	2	ea	HAND SINK	830.50	1,661.00
138	2	ea	COCKTAIL STATION	2,046.00	4,092.00
139			Spare No.		Spare
140			Spare No.		Spare
141			Soda Gun, QTY (2), By Purveyor.		
142	2	ea	P.O.S. EQUIPMENT STAND	865.00	1,730.00

Item	Qty		Description	Price Each	Price Total
143			P.O.S. Equipment, QTY (3), By Owner/Operator.		
144	1	ea	GLASS RACK STORAGE	586.30	586.30
145	1	ea	GLASS WASHER	5,791.50	5,791.50
146	1	ea	DUMP SINK	864.60	864.60
147			Spare No.		Spare
147			Back Bar Counter, QTY (1), Specified by Arch/Interior Designer., By G.C.		
148			Spare No.		Spare
148			Spare No.		Spare
149			Spare No.		Spare
149			Spare No.		Spare
150			Spare No.		Spare
150			Spare No.		Spare
151			Bar Top and Die, QTY (1), Specified by Arch/Interior Designer, Provided by G.C.		
151			Display Shelf, QTY (1), Specified by Arch/Interior Designer., By G.C.		
152	3	ea	BACKBAR STORAGE CABINET, REFRIGERATED	1,577.95	4,733.85
153	2	ea	BLENDER STATION	666.60	1,333.20
154	2	ea	BLENDER	170.50	341.00
155	2	ea	MIXER	332.20	664.40
156			Spare No.		Spare
157			Trash Recetacles, QTY (LOT), By Owner/Operator.		
158	2	ea	WASTE CABINET	246.40	492.80
159			Spare No.		Spare
160			Spare No.		Spare
161	1	ea	ESPRESSO MACHINE	21,808.56	21,808.56
162			Soda Rack and System, QTY(1), By Purveyor.		By Purveyor
163			Spare No.		Spare
164			Spare No.		Spare
165			Spare No.		Spare
166			Spare No.		Spare
167			Spare No.		Spare
168			Spare No.		Spare
169			Spare No.		Spare
170			Spare No.		Spare
171			Spare No.		Spare
172			Spare No.		Spare
173			Spare No.		Spare
174			Spare No.		Spare
175			Spare No.		Spare
176			Spare No.		Spare
177			Spare No.		Spare
178			Spare No.		Spare
179			Spare No.		Spare
180			Spare No.		Spare
181	6	ea	DRY STORAGE SHELVING	442.75	2,656.50
182	1	ea	ICE MAKER, CUBE-STYLE	8,214.93	8,214.93
183	1	ea	FLOOR TROUGH AND GRATE	1,397.20	1,397.20
184	1	ea	POT SINK	3,652.75	3,652.75
185	1	ea	WALL SHELF	633.19	633.19
186			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
187	2	ea	CORNER GUARD	63.25	126.50
188	1	ea	WALL FLASHING	2,327.60	2,327.60
189			Spare No.		Spare

Item	Qty		Description	Price Each	Price Total
190			Spare No.		Spare
191	1	ea	REACH-IN REFRIGERATOR	7,046.17	7,046.17
192	1	ea	REF'D MAKE-UP TABLE	13,164.23	13,164.23
193	1	ea	WORK COUNTER WITH SINK	3,364.90	3,364.90
194	1	ea	HAND SINK	847.55	847.55
195	1	ea	WALL SHELF	690.76	690.76
196	1	ea	WORK COUNTER	1,461.77	1,461.77
197			Spare No.		Spare
198			Spare No.		Spare
199			Spare No.		Spare
200			Spare No.		Spare
201			Display Shelf, QTY (1), Specified by Arch/Interior Designer., By G.C.		
202	1	ea	WORK COUNTER	1,461.77	1,461.77
203	1	ea	EXHAUST HOOD	10,701.90	10,701.90
204	1	ea	FIRE SUPPRESSION SYSTEM	3,872.00	3,872.00
205	1	ea	WALL FLASHING	1,138.50	1,138.50
206	1	ea	6-OPEN BURNER RANGE	16,533.76	16,533.76
207	1	ea	POT FILLER FAUCET	254.58	254.58
208	1	ea	GRIDDLE	10,068.15	10,068.15
209	1	ea	HOOD CONTROL PANEL	3,542.00	3,542.00
210			Spare No.		Spare
211	1	ea	CHEESEMELTER	4,470.52	4,470.52
212	1	ea	WORK COUNTER	974.51	974.51
213	1	ea	PREP/REF'D DISPLAY CASE	15,958.90	15,958.90
214	1	ea	FOOD SHIELD	3,000.00	3,000.00
215			Serving Counter, QTY (1), Specified by Arch/Interior Designer., By G.C.		
216			P.O.S. Equipment, QTY (2), By Owner/Operator		By Owner
217			Spare No.		Spare
218			Spare No.		Spare
219			Spare No.		Spare
220			Spare No.		Spare
221	1	ea	WORK COUNTER WITH SINK	8,492.00	8,492.00
222	1	ea	DROP-IN HANDSINK	2,208.24	2,208.24
223	1	ea	DIPPERWELL AND FAUCET	150.82	150.82
224	1	ea	ESPRESSO MACHINE	21,808.56	21,808.56
225	1	ea	UNDERCOUNTER REFRIGERATOR	3,300.00	3,300.00
226			Coffee Brewer, QTY (Lot), By Purveyor		By Purveyor
227			Air Pots and Rack, QTY (Lot), By Purveyor		By Purveyor
228			Ice Tea Brewer, QTY (Lot), By Purveyor		By Purveyor
229			Spare No.		Spare
230			Spare No.		Spare
231			Syrup Rack, QTY (Lot), By Architect/I.D., Provided by G.C.		By Others
232			Pick-Up/Condiment Counter, QTY (1), Specified by Architect/ID		By Others
233			Silverware/Napkin Dispenser, QTY (Lot), By Owner/Operator.		By Owner
234			Spare No.		Spare
235			Spare No.		Spare
236	2	ea	REFRIGERATED SELF-SERVICE CASE	15,695.56	31,391.11
237			Spare No.		Spare
238			Spare No.		Spare
239			Spare No.		Spare
240			Spare No.		Spare

Item	Qty		Description	Price Each	Price Total
241			Spare No.		Spare
242			Spare No.		Spare
243			Spare No.		Spare
244			Spare No.		Spare
245			Spare No.		Spare
246			Spare No.		Spare
247			Spare No.		Spare
248			Spare No.		Spare
249			Spare No.		Spare
250			Spare No.		Spare
251	62	ea	DRY STORAGE SHELVING	442.75	27,450.50
252	31	ea	CORNER GUARD	63.25	1,960.75
253			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
254	1	ea	KEG COOLER	7,314.23	7,314.23
255			Evaporator Coil, QTY(1), For Item #254, Part of Item #256.		Included
256	1	ea	REMOTE REFRIGERATION SYSTEM	6,957.50	6,957.50
257	1	ea	BEER CHILL SYSTEM	3,759.80	3,759.80
258	4	ea	DUNNAGE RACK	104.41	417.65
259			Spare No.		Spare
260			Spare No.		Spare
261	1	ea	REACH-IN REFRIGERATOR	7,046.17	7,046.17
262	1	ea	WORK COUNTER WITH SINK	4,852.54	4,852.54
263	1	ea	MICROWAVE OVEN	548.63	548.63
264	1	ea	TOASTER	590.94	590.94
265			Coffee Brewer, QTY (Lot), By Purveyor		By Purveyor
266			Spare No.		Spare
267			Spare No.		Spare
268			Spare No.		Spare
269			Spare No.		Spare
270			Spare No.		Spare
271			Office Furniture, QTY (Lot), By Owner/Operator		By Owner
272	2	ea	WORK TABLE	1,726.73	3,453.45
273			Overshelf, QTY(1), Part of Item #272.		Included
274	2	ea	WORK TABLE	1,549.63	3,099.25
275	1	ea	20 QT. MIXER	8,081.97	8,081.97
276	1	ea	MIXER STAND	1,400.86	1,400.86
277	1	ea	WORK TABLE WITH SINKS	5,414.84	5,414.84
278	1	ea	WALL SHELF	1,381.51	1,381.51
279			Spare No.		Spare
280			Spare No.		Spare
281	1	ea	FOOD SLICER	8,128.00	8,128.00
282	1	ea	FOOD PROCESSOR, ELECTRIC	4,419.95	4,419.95
283	10	ea	HAND SINK	957.45	9,574.45
284			Soap and Towel Dispenser, QTY (10), By Owner/Operator		By Owner
285	1	ea	EXHAUST HOOD	36,330.80	36,330.80
286	1	ea	FIRE SUPPRESSION SYSTEM	6,198.50	6,198.50
287	2	ea	WALL FLASHING	2,024.00	4,048.00
288			Spare No.		Spare
289			Spare No.		Spare
290			Spare No.		Spare

Item	Qty		Description	Price Each	Price Total
291	1	ea	WORK COUNTER	3,967.04	3,967.04
292	1	ea	COMBI OVEN ASSEMBLY	20,521.66	20,521.66
293	1	ea	GRIDDLE	9,430.04	9,430.04
294	1	ea	REFRIGERATED BASE	7,860.97	7,860.97
295	2	ea	6-OPEN BURNER RANGE	16,533.76	33,067.51
296	1	ea	POT FILLER FAUCET	254.58	254.58
297	1	ea	FRYER BATTERY, GAS	25,658.00	25,658.00
298			Spare No.		Spare
299			Spare No.		Spare
300			Spare No.		Spare
301			Dump Station, QTY (1), Included in Item #297, Fryer.		Included
302	1	ea	SPREADER	1,320.67	1,320.67
303	1	ea	GRIDDLE	12,606.39	12,606.39
304	1	ea	HOT TOP RANGE	11,075.73	11,075.73
305	1	ea	SPREADER	1,786.18	1,786.18
306	1	ea	CHAR-BROILER	7,267.44	7,267.44
307	1	ea	SALAMANDER BROILER	3,859.07	3,859.07
308	1	ea	HOOD CONTROL PANEL	3,542.00	3,542.00
309			Spare No.		Spare
310			Spare No.		Spare
311			Office Furniture, QTY (Lot), By Owner/Operator		By Owner
312	1	ea	WALK-IN COOLER	7,314.23	7,314.23
313			Evaporator Coil, QTY(1), For Item #312, Part of Item #314.		Included
314	1	ea	REMOTE REFRIGERATION SYSTEM	6,957.50	6,957.50
315	5	ea	COOLER SHELVING	348.89	1,744.44
316			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
317	1	ea	ICE MAKER, CUBE-STYLE	8,214.93	8,214.93
318	1	ea	FLOOR TROUGH AND GRATE	1,397.20	1,397.20
319			Spare No.		Spare
320			Spare No.		Spare
321	1	ea	POT SINK	3,984.82	3,984.82
322	1	ea	WALL SHELF	690.76	690.76
323	1	ea	ASSEMBLY COUNTER	14,942.86	14,942.86
324			Over Shelf QTY (1), Two-Tiered, Included in Item #323, Assembly Counter with Sink.		Included
325	1	ea	HOT FOOD WELL	3,236.53	3,236.53
326	1	ea	FOOD WARMER	1,230.61	1,230.61
327	1	ea	REF'D MAKE-UP TABLE	13,164.23	13,164.23
328			P.O.S. Printer, QTY (1), Provided by Owner/Operator.		By Owner
329			Spare No.		Spare
330			Spare No.		Spare
331	1	ea	EXHAUST HOOD	17,836.50	17,836.50
332	1	ea	FIRE SUPPRESSION SYSTEM	3,872.00	3,872.00
333	1	ea	HOOD CONTROL PANEL	3,542.00	3,542.00
334	1	ea	WALL FLASHING	2,530.00	2,530.00
335	1	ea	6-OPEN BURNER RANGE	16,533.76	16,533.76
336	1	ea	POT FILLER FAUCET	254.58	254.58
337	1	ea	GRIDDLE	10,068.15	10,068.15
338			Spare No.		Spare
339			Spare No.		Spare
340			Spare No.		Spare

Item	Qty		Description	Price Each	Price Total
341	2	ea	COMBI OVEN, GAS, HALF SIZE	19,095.98	38,191.96
342	1	ea	CHAR-BROILER	7,267.44	7,267.44
343	1	ea	SALAMANDER BROILER	3,859.07	3,859.07
344	1	ea	FRYER BATTERY, GAS	25,658.00	25,658.00
345			Dump Station, QTY (1), Included in Item #344, Fryer.		Included
346			Spare No.		Spare
347			Spare No.		Spare
348			Spare No.		Spare
349			Spare No.		Spare
350			Spare No.		Spare
351	1	ea	WORK COUNTER WITH SINK	10,696.40	10,696.40
352	1	ea	WORK COUNTER	12,584.00	12,584.00
353			Coffee Brewer, QTY (Lot), By Purveyor		By Purveyor
354			Air Pots and Rack, QTY (Lot), By Purveyor		By Purveyor
355			Ice Tea Brewer, QTY (Lot), By Purveyor		By Purveyor
356			Soda/Ice Dispenser, QTY (Lot), By Purveyor		By Purveyor
357			Juice Dispenser, QTY (Lot), By Purveyor		By Purveyor
358	1	ea	DISPLAY CASE, REFRIGERATED SELF-SERVE	12,875.81	12,875.81
359			Spare No.		Spare
360			Spare No.		Spare
361	1	ea	REACH-IN REFRIGERATOR	7,046.17	7,046.17
362			Serving Counter, QTY (1), By Architect/G.C.		By Others
363			P.O.S. Equipment, QTY (3), By Owner/Operator		By Owner
364			Soda Rack and System, QTY(1), By Purveyor.		By Purveyor
365			Spare No.		Spare
366			Spare No.		Spare
367			Spare No.		Spare
368			Spare No.		Spare
369			Spare No.		Spare
370			Spare No.		Spare
371			Office Furniture, QTY (Lot), By Owner/Operator		By Owner
372	1	ea	WALK-IN COOLER	7,314.23	7,314.23
373			Evaporator Coil, QTY(1), For Item #372, Part of Item #374.		Included
374	1	ea	REMOTE REFRIGERATION SYSTEM	6,957.50	6,957.50
375	5	ea	COOLER SHELVING	348.89	1,744.44
376			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
377	1	ea	ICE MAKER, CUBE-STYLE	8,214.93	8,214.93
378	1	ea	FLOOR TROUGH AND GRATE	1,397.20	1,397.20
379			Spare No.		Spare
380			Spare No.		Spare
381	1	ea	POT SINK	5,645.16	5,645.16
382	1	ea	WALL SHELF	978.57	978.57
383	1	ea	WORK COUNTER WITH SINK	10,696.40	10,696.40
384	2	ea	WALL SHELF	825.00	1,650.00
385	1	ea	EXHAUST HOOD	19,025.60	19,025.60
386	1	ea	FIRE SUPPRESSION SYSTEM	3,872.00	3,872.00
387	1	ea	HOOD CONTROL PANEL	3,542.00	3,542.00
388	1	ea	WALL FLASHING	2,024.00	2,024.00
389			Spare No.		Spare
390			Spare No.		Spare
391	1	ea	6-OPEN BURNER RANGE	16,533.76	16,533.76
392	1	ea	POT FILLER FAUCET	254.58	254.58

Item	Qty		Description	Price Each	Price Total
393	1	ea	GRIDDLE	10,068.15	10,068.15
394	2	ea	COMBI OVEN, GAS, HALF SIZE	19,095.98	38,191.96
395	1	ea	CHAR-BROILER	7,267.44	7,267.44
396	1	ea	SALAMANDER BROILER	3,859.07	3,859.07
397	1	ea	WORK COUNTER	1,936.00	1,936.00
398			Soda Rack and System, QTY(1), By Purveyor.		By Purveyor
399			Spare No.		Spare
400			Spare No.		Spare
401			Serving Counter, QTY (1), By Architect/G.C.		By Others
402			P.O.S. Equipment, QTY (3), By Owner/Operator		By Owner
403	1	ea	DISPLAY CASE, REFRIGERATED SELF-SERVE	12,875.81	12,875.81
404			Coffee Brewer, QTY (Lot), By Purveyor		By Purveyor
405			Air Pots and Rack, QTY (Lot), By Purveyor		By Purveyor
406			Ice Tea Brewer, QTY (Lot), By Purveyor		By Purveyor
407			Soda/Ice Dispenser, QTY (Lot), By Purveyor		By Purveyor
408			Juice Dispenser, QTY (Lot), By Purveyor		By Purveyor
409			Spare No.		Spare
410			Spare No.		Spare
411			Spare No.		Spare
412			Spare No.		Spare
413			Spare No.		Spare
414			Spare No.		Spare
415			Spare No.		Spare
416			Spare No.		Spare
417			Spare No.		Spare
418			Spare No.		Spare
419			Spare No.		Spare
420			Spare No.		Spare
421			Office Furniture, QTY (Lot), By Owner/Operator		By Owner
422	1	ea	WALK-IN COOLER	7,314.23	7,314.23
423			Evaporator Coil, QTY(1), For Item #421, Part of Item #424.		Included
424	1	ea	REMOTE REFRIGERATION SYSTEM	6,957.50	6,957.50
425	5	ea	COOLER SHELVING	348.89	1,744.44
426			Mop Sink with Hose Bibb, QTY(1), Provided by Plumbing Division.		By Others
427	1	ea	ICE MAKER, CUBE-STYLE	8,214.93	8,214.93
428	1	ea	FLOOR TROUGH AND GRATE	1,397.20	1,397.20
429			Spare No.		Spare
430			Spare No.		Spare
431	1	ea	POT SINK	3,984.82	3,984.82
432	1	ea	WALL SHELF	690.76	690.76
433	1	ea	WORK COUNTER WITH SINK	11,374.00	11,374.00
434	2	ea	WALL SHELF	880.00	1,760.00
435	1	ea	WORK COUNTER	12,674.75	12,674.75
436	2	ea	WALL SHELF	660.00	1,320.00
437			Soda Rack and System, QTY(1), By Purveyor.		By Purveyor
438			Spare No.		Spare
439			Spare No.		Spare
440			Spare No.		Spare
441	1	ea	WORK COUNTER	6,776.00	6,776.00
442	1	ea	WALL SHELF	385.00	385.00
443			Serving Counter, QTY (1), By Architect/G.C.		By Others
444			P.O.S. Equipment, QTY (3), By Owner/Operator		By Owner
445	1	ea	EXHAUST HOOD	15,458.30	15,458.30

Item	Qty		Description	Price Each	Price Total
446	1	ea	FIRE SUPPRESSION SYSTEM	3,872.00	3,872.00
447	1	ea	HOOD CONTROL PANEL	3,542.00	3,542.00
448	1	ea	WALL FLASHING	1,644.50	1,644.50
449			Spare No.		Spare
450			Spare No.		Spare
451	2	ea	COMBI OVEN, GAS, HALF SIZE	19,095.98	38,191.96
452	1	ea	CHAR-BROILER	7,267.44	7,267.44
453	1	ea	SALAMANDER BROILER	3,859.07	3,859.07
454	1	ea	6-OPEN BURNER RANGE	16,533.76	16,533.76
455	1	ea	POT FILLER FAUCET	254.58	254.58
456	1	ea	GRIDDLE	10,068.15	10,068.15
457	1	ea	WORK COUNTER	1,936.00	1,936.00
458			Spare No.		Spare
459			Spare No.		Spare
460			Spare No.		Spare
461	1	ea	DISPLAY CASE, REFRIGERATED SELF-SERVE	12,875.81	12,875.81
462			Coffee Brewer, QTY (Lot), By Purveyor		By Purveyor
463			Juice Dispenser, QTY (Lot), By Purveyor		By Purveyor
464			Ice Tea Brewer, QTY (Lot), By Purveyor		By Purveyor
465			Soda/Ice Dispenser, QTY (Lot), By Purveyor		By Purveyor
466			Air Pots and Rack, QTY (Lot), By Purveyor		By Purveyor
467			Spare No.		Spare
468			Spare No.		Spare
469			Spare No.		Spare
470			Spare No.		Spare
471			Spare No.		Spare
472			Spare No.		Spare
473			Spare No.		Spare
474			Spare No.		Spare
475			Spare No.		Spare
476			Spare No.		Spare
477			Spare No.		Spare
478			Spare No.		Spare
479			Spare No.		Spare
480			Spare No.		Spare

Merchandise Including Dealer Mark Up & Installation:	1,536,131.65
Total:	1,536,131.65

Estimation is valid for 120 days. After 120 days add 1% escalation per month until equipment is purchased.

Disclaimer: While we endeavor to be as accurate as possible, there are many circumstances which may affect cost, and possibly cause variations in this estimation, such as:

1. Dealer Mark Up and delivery & setting cost can vary from dealer to dealer, depending on many unknown variables such as buying groups, dealer discounts, quantity discounts, manufacturer's price increases and rebates. Project location, financing, and terms of payments, etc. These variables can only be determined by the bidding or negotiation process.

2. Taxes will vary according to state, county, city, municipality, transit taxes, project tax status, etc.

Listed equipment costs do not include the following: Architectural, Engineering, or Interior Design, Small Wares, Spare Parts Kits, Taxes, Utility Rough-Ins or Final Connections, Equipment Not Included in the Kitchen Equipment Contract, or Consultant's Fees.

Foodservice equipment estimation of probable cost only; Subject to change as concept and design are developed, reviewed, and revised, and final equipment selection is made and approved. Actual cost must be obtained by quotation from qualified Kitchen Equipment Contractor's formal bid proposal.

All items are provided with manufacturer's standard finishes, unless otherwise noted.

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
Concept IV																				
	1	1	Remote Refrigeration System			3			1											
	2	1	Walk-In Cooler	1					1											
	3	1	Evaporator Coil	FROM #254									1	1						
	4	8	Cooler Shelving																	
	5	Lot	Office Furniture (O)	2.7				3												
	6	Lot	Corner Guard																	
	7	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	8	9	Dry Storage Shelving																	
	9		Spare No.																	
	10		Spare No.																	
	11	2	Hand Sink								X	10			2					
	12	2	Soap and Towel Dispenser (O)																	
	13	1	Ice Maker, Cube-Style			3.31			1		X			1				1,500		(Note#1)
	14	1	Floor Trough and Grate											1						
	15	1	Pot Sink								X	90	1	1						
	16	1	Wall Shelf																	
	17	1	Prep Table with Sinks								X	50	1	1						
	18	1	Wall Shelf																	
	19		Spare No.																	
	20		Spare No.																	
	21	1	Reach-In Refrigerator	0.84				1												
	22	1	Refrigerator, Roll-in	1.1				1												
	23	1	Pan Rack Cart																	
	24	1	Work Counter with Sink	0.9				1			X	25	1	1						
	25	1	Hand Sink								X	5			1					
	26	1	Wall Shelf																	
	27	2	Conveyor Oven		12				2											
	28	2	Condensate Hood															1,800		
	29		Spare No.																	
	30		Spare No.																	
	31	2	Ref'd Make-Up Table	2.18				2												(Note#1)
	32	1	Work Counter with Sink	0.9				1			X	25	1	1						
	33	1	Work Counter	0.9				1												
	34	1	Wall Shelf																	
	35	1	Serving Counter (GC)																	
	36	2	P.O.S. Equipment (O)	0.6				2												

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	37		Spare No.																	
	38		Spare No.																	
	39		Spare No.																	
	40		Spare No.																	
	41		Spare No.																	
	42		Spare No.																	
	43		Spare No.																	
	44		Spare No.																	
	45		Spare No.																	
	46		Spare No.																	
	47		Spare No.																	
	48		Spare No.																	
	49		Spare No.																	
	50		Spare No.																	
Pub																				
	51	1	Remote Refrigeration System			9			1											
	52	1	Walk-In Cooler	1					1											
	53	1	Evaporator Coil	FROM #52									1	1						
	54	1	Walk-In Freezer	1					1											
	55	1	Evaporator Coil	FROM #54										1						
	56	8	Cooler Shelving																	
	57	Lot	Corner Guard																	
	58		Spare No.																	
	59		Spare No.																	
	60		Spare No.																	
	61	8	Dry Storage Shelving																	
	62	Lot	Office Furniture (O)	2.7				3												
	63	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	64	1	Wall Shelf																	
	65	2	Hand Sink								X	10			2					
	66	2	Soap and Towel Dispenser (O)																	
	67	1	Pot Sink								X	90	1	1						
	68	1	Wall Shelf with Utensil Rack																	
	69		Spare No.																	
	70		Spare No.																	
	71	1	Wall Flashing																	
	72	1	Dishwasher			23.7	#		2		X	264	1	1						
	73	1	Condensate Hood															900		
	74	1	Wall Flashing																	

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	75	1	Soiled Dish Table											1						
	76	1	Glass Rack Shelf																	
	77	1	Food Waste Collector			1.2	#		1		X	5		1						
	78	1	Pre-Rinse Unit																	
	79		Spare No.																	
	80		Spare No.																	
	81	1	Work Table with Sink								X	25	1	1						
	82	1	Wall Shelf																	
	83	1	Ice Maker, Cube-Style			3.06			1		X			1				2,500		(Note#1)
	84	1	Floor Trough and Grate											1						
	85	1	Work Table with Sinks								X	50	1	1						
	86	1	Wall Shelf																	
	87	1	Work Table																	
	88		Spare No.																	
	89		Spare No.																	
	90		Spare No.																	
	91	1	20 QT. Food Mixer	0.5				1												
	92	1	Food Slicer	0.5				1												
	93	1	Food Processor, Electric	0.58				1												
	94	1	Exhaust Hood	1					1			FROM#99	1	1				3,300	1,980	
	95	1	Fire Suppression System	1				1												
	96	1	Exhaust Hood	1					1			FROM#99	1	1				3,300	1,980	
	97	1	Wall Flashing																	
	98	1	Wall Flashing																	
	99	1	Hood Control Panel	1.8					1			15	1	1						
	100		Spare No.																	
	101	1	Salamander Broiler							32										
	102	1	Work Counter	0.9				1												
	103	1	Griddle	0.05				1		120										
	104	1	Refrigerated Base	0.8				1												(Note#1)
	105	2	6-Open Burner Range							490										
	106	1	Pot Filler Faucet								X	15								
	107		Spare No.																	
	108		Spare No.																	
	109		Spare No.																	
	110		Spare No.																	
	111	1	Spreader																	
	112	1	Fryer Battery, Gas	0.73				1		80										
	113	1	Dump Station								X	25	1	1						
	114	1	Combi Oven Assembly	2.81						151	X		1	2						

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
			120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
115	1	Storage Shelving																	
116		Spare No.																	
117		Spare No.																	
118		Spare No.																	
119		Spare No.																	
120		Spare No.																	
121	1	Work Counter with Sink	0.9				1			X	25	1	1						
122	2	Ref'd Make-Up Table	2.18				2												(Note#1)
123	1	Work Counter with Sink	0.9				1			X	25	1	1						
124	1	Hand Sink								X	5			1					
125	1	Bar Top and Die (GC)																	
126	1	Serving Counter (GC)																	
127	2	P.O.S. Equipment (O)	0.6				2												
128		Spare No.																	
129		Spare No.																	
130		Spare No.																	
131	4	Heat Lamp	1					4											
132	1	Serving Counter (GC)																	
133	1	Bar Top and Die (GC)																	
134	2	Access Door (GC)																	
135	1	Beer Dispensing Tower																	
135	1	Drip Tray											1						
136	Lot	Trash Receptacle (O)																	
137	2	Hand Sink								X	10			2					
138	2	Cocktail Station										2	2						
139		Spare No.																	
140		Spare No.																	
141	2	Soda Gun (P)	1				2			X									
142	2	P.O.S. Equipment Stand																	
143	3	P.O.S. Equipment (O)	0.9				3												
144	1	Glass Rack Storage																	
145	1	Glass Washer	2.4					1		X	15	1	1						
146	1	Dump Sink								X	25	1	1						
147	1	Back Bar Counter (GC)	1.8				2			X	25	1	1						
147		Spare No.																	
148		Spare No.																	
148		Spare No.																	
149		Spare No.																	
149		Spare No.																	
150		Spare No.																	

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	150		Spare No.																	
	151	1	Bar Top and Die (GC)																	
	151	1	Display Shelf (GC)																	
	152	3	Backbar Cooler	3.3				3												(Note#1)
	153	2	Blender Station								X	50		2						
	154	2	Blender	1				2												
	155	2	Mixer	0.66				2												
	156		Spare No.																	
	157	Lot	Trash Receptacle (O)																	
	158	2	Waste Cabinet																	
	159		Spare No.																	
	160		Spare No.																	
	161	1	Espresso Machine		6			1			X		1	1						
	162	1	Soda Rack and System (P)	1.5				1			X		1	1						
	163		Spare No.																	
	164		Spare No.																	
	165		Spare No.																	
	166		Spare No.																	
	167		Spare No.																	
	168		Spare No.																	
	169		Spare No.																	
	170		Spare No.																	
	171		Spare No.																	
	172		Spare No.																	
	173		Spare No.																	
	174		Spare No.																	
	175		Spare No.																	
	176		Spare No.																	
	177		Spare No.																	
	178		Spare No.																	
	179		Spare No.																	
	180		Spare No.																	
Coffee House																				
	181	6	Dry Storage Shelving																	
	182	1	Ice Maker, Cube-Style			3.31			1		X			1				1,500		(Note#1)
	183	1	Floor Trough and Grate											1						
	184	1	Pot Sink								X	90	1	1						
	185	1	Wall Shelf																	
	186	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	187	Lot	Corner Guard																	

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
			120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
188	1	Wall Flashing																	
189		Spare No.																	
190		Spare No.																	
191	1	Reach-In Refrigerator	0.84				1												
192	1	Ref'd Make-Up Table	1.09				1												(Note#1)
193	1	Work Counter with Sink	0.9				1			X	25	1	1						
194	1	Hand Sink								X	5			1					
195	1	Wall Shelf																	
196	1	Work Counter	0.9				1												
197		Spare No.																	
198		Spare No.																	
199		Spare No.																	
200		Spare No.																	
201	1	Display Shelf (GC)																	
202	1	Work Counter	0.9				1												
203	1	Exhaust Hood	1					1		FROM#209		1	1				3,520	2,112	
204	1	Fire Suppression System	1				1												
205	1	Wall Flashing																	
206	1	6-Open Burner Range							245										
207	1	Pot Filler Faucet								X	15								
208	1	Griddle							100										
209	1	Hood Control Panel	1.8					1			15	1	1						
210		Spare No.																	
211	1	Cheesemelter							32										
212	1	Work Counter	0.9				1												
213	1	Prep/Ref'd Display Case								X	15								
214	1	Food Shield																	
215	1	Serving Counter (GC)																	
216	2	P.O.S. Equipment Stand																	
217		Spare No.																	
218		Spare No.																	
219		Spare No.																	
220		Spare No.																	
221	1	Work Counter with Sink	0.9				1			X	25	1	1						
222	1	Drop-In Handsink								X	5		1						
223	1	Dipperwell and Faucet								X			1						
224	1	Espresso Machine		6			1			X		1	1						
225	1	Undercounter Refrigerator	0.5				1												(Note#1)

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	226	1	Coffee Brewer (P)		6			1			X									
	227	1	Air Pots and Rack (P)																	
	228	1	Ice Tea Brewer (P)	1.8				1			X									
	229		Spare No.																	
	230		Spare No.																	
	231	1	Syrup Rack (P)																	
	232	1	Pick-Up/ Condiment Counter (GC)	0.9				1												
	233	Lot	Silverware/Napkin Dispenser																	
	234		Spare No.																	
	235		Spare No.																	
	236	2	Refrigerated Self-Service Case		4.5			2					1	2						(Note#1)
	237		Spare No.																	
	238		Spare No.																	
	239		Spare No.																	
	240		Spare No.																	
	241		Spare No.																	
	242		Spare No.																	
	243		Spare No.																	
	244		Spare No.																	
	245		Spare No.																	
	246		Spare No.																	
	247		Spare No.																	
	248		Spare No.																	
	249		Spare No.																	
	250		Spare No.																	
Main Kitchen																				
	251	62	Dry Storage Shelving																	
	252	Lot	Corner Guard																	
	253	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	254	1	Keg Cooler	1					1											
	255	1	Evaporator Coil	FROM #254									1	1						
	256	1	Remote Refrigeration System			3			1											
	257	1	Beer Chill System	1.85				1												(Note#1)
	258	4	Dunnage Rack																	
	259		Spare No.																	
	260		Spare No.																	
	261	1	Reach-In Refrigerator	0.84				1												
	262	1	Work Counter with Sink	0.9				1			X	25	1	1						
	263	1	Microwave Oven	1				1												

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	264	1	Toaster																	
	265	1	Coffee Brewer (P)		6			1			X									
	266		Spare No.																	
	267		Spare No.																	
	268		Spare No.																	
	269		Spare No.																	
	270		Spare No.																	
	271	Lot	Office Furniture (O)	2.7				3												
	272	2	Work Table																	
	273	1	Over Shelf																	
	274	2	Work Table																	
	275	1	20 QT. Mixer	0.5				1												
	276	1	Mixer Stand																	
	277	1	Work Table with Sinks								X	50	1	1						
	278	1	Wall Shelf																	
	279		Spare No.																	
	280		Spare No.																	
	281	1	Food Slicer	0.5				1												
	282	1	Food Processor, Electric	0.58				1												
	283	10	Hand Sink								X	50			10					
	284	10	Soap and Towel Dispenser (O)																	
	285	1	Exhaust Hood	1					1			FROM#308	1	1				3,520	2,112	
	286	1	Fire Suppression System	1				1												
	287	2	Wall Flashing																	
	288		Spare No.																	
	289		Spare No.																	
	290		Spare No.																	
	291	1	Work Counter	0.9				1												
	292	1	Combi Oven Assembly	2.81						151	X		1	2						
	293	1	Griddle	0.05				1		120										
	294	1	Refrigerated Base	0.8				1												(Note#1)
	295	2	6-Open Burner Range							490										
	296	1	Pot Filler Faucet								X	15								
	297	1	Fryer Battery, Gas	0.73				1		80										
	298		Spare No.																	
	299		Spare No.																	
	300		Spare No.																	
	301	1	Dump Station								X	25	1	1						
	302	1	Spreader																	
	303	1	Griddle							100										

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	304	1	Hot Top Range							100										
	305	1	Spreader																	
	306	1	Char-Broiler							135										
	307	1	Salamander Broiler							32										
	308	1	Hood Control Panel	1.8					1			15	1	1						
	309		Spare No.																	
	310		Spare No.																	
Concept I																				
	311	Lot	Office Furniture (O)	2.7				3												
	312	1	Walk-In Cooler	1					1											
	313	1	Evaporator Coil	FROM #312									1	1						
	314	1	Remote Refrigeration System			3			1											
	315	5	Cooler Shelving																	
	316	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	317	1	Ice Maker, Cube-Style			3.31			1		X			1				1,500		(Note#1)
	318	1	Floor Trough and Grate											1						
	319		Spare No.																	
	320		Spare No.																	
	321	1	Pot Sink								X	90	1	1						
	322	1	Wall Shelf																	
	323	1	Assembly Counter	0.9				2			X	25	1	1						
	324	1	Over Shelf																	
	325	1	Hot Food Well		6.2				1		X		1	1						
	326	1	Food Warmer	2.5					1											
	327	1	Ref'd Make-Up Table	1.09				1												(Note#1)
	328	1	P.O.S. Printer (O)	0.2				1												
	329		Spare No.																	
	330		Spare No.																	
	331	1	Exhaust Hood	1					1		FROM#331		1	1				3,300	1,980	
	332	1	Fire Suppression System	1				1												
	333	1	Hood Control Panel	1.8					1			15	1	1						
	334	1	Wall Flashing																	
	335	1	6-Open Burner Range							245										
	336	1	Pot Filler Faucet								X	15								
	337	1	Griddle							100										
	338		Spare No.																	
	339		Spare No.																	
	340		Spare No.																	
	341	2	Combi Oven, Gas, Half Size	1.18				2		91	X		1	2						
	342	1	Char-Broiler							135										

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX	MBH	COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	343	1	Salamander Broiler							32										
	344	1	Fryer Battery, Gas	0.73				1		80										
	345	1	Dump Station								X	25	1	1						
	346		Spare No.																	
	347		Spare No.																	
	348		Spare No.																	
	349		Spare No.																	
	350		Spare No.																	
	351	1	Work Counter with Sink	0.9				1			X	25	1	1						
	352	1	Work Counter	0.9				1												
	353	1	Coffee Brewer (P)		6			1			X									
	354	1	Air Pots and Rack (P)																	
	355	1	Ice Tea Brewer (P)	1.8				1			X									
	356	1	Soda/Ice Dispenser	1.5				1			X		1	2						
	357	1	Juice Dispenser	1.5				1			X									
	358	1	Display Case, Refrigerated Self-Serve		2.5			1													(Note#1)
	359		Spare No.																	
	360		Spare No.																	
	361	1	Reach-In Refrigerator	0.84				1												
	362	1	Serving Counter (GC)																	
	363	3	P.O.S. Equipment (O)	0.9				3												
	364	1	Soda Rack and System (P)	1.5				1			X		1	1						
	365		Spare No.																	
	366		Spare No.																	
	367		Spare No.																	
	368		Spare No.																	
	369		Spare No.																	
	370		Spare No.																	
Concept II																				
	371	Lot	Office Furniture (O)	2.7				3												
	372	1	Walk-In Cooler	1					1											
	373	1	Evaporator Coil	FROM #372									1	1						
	374	1	Remote Refrigeration System			3			1											
	375	5	Cooler Shelving																	
	376	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	377	1	Ice Maker, Cube-Style			3.31			1		X			1				1,500		(Note#1)
	378	1	Floor Trough and Grate											1						
	379		Spare No.																	
	380		Spare No.																	
	381	1	Pot Sink								X	90	1	1						

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
			120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
382	1	Wall Shelf																	
383	1	Work Counter with Sink	0.9				1			X	25	1	1						
384	2	Wall Shelf																	
385	1	Exhaust Hood	1					1			FROM#387	1	1				3,080	1,848	
386	1	Fire Suppression System	1				1												
387	1	Hood Control Panel	1.8					1			15	1	1						
388	1	Wall Flashing																	
389		Spare No.																	
390		Spare No.																	
391	1	6-Open Burner Range							245										
392	1	Pot Filler Faucet								X	15								
393	1	Griddle							100										
394	2	Combi Oven, Gas, Half Size	1.18				2		91	X		1	2						
395	1	Char-Broiler							135										
396	1	Salamander Broiler							32										
397	1	Work Counter	0.9				1												
398	1	Soda Rack and System (P)	1.5				1			X		1	1						
399		Spare No.																	
400		Spare No.																	
401	1	Serving Counter (GC)																	
402	3	P.O.S. Equipment (O)	0.9				3												
403	1	Display Case, Refrigerated Self-Serve		2.5			1												(Note#1)
404	1	Coffee Brewer (P)		6			1			X									
405	1	Air Pots and Rack (P)																	
406	1	Ice Tea Brewer (P)	1.8				1			X									
407	1	Soda/Ice Dispenser	1.5				1			X		1	2						
408	1	Juice Dispenser	1.5				1			X									
409		Spare No.																	
410		Spare No.																	
411		Spare No.																	
412		Spare No.																	
413		Spare No.																	
414		Spare No.																	
415		Spare No.																	
416		Spare No.																	
417		Spare No.																	
418		Spare No.																	
419		Spare No.																	

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
	420		Spare No.																	
Concept III																				
	421	Lot	Office Furniture (O)	2.7				3												
	422	1	Walk-In Cooler	1					1											
	423	1	Evaporator Coil	FROM #422									1	1						
	424	1	Remote Refrigeration System			3			1											
	425	5	Cooler Shelving																	
	426	1	Mop Sink with Hose Bibb (PC)								X	15			1					
	427	1	Ice Maker, Cube-Style			3.31			1		X			1				1,500		(Note#1)
	428	1	Floor Trough and Grate											1						
	429		Spare No.																	
	430		Spare No.																	
	431	1	Pot Sink								X	90	1	1						
	432	1	Wall Shelf																	
	433	1	Work Counter with Sink	0.9				1			X	25	1	1						
	434	2	Wall Shelf																	
	435	1	Work Counter	0.9				1												
	436	2	Wall Shelf																	
	437	1	Soda Rack and System (P)	1.5				1			X		1	1						
	438		Spare No.																	
	439		Spare No.																	
	440		Spare No.																	
	441	1	Work Counter	0.9				1												
	442	1	Wall Shelf																	
	443	1	Serving Counter (GC)																	
	444	3	P.O.S. Equipment (O)	0.9				3												
	445	1	Exhaust Hood	1					1			FROM#447	1	1				2,860	1,716	
	446	1	Fire Suppression System	1				1												
	447	1	Hood Control Panel	1.8					1			15	1	1						
	448	1	Wall Flashing																	
	449		Spare No.																	
	450		Spare No.																	
	451	2	Combi Oven, Gas, Half Size	1.18				2		91	X		1	2						
	452	1	Char-Broiler							135										
	453	1	Salamander Broiler							32										
	454	1	6-Open Burner Range							245										
	455	1	Pot Filler Faucet								X	15								
	456	1	Griddle							100										
	457	1	Work Counter	0.9				1												

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
			120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
458		Spare No.																	
459		Spare No.																	
460		Spare No.																	
461	1	Display Case, Refrigerated Self-Serve		2.5			1												(Note#1)
462	1	Coffee Brewer (P)		6			1			X									
463	1	Juice Dispenser	1.5				1			X									
464	1	Ice Tea Brewer (P)	1.8				1			X									
465	1	Soda/Ice Dispenser	1.5				1			X		1	2						
466	1	Air Pots and Rack (P)																	
467		Spare No.																	
468		Spare No.																	
469		Spare No.																	
470		Spare No.																	
471		Spare No.																	
472		Spare No.																	
473		Spare No.																	
474		Spare No.																	
475		Spare No.																	
476		Spare No.																	
477		Spare No.																	
478		Spare No.																	
479		Spare No.																	
480		Spare No.																	

RICCA NEWMARK DESIGN **PRELIMINARY FOODSERVICE EQUIPMENT UTILITY LOAD SCHEDULE**

PROJECT NAME: University of Oregon Erb Memorial Union Renovation	**PROJECT NUMBER: 11191.F00** **PROJECT PHASE: Schematic Design**	**DATE: 03-15-2012** **FILE NO.: 11191SDU1.xls**

	ITEM NO.	QTY. REQ'D.	EQUIPMENT DESCRIPTION	ELECTRICAL KW						GAS MBH	WATER		WASTE			CHILLED WATER		VENTILATION		
				120/1	120/208 208/1	120/208 208/3	480/3	RECP.	J BOX		COLD	140F. GPH	FS	IW	DW	SUPPLY	RETURN	EXH CFM	SUP CFM	GENL CFM
			TOTALS:	139.12	72.2	68.51	#	135	44	4346.4	X	1849	65	94	26	0	0	35580	13728	0

FS = FLOOR SINK IW = INDIRECT WASTE DW = DIRECT WASTE # = 480 VOLT EQUIPMENT AVAILABLE UPON REQUEST, IN LIEU OF 208V 3PH LISTED

(E), (O), (P), (GC), (PC), (MC) = UTILITIES FOR EXISTING, OWNER, PURVEYOR, GENERAL CONTRACTOR, PLUMBING CONTRACTOR, OR MECHANICAL CONTRACTOR EQUIPMENT ARE ESTIMATIONS ONLY, BASED ON SIMILAR EQUIPMENT, AND MUST BE VERIFIED WITH ACTUAL EQUIPMENT TO BE INSTALLED.

!!NOTE!! ESTIMATED UTILITIES ONLY; SUBJECT TO CHANGE AS CONCEPT AND DESIGN ARE DEVELOPED, REVIEWED, AND REVISED; AND FINAL EQUIPMENT SELECTION IS MADE AND APPROVED.

THIS PRELIMINARY UTILITY SCHEDULE IS INTENDED TO INDICATE THE SCOPE OF UTILITIES, AND IS NOT TO BE USED FOR FINAL UTILITY SERVICE DESIGN.

UTILITIES INDICATED FOR EACH ITEM, ARE TOTALS FOR QUANTITY INDICATED (NOT PER EACH).

NOTE #1 - GEN'L VENTILATION: COMPRESSORS / RACK VENTILATION CAN BE ELIMINATED IF LOCATED OUTDOORS; OR REDUCED TO 20% OF LISTED CFM'S IF 24 / 7 RECIRCULATING COOLING WATER SUPPLY AND RETURN IS AVAILABLE.

NOTE #2 - GEN'L VENTILATION: INDIVIDUAL REFRIGERATION ITEM VENTILATION INDICATED CAN BE REDUCED TO 20% OF LISTED CFM'S IF 24 / 7 RECIRCULATING COOLING WATER SUPPLY AND RETURN IS AVAILABLE.

9. CONCERT HALL ACOUSTICS

a) ACOUSTICS DESIGN

b) NOISE AND VIBRATION CONTROL OF MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS GUIDELINES

ACOUSTICS DESIGN

801 West Adams Street, 8th Floor Chicago, Illinois 60607 USA tel +1 312 441 1980 fax +1 312 441 1981
www.kirkegaard.com

Overview

The acoustics of the EMU Concert Hall aim for excellence – similar in quality to the 1,400 seat Weill Concert Hall at Sonoma State University – Green Music Center (SSU-GMC). Orchestral music will sound warm and enveloping. Chamber music will be intimate. Amplified music will be exciting but clean. Opera singers must be able to fill the hall without forcing and without being overwhelmed by the pit.

Throughout the Concert Hall building, which is situated to the East of the main atrium, sound "bleed" from one space to another will be controlled so that every space can be active simultaneously without interfering with performances. The one possible exception is loud amplified events in the atrium. Noise from the mechanical systems will be controlled to create a pleasant ambience throughout the concert hall building. Mechanical systems in the concert hall itself will be virtually silent.

Our strategies for achieving these qualities will develop as the design develops. At a Schematic Design level, we offer the following design approaches for pricing. The concert hall at SSU-GMC not only is an acoustical bench mark but also is a reference point in terms of project cost.

Estimating the Cost of Acoustical Design

The acoustical design of the EMU Concert Hall does not stand apart from the architectural and engineering designs and therefore cannot be documented within a single specification section or on a separate set of drawings. The acoustic criteria for the building will affect virtually every sheet of the construction documents. As a result, the costs of the acoustical design cannot be assigned to a particular trade. Rather, the cost effects of acoustical requirements must be accommodated by each building trade whose work is affected. It becomes very important, therefore, to clearly communicate the full extent of unusual construction requirements to the cost estimators early on in design.

Weill Concert Hall
Green Music Center
Sonoma State University
Rohnert Park, CA

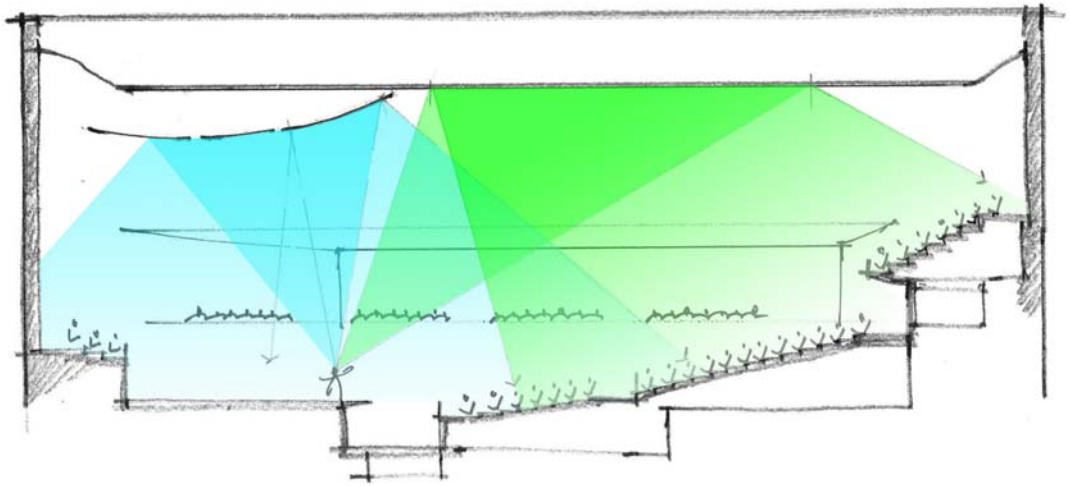
One of the models for the UO-EMU Concert Hall

Concert Hall - Room Acoustics

Our goal is to provide an acoustic environment that is excellent for the most important “core uses” of the room while accommodating a broader range of uses. Core uses that rely on the natural acoustics of the concert hall include orchestras, concert bands, high-profile solo or chamber musicians, choruses, opera, and some jazz performances. Otherwise, including most jazz performances, certain kinds of dance, and certain popular music performers use light amplification to supplement the natural acoustics of the hall. Other uses rely heavily on amplification and want the room’s natural acoustics to recede into the background – heavily amplified music, dance performed to recorded music, and any use that is focused on speech, such as commencement ceremonies.

The natural acoustics and adjustable elements that support the core uses will provide a range of acoustic environments. Some anticipated uses would ideally take place in an acoustic environment outside of that range – for example, movies with elaborate sound effects and heavily amplified popular music. Although the concert hall is not an ideal environment for these uses, they could still be presented inside the hall and satisfy the listener.

Our goal for natural acoustics is a comfortably loud, “present” sound that is clear and beautiful, avoiding harshness, muddiness or opacity. The audience should feel enveloped by the sound, and the performers should feel their own sound returning to them as a re-assuring “room response”. In terms of sound reinforcement, the room remains present but not dominant, with a shorter reverberation time and fewer supportive reflections. Avoiding late reflections (“echoes”) from amplified sources to the audience (or back to performers) is especially critical for ensuring the greatest possible clarity.



Supportive reflections from canopy and ceiling

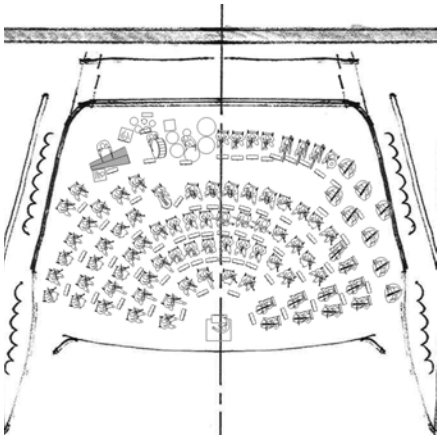
Curtis R. Priem
Experimental Media and Performing Arts Center
Rensselaer Polytechnic Institute
Troy, NY

Another model for the UO-EMU Concert Hall

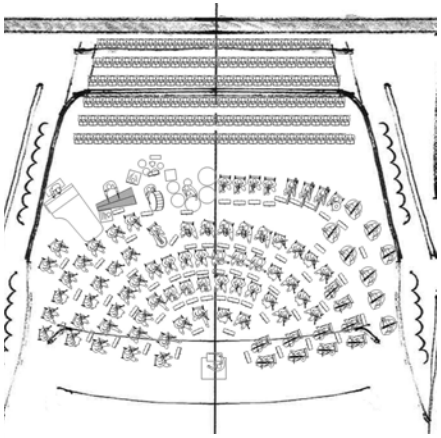
Geometry

The EMU Concert Hall at 1,100 seats is similar in scale to the 1,200 seat, shoebox shaped concert hall at Rensselaer Polytechnic Institute – Experimental Media and Performing Arts Center (RPI-EMPAC) which serves as an important model for the design of this project.

- The volume within the audience chamber must be large enough to generate significant reverberation and to avoid uncomfortable loudness levels – at least 500,000 cubic feet.
- The volume within the audience chamber must be not so large that it becomes difficult for a performer to energize the room – less than 900,000 cubic feet.
- The current concept, with a ceiling slab approximately 52' above the performance platform, encloses roughly 600,000 cubic feet. This is less than that of EMPAC, however, we feel that with proper room shaping and surface development, the hall would be appropriate reverberant for the core uses without excessive height.
- The performance platform graciously accommodates 90 musicians on the flat. A stage extension accommodates full orchestra plus a large chorus.
- The orchestra pit could easily accommodate 55 musicians.
- The audience chamber is narrower near the performance platform, so that the walls closest to the performers reflect sound from the performance platform laterally to the audience in a time frame that is helpful and supportive.
- At the side walls in the middle of the room, a recessed side gallery provides critical supportive reflections down to the main floor and up to the balcony.

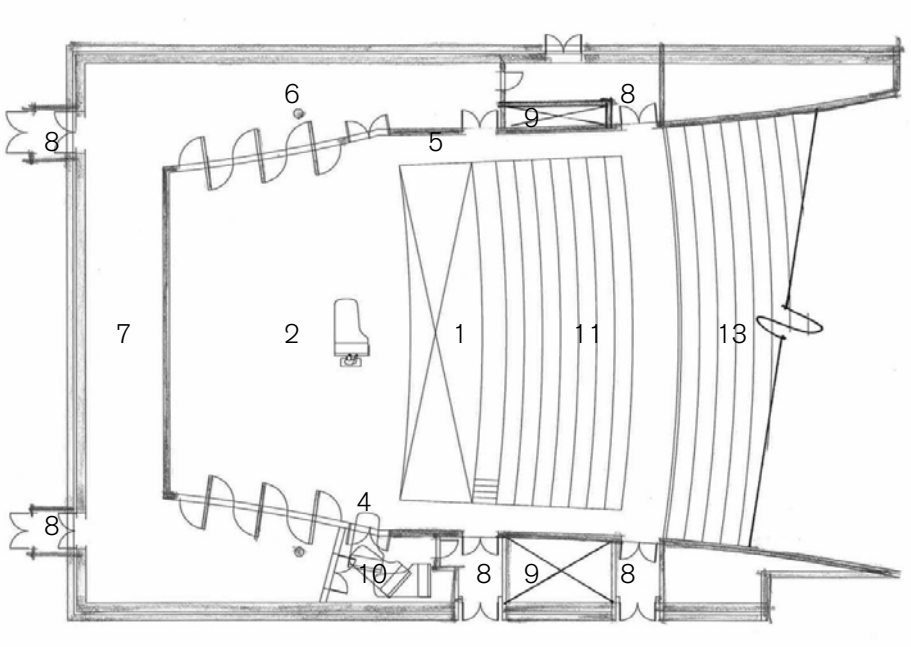


90-person orchestra

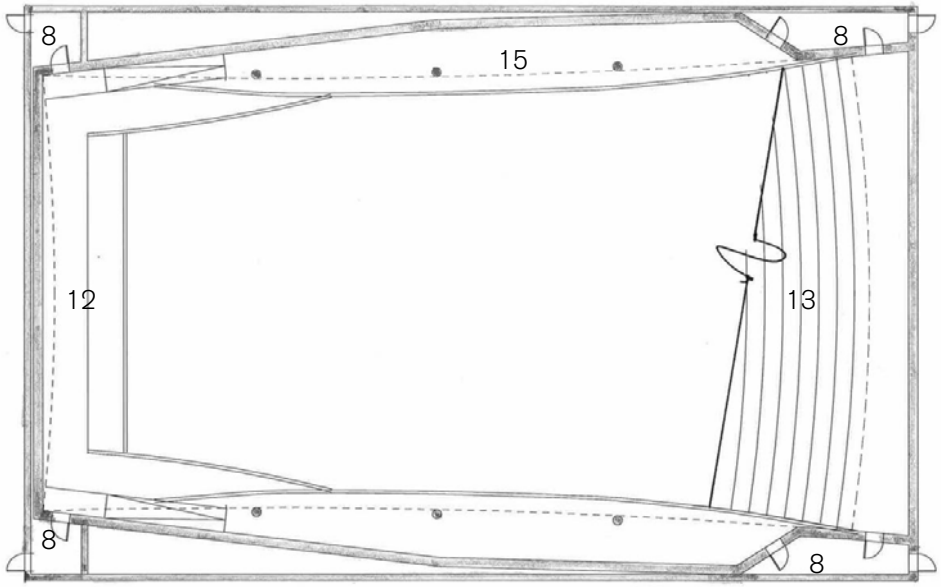


90-person orchestra with 160 person chorus

55-person opera orchestra in pit



Orchestra Level Plan

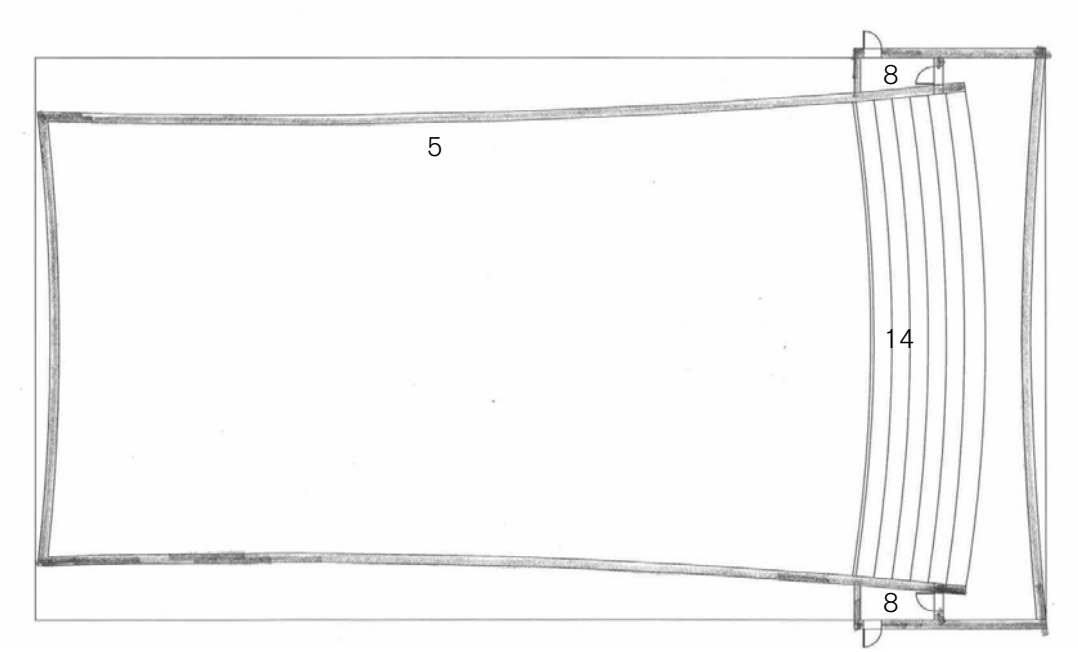


Choral Terrace and Side Gallery Level Plan

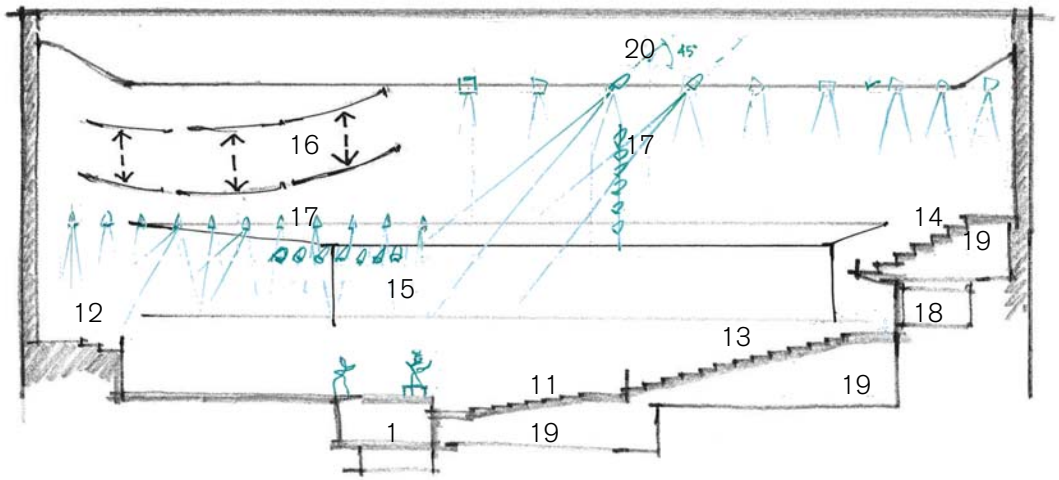
Legend

1. Orchestra pit
2. Performance platform
3. Pivoting door
4. Downstage entry
5. Supportive sidewall
6. Wing space
7. Backstage
8. Sound and Light Lock
9. Gallery supply air chase
10. Piano storage
11. Orchestra level seating
12. Choral terrace
13. Parterre level seating
14. Balcony seating
15. Side gallery seating
16. Adjustable canopy
17. Performance lighting
18. Control Room
19. Supply air plenum
20. Attic

801 West Adams Street, 8th Floor Chicago, Illinois 60607 USA tel +1 312 441 1980 fax +1 312 441 1981
www.kirkegaard.com



Balcony Level Plan



Longitudinal Section

Legend

1. Orchestra pit
2. Performance platform
3. Pivoting door
4. Downstage entry
5. Supportive sidewall
6. Wing space
7. Backstage
8. Sound and Light Lock
9. Gallery supply air chase
10. Piano storage
11. Orchestra level seating
12. Choral terrace
13. Parterre level seating
14. Balcony seating
15. Side gallery seating
16. Adjustable canopy
17. Performance lighting
18. Control Room
19. Supply air plenum
20. Attic

801 West Adams Street, 8th Floor Chicago, Illinois 60607 USA tel +1 312 441 1980 fax +1 312 441 1981
www.kirkegaard.com

Sculpted Surfaces

- Shaped reflectors over the performance platform, similar to the adjustable canopy at Royal Festival Hall, reflect sound from the performance platform down to the audience in a time frame that is helpful and supportive. Assume 16 oz canvas made of Nomex or some other inherently fire retardant fabric.
- Side gallery railings are tall and lightly shaped, made of heavy plaster or wood.
- Balcony railings (across the rear) are strongly sculpted or heavily perforated to avoid confusing echoes from loudspeaker sources.
- Rear walls are deeply sculpted so that they return sound to the audience for envelopment and to contribute to reverberation, while avoid confusing echoes from natural acoustic sources. This shaping also provides a useful "room response" to performers.
- The upstage wall has moderate sculpting to achieve medium scale diffusion.
- Sculpted windows on the sidewalls provide large scale diffusion.
- Ceilings at the undersides of balconies and side gallery soffits are carefully shaped in convex curves to interact with the sculpted rear and side walls, reflecting sound down to the seats. Assume heavy plaster.

Nomex canopy

Royal Festival Hall
Southbank Centre
London, UK

Open Balcony Rail

SSU-GMC

Finish Materials

- Fixed surfaces are typically reflective, to maximize reverberation within the given volume. Examples of reflective materials: concrete, plaster, wood, glass, metal, stone, gypsum board.
- Thin surfaces are used sparingly, to minimize bass absorption. For example, plaster should be applied directly to concrete or masonry; wood should be laminated to a heavy substrate or backed by multiple layers of plywood; glass should be thicker than usual and stiffly braced, gypsum board should only be used in multiple layers.
- At this point in design, assume that the walls in the upper volume are textured concrete with varying degree of diffusion.
- Upholstered seating is the only significant fixed absorption in the room. Fabric-covered chairs with wood on the bottom and the back absorb enough sound that the acoustic difference between a rehearsal and a heavily attended performance is not shocking to the performers.
- Fixed absorption on the walls and ceiling is used only where necessary to weaken a reflection that would otherwise be problematic. Examples of fixed absorption: fabric-wrapped glass fiber panels, wool felt, spray-on fireproofing, dead-hung fabric banners.
- Carpet is used sparingly, restricted to major circulation areas where the disadvantage of its absorption is offset by its reducing footfall noise. Cork flooring is a reasonable alternative in circulation areas.

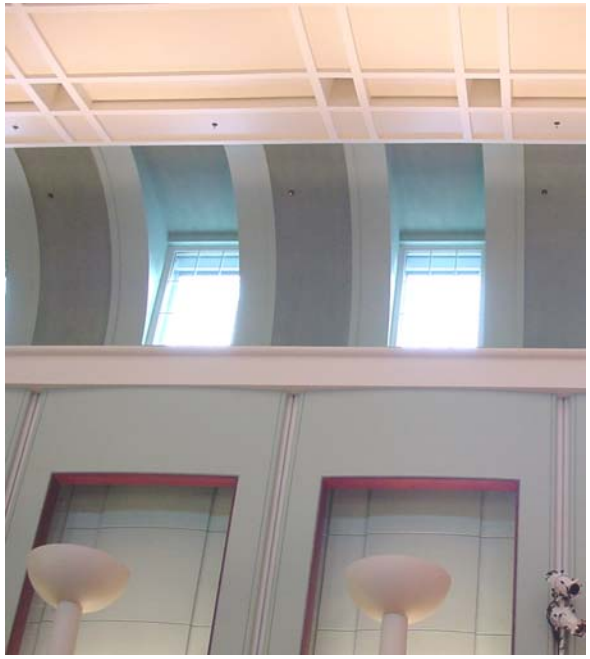
Fine scale diffusion – board formed concrete

Medium scale diffusion – cast plaster panels

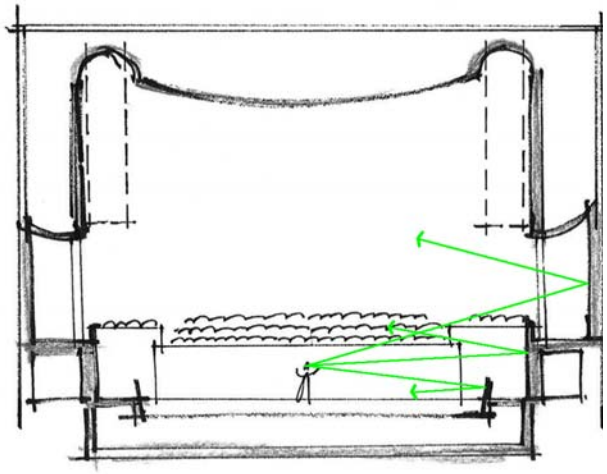
Large scale diffusion – deeply inset windows

Lower side wall – RPI-EMPAC

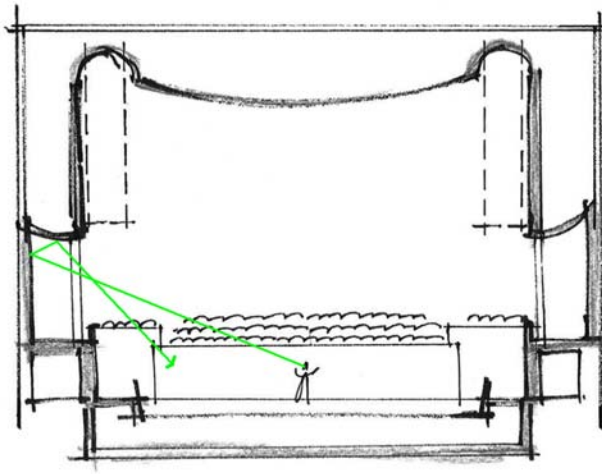
Soffit shaping – RPI-EMPAC



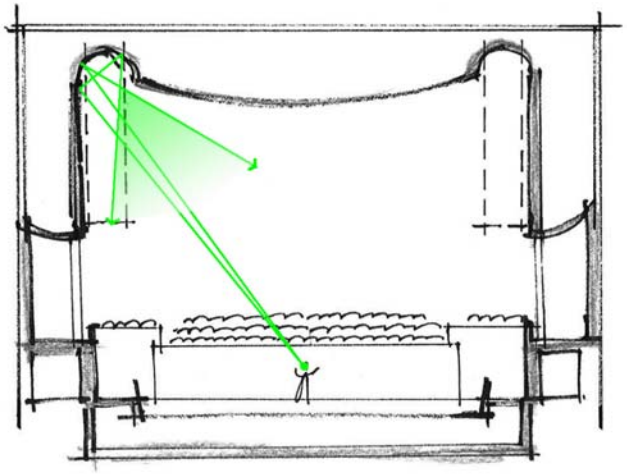
Upper corner shaping – University of Delaware



Supportive side wall reflections



Supportive soffit reflections



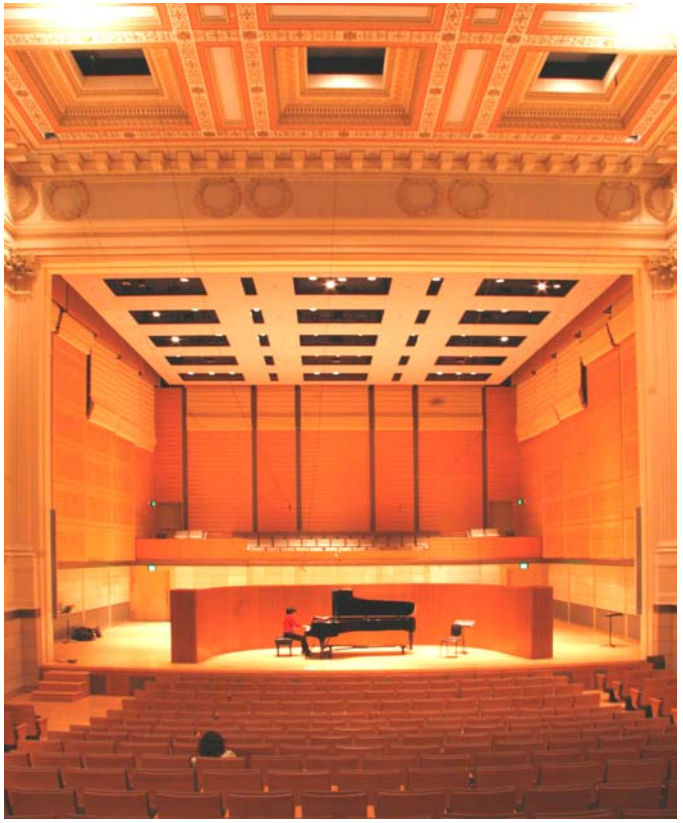
Diffusive upper corner reflections

Recital Screen

- For chamber ensembles to sound acoustically intimate, reflections to audience must follow shortly after the direct sound. The recital screen provides early reflections to minimize the initial time delay.
- The screens are portable elements that are roughly 6' to 8' tall with appropriate construction to reflect mid to high frequency sound.

Adjustable Absorption

- Movable absorption is used extensively to reduce reverberation and to prevent troublesome late reflections (echoes). Banners along the side walls are perpendicular to the walls similar to the Auer Hall at University of Indiana. (Following page)
- Movable absorptive banners at the upper side walls reduce reverberation and weaken cross-room reflections from loudspeaker sources. This prevents confusing echoes and reduces mid and high frequency reverberation.
- Movable absorptive banners at the upper rear wall behind the audience weaken reflections back towards performance platform from loudspeaker sources or from loud natural acoustic sources (drums, for example). This prevents confusing echoes and reduces mid and high frequency reverberation. At the upper rear corner, we prefer that the absorption hangs several feet away from the wall so that it also reduces low frequency reverberation.
- Movable absorptive curtains at the lower upstage wall of the performance platform prevent confusing echoes from certain performers – jazz combos or solo piano, for example – and from stage monitors for amplified performances.
- Movable absorptive banners at the upper upstage wall reduce reverberation at the stage and control echoes.
- All movable absorption retracts into the attic or into pockets so that the difference between the retracted and exposed condition is maximized. All movable absorption that is large or not easily accessed is motorized for ease of deployment.

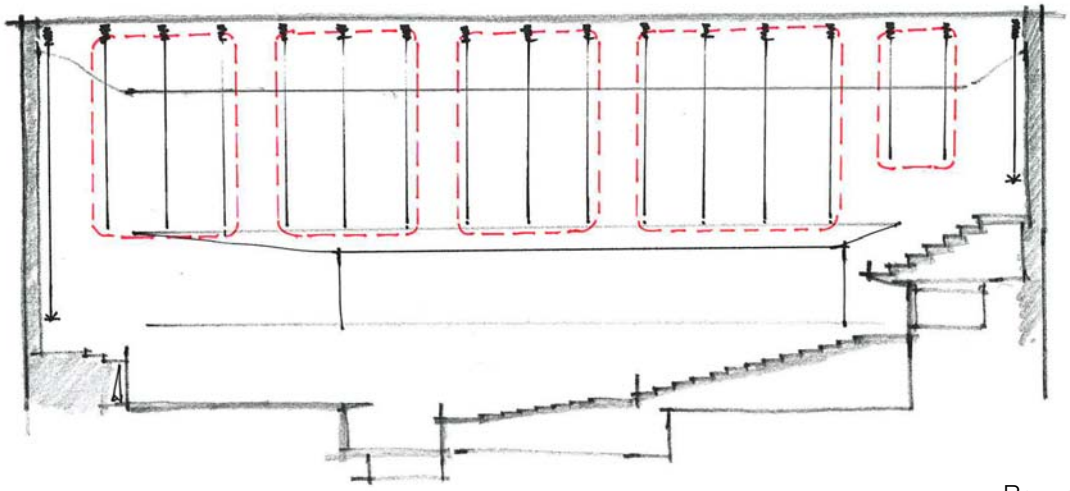


Concert Hall
San Francisco Conservatory of Music
San Francisco, CA

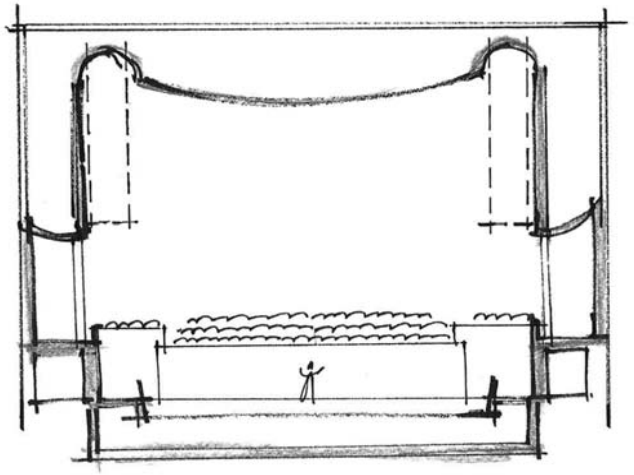
Recital screen and adjustable side wall and upstage banners

Banners retracted – SSU-GMC

Perpendicular banners – Auer Hall



Banner groups



Transverse Section

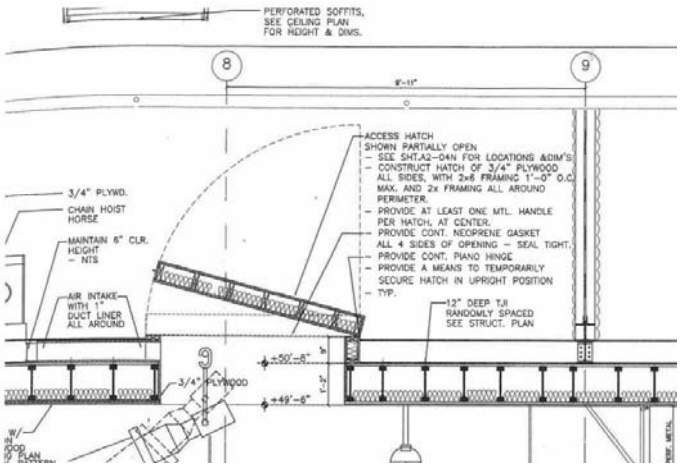
801 West Adams Street, 8th Floor Chicago, Illinois 60607 USA tel +1 312 441 1980 fax +1 312 441 1981

www.kirkegaard.com

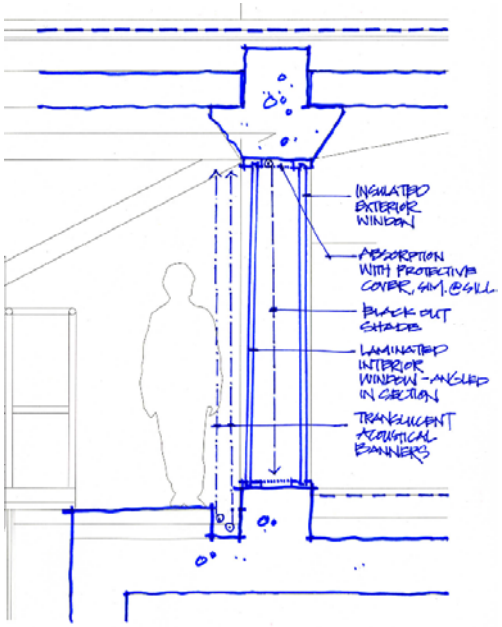
Concert Hall – Isolation

Our goal is that musicians and audiences in the concert hall are never distracted by noise and vibration from the nearby mechanical equipment room, back of house support spaces, atrium and railroad north of Franklin Boulevard.

- The audience chamber and performance platform are surrounded by a thick cast-in-place concrete perimeter wall, minimum 18" thickness. This wall may be exposed in the upper volume, and elsewhere it forms the substrate for finishes wherever possible. Where geometry makes this impractical, the perimeter wall may be outside of the acoustical volume and a grout-filled CMU wall may be the substrate for the finishes.
- The acoustic ceiling of the concert hall is a stressed skin assembly consisting of multiple layers of plywood on both sides of closely spaced TJIs. This assembly is light weight to reduce the seismic load high in the room yet stiff to contain the sound energy within the hall. Alternatively, the acoustical ceiling could be composed of cross laminated timber planks.
- A separate composite roof deck (minimum 75 psf) above the acoustic ceiling assembly forms the envelope of the building. Deep steel trusses bear on the concrete perimeter wall, support the roof slab at or above the trusses and supporting the acoustical ceiling at or near the bottom of the trusses. The attic space may be used for ductwork and access to lighting and variable acoustic devices.
- Windows to the exterior have at least two layers of glass, with heavy laminated glass at the interior (3/4" minimum) and several feet of airspace to the laminated/insulating exterior glass.
- Person and equipment access to the performance platform and the audience chamber is through vestibules with gasketed inner and outer doors. Panic hardware is restricted to the outer doors. The inner doors are non-latching for quiet operation.
- All walls within vestibules are lined full height with absorptive treatments – fabric-wrapped glass fiber in front-of-house locations and Tectum in a C-40 mounting in back-of-house locations.
- An acoustic "through-building" isolation joint protects the concert hall from noise and vibration in the surrounding EMU complex – rumbling air handling units, flushing toilets, elevators, carts rolling along corridors, high heels clicking across lobby floors – even if the noise sources are right next to the hall.
- The continuous isolation joint runs along the north and west sides of the concert hall from the top of the foundation slab through the low roof of the building surrounding the concert hall. The isolation joint is located at the outside surface of the concrete perimeter wall.
- The lobbies to the south and southwest of the audience chamber are structurally continuous with the concert hall superstructure. These lobby floors would have a 1" thick resilient underlayment under the radiant topping slab to control impact noise.



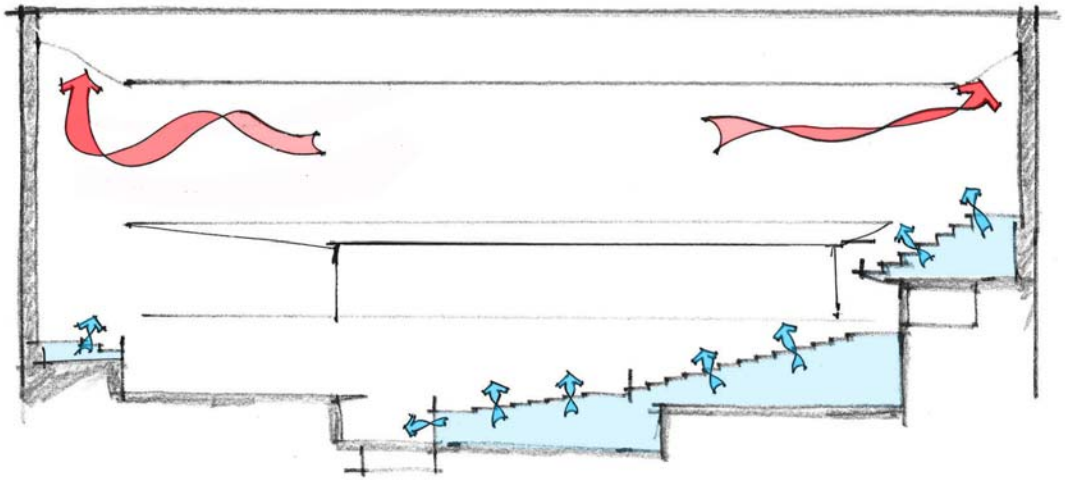
Stressed skin ceiling assembly – SSU-GMC



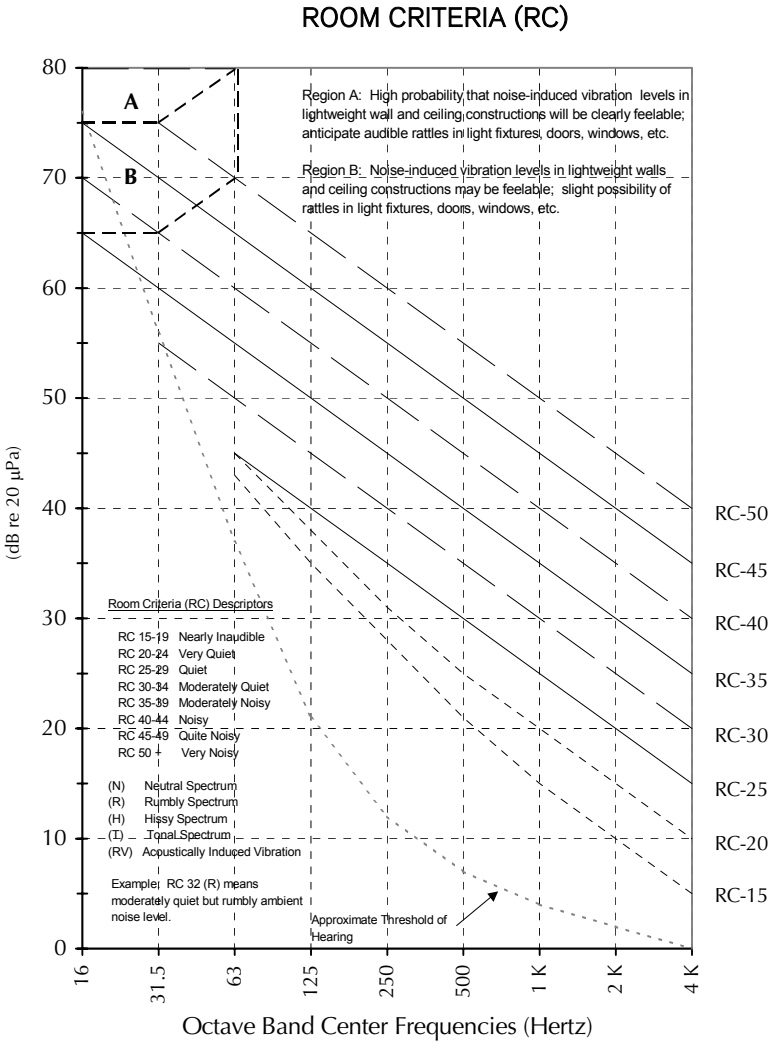
Clerestory isolation detail – Cyprus Cultural Center

Concert Hall – Noise Control

Our goal is that musicians and audiences in the hall never notice noise from the mechanical systems or the lighting systems. The hall will have a displacement ventilation system where supply air is delivered low in the room to cool the occupied zone while hot air stratifies and is removed at the top of the room. The displacement ventilation system significantly decreases the penetrations in the acoustical ceiling, preserving strong ceiling reflections critical to the acoustics. Our noise control target is a virtually silent RC-15, which necessitates the following:



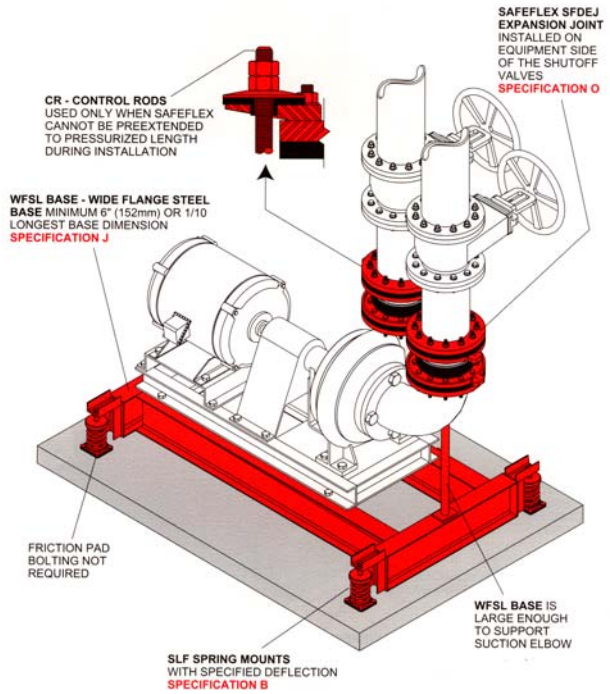
- Well-built, high quality air handling units generate less noise and vibration than cheaper alternatives. Fan-array type units are used because of their efficiency, compact footprint, and quieter noise levels at hard-to-attenuate low frequencies.
- Absorptive treatments in both supply and return ducts prevent noise from traveling through the ducts. This typically includes attenuators for primary noise reduction and duct liner or double-wall ductwork for attenuation of turbulence noise.
- Ductwork grows gradually larger as it approaches the concert hall, so that air flows more slowly with less turbulence noise.
- At all levels of the concert hall, air is delivered to the audience from below the seats, through a large number of small openings in the floor or risers. The air is only a few degrees cooler than room temperature, and it flows very slowly, so that audiences experience a fresh, comfortable condition without drafts or noise. Exhaust and return air is drawn out high overhead, where the hot air naturally collects.



- An increasing number of audio and theatrical devices, including lighting fixtures, motor controllers, sound boards, and projectors, are provided with cooling fans. Where possible, fan-free alternatives are selected. Otherwise, the devices are remotely located outside of the audience chamber. Where their presence in the chamber is unavoidable, we will explore techniques for reducing their noise as far as possible.
- Architectural lighting within the audience chamber is typically dimmed during performances. To minimize annoying "sing" from the filaments, theatrical lighting in the audience chamber and over the performance platform uses high-rise-time dimmers.

General

- Chilled water, steam, and hot water will be brought to the building from the central campus loop, so we do not anticipate chillers, boilers, or cooling towers within this building. If, in the end, these noisy elements are included, they must be carefully located and carefully isolated.
- All moving or vibrating equipment within the building – steam pressure-reducing valves, air handling units, condensers, fan-powered boxes, fan-coil units, pumps, exhaust fans, elevator machines, transformers, dimmers – is mounted on vibration isolators to reduce the vibration they put into the building's structure. Pumps are typically mounted to concrete inertia bases that sit on springs. Flexible connectors on ducts, pipes, and conduit, combined with resilient supports for the ducts, pipes, and conduit closest to the equipment, prevent short-circuiting of the vibration isolation.
- Wherever resiliently supported ductwork, piping, or conduit penetrates a wall or slab, *and* wherever any ductwork, piping, sprinkler piping, data, or conduit penetrates an acoustically significant wall, slab, or ceiling, the penetration requires a special detail. The dual purpose of the special detail is to ensure long-term air-tightness *and* to prevent vibration transfer between the duct, piping, or conduit and the wall, slab, or ceiling. The detail resembles a standard fire-rated penetration detail – an oversized penetration, sleeved if necessary, with mineral wool fire safing stuffed in the annular space between the pipe and the sleeve, and a permanently resilient sealant applied at each side of the penetration.



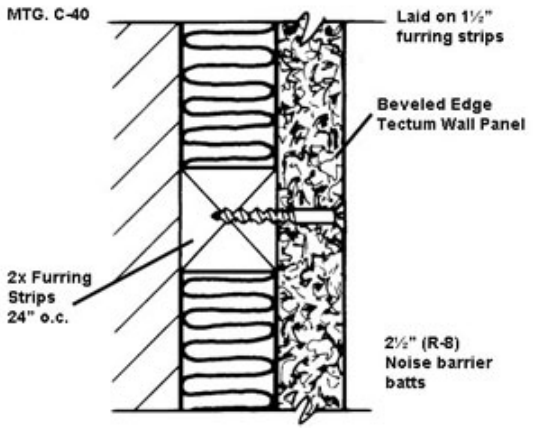
Pump vibration isolation

Resiliently sealed conduit and pipe penetrations

Other Spaces – Room Acoustics

At a conceptual level we are primarily interested in pointing out where absorptive finishes that are not part of standard construction practice might be used. For pricing purposes, assume the following:

- Control, Recording Rooms – lay-in tile ceilings; some fabric-wrapped wall panels. Where ceilings are gypsum board, extensive fabric-wrapped wall panels and carpeted floors are needed. The Recording Room also has a significant area of wall-mounted diffusive treatments.
- Dressing Rooms and Offices – lay-in tile ceilings. Where ceilings are unusually high or are gypsum board, some fabric-wrapped wall panels will be needed.
- Conference Rooms – gypsum board ceilings; carpeted floors; extensive fabric-wrapped wall panels.
- Green Room and Performer Lounge – some fabric-wrapped wall panels.
- Backstage and wing space – acoustic metal deck or K-13 spray on ceiling; Tectum wall panels in a C-40 mounting covering walls. This extensive absorption helps protect the concert hall performance platform from noise.
- Mechanical Rooms, Dimmer Rooms, Amplifier Rooms, and Electrical Rooms with transformers – K-13 spray or duct liner on ceiling; extensive Tectum wall panels in a C-40 mounting.



Tectum in a C-40 mounting

Other Spaces – Isolation

Wall, floor, and ceiling assemblies will be developed as adjacencies are established. To summarize the design intent:

- Noise producing spaces such as Dimmer Rooms, Amp Rooms, Toilets, and Mechanical Rooms are all located outside of the isolation joint around the concert hall.
- Grout-filled CMU walls typically surround mechanical rooms, regardless of adjacencies, to control low-frequency noise.
- Special gypsum board assemblies that include acoustic batt insulation and have at least three layers of gypsum board are used around rooms that require a small increase in isolation but are not especially noisy or especially sensitive.
- At noise-producing rooms that are directly adjacent to the concert hall's concrete perimeter wall, special gypsum board assemblies would be developed on the mechanical room side of the acoustic isolation joint, rather than CMU walls, to avoid problems with mortar droppings bridging the acoustic joint.

Isolated gypsum board assembly

NOISE AND VIBRATION CONTROL OF MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS GUIDELINES

801 West Adams Street, 8th Floor Chicago, Illinois 60607 USA tel +1 312 441 1980 fax +1 312 441 1981
www.kirkegaard.com

1 OVERVIEW

1.1 Intent of the Guidelines.

These guidelines are intended to avoid noisy system designs in acoustically critical spaces, such as the concert hall, recording room, as well as acoustically sensitive spaces with somewhat less stringent criteria. This document will use the term "acoustically sensitive space" for rooms with criteria of RC-25 to RC-34, and the term "acoustically critical space" for rooms with criteria of RC-24 and below. The focus here is on special performance and assembly spaces; this information is not found in the ASHRAE Handbooks or the several available texts on noise control for ordinary spaces.

These guidelines are very general and are intended for use in basic system selection and layout. If followed carefully, the resulting systems, assuming proper installation, should not have major acoustical problems and may avoid the need for major changes late in the design process. These guidelines represent a conservative approach to design, and are not a substitute for project specific input during design or for careful acoustical interface and collaboration throughout the design process.

1.2 Noise Criteria.

Listed below are the recommended criteria for background (ambient) noise levels in terms of Room Criteria (RC) curves. The criteria give background noise levels that should not be exceeded; they affect equipment selection through a complex function of room shape and materials, system configuration and equipment operation. A discussion of background noise rating systems can be found in Chapter 52 of the 1987 ASHRAE HVAC Systems and Applications Handbook. For spaces with maximum background levels of RC-25 or greater, the criteria are expressed in terms of Room Criteria as published in the current ASHRAE Guide. For more critical spaces, the criteria are based upon our experience and resemble the Preferred Noise Criteria (PNC) curves published in older editions of the ASHRAE handbooks. (PNC curves were deleted from the latest editions because ASHRAE promotes the involvement of an acoustical consultant in the design of these critical spaces.) A chart and graph of the criteria appear below.

The criteria presented may be used for preliminary selections of equipment from manufacturer's literature. However, manufacturers typically list older Noise Criteria (NC) values for their products. The NC values differ from the RC values primarily in the low and high frequency octaves; the two criteria are sufficiently similar in the middle octaves (where air turbulence noise is generated) such that NC values may still be used with care for selection of diffusers, grilles and registers. See Section 6.5 for a discussion of the importance of geometry with respect to the noise produced by duct terminals.

We will require submission of manufacturers' sound power levels by octave band for all rotating equipment on this project. If this test data is not available we will base our recommendations upon our best estimates, which may result in conservative design. Please alert us to any special noise generating equipment such as air compressors, motorized coat racks, etc. Be aware of the need for conservative design when using VAV boxes (see section 2.3 of this document). The schedule of acoustical criteria for all spaces will be refined as the program is finalized, but you may use the following list for preliminary guidance. We can provide a guideline specification section for background noise criteria for inclusion in the project manual.

MAXIMUM SOUND PRESSURE LEVEL VALUES BY OCTAVE BAND
FOR RC BACKGROUND NOISE CRITERIA

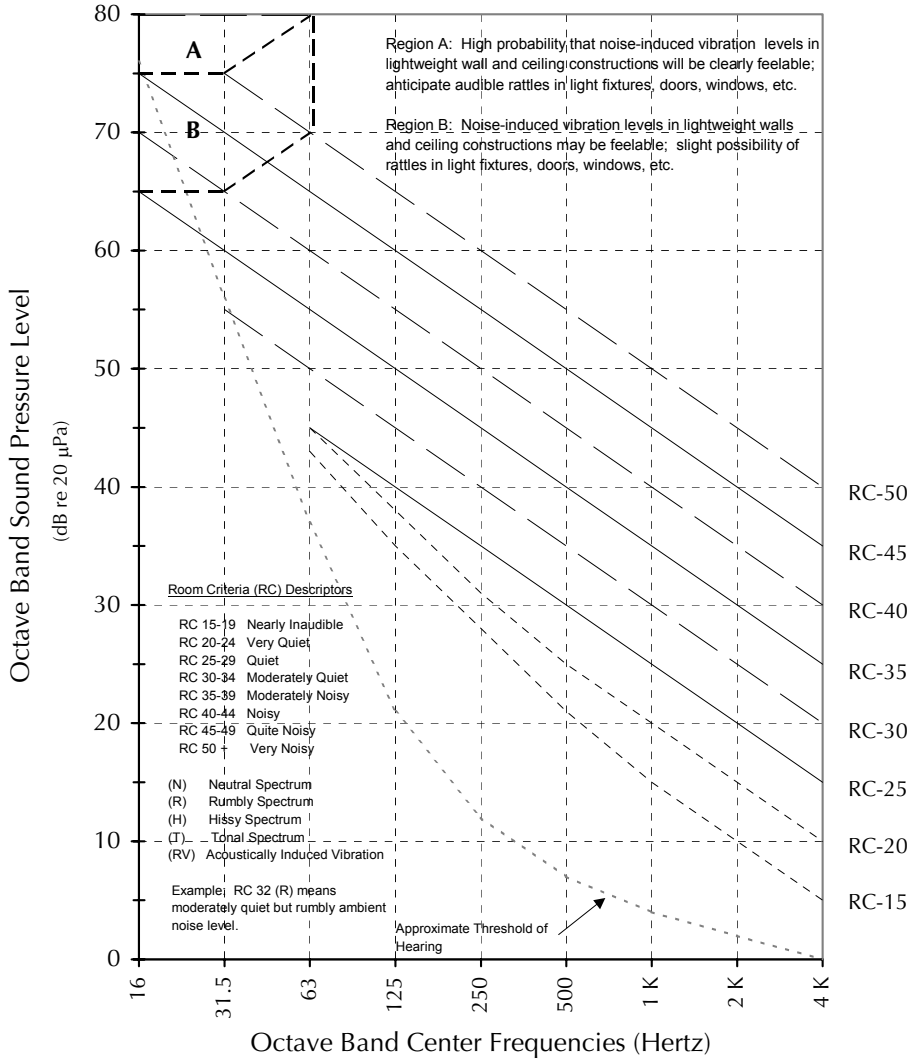
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz
RC 15	43	35	28	21	15	10	5
RC 20	45	38	31	25	20	15	10
RC 25	45	40	35	30	25	20	15
RC 30	50	45	40	35	30	25	20
RC 35	55	50	45	40	35	30	25
RC 40	60	55	50	45	40	35	30
RC 45	65	60	55	50	45	40	35
RC 50	70	65	60	55	50	45	40

LIST OF SPACES AND CRITERIA.*

Concert Hall	RC 15
Recording and Control Rooms	RC 20
Backstage and Vestibules	RC 20
Conductor and Star Dressing Rooms	RC 30-34
Lobby	RC 35
Back of House Corridor	RC 35-40

*Spaces and criteria subject to change as project progresses.

ROOM CRITERIA (RC)



2 BASIC SYSTEM SELECTION

2.1 Air Handling Systems for Acoustically Sensitive Spaces.

The choice of air delivery locations plays a significant role in providing patron comfort and determining architectural volume and acoustical response in the space. For several decades, the European tradition has favored air supply from the floor beneath the seats, allowing relatively warm air to be introduced at low velocities. The American tradition has long favored supply of cold air from the ceiling, relying upon the mixing of the falling cold air with the rising warm air from the people in an attempt to achieve a comfortable and draft-free condition at the patrons' seats, often located as much as 70 feet below the points of air discharge. The scarcity of draft-free halls with high supply suggests the difficulty of the approach.

On-stage requirements for a draft-free environment are even more stringent since drafts can affect the tuning and timbre of wooden instruments, the playing qualities of reeds (which cannot be permitted to dry too quickly), and the physical comfort of the musicians, whose playing can be profoundly affected by cold, stiff fingers. Many stages with overhead supply systems are known for drafts brisk enough to turn pages. Airflow from overhead stage supply systems can be further complicated by the presence of an acoustical canopy, a movable element with impact on airflow which varies with the position of the canopy itself.

The underfloor supply approach, when properly designed, delivers carefully controlled air quantities from numerous discharge points very near the patrons. Air is supplied at a very low velocity and distributed more evenly. The position of the canopy has no effect on the path of air supplied low from the perimeter walls of the stage. The concept, based on experience and logic, is generally less prone to drafts, musician discomfort, and spontaneous page-turning.

We favor underfloor supply systems in part because of improved patron comfort. From an acoustical perspective the systems can be extremely effective in controlling background HVAC noise levels. Underfloor supply systems also eliminate the requirement for ductwork at the ceiling and reduce the overall amount of ductwork. Since exclusion of overhead ductwork in the acoustical volume would require a greater building height to maintain the required room volume, there may be a construction cost savings with the underfloor system.

Underfloor systems require reheat capability at the air-handler to control humidity. We defer to the Energy and HVAC consultants to determine the relative energy efficiency of one system compared to another. However, the highly specialized requirements of the concert hall provide strong arguments in favor of the underfloor system, even if energy costs remain the same regardless of the relative operating costs. Development of efficient system design and operating strategies will help to control energy consumption related to the operation of the concert hall system. We can offer assistance in designing this highly desirable, special system.

Acoustically sensitive spaces (RC 25-34) are best served by remotely located air handling equipment; local unitary air-conditioners are generally inappropriate. A remote location is one that has a buffer zone between it and the sensitive space and shares no common walls or slabs. For acoustically critical spaces (RC-24 and below) we recommend structural isolation joints or independent structures. These joints and separations are very important, and we should be consulted regarding their design. We recommend low-pressure air distribution in these spaces. Low-pressure air distribution can be achieved with either constant volume fan systems or variable volume fan systems utilizing either change of fan speed or blade pitch.

Noise from high or medium velocity ductwork, air valves, and/or terminal VAV boxes will typically exceed the required Room Criteria.

2.2 Built up Air Handling Units.

High fan efficiency is a very desirable goal because it is directly linked to quiet fan operation (see section 4.1); however, the limited range of components available for packaged equipment typically precludes selection for peak fan efficiency. Therefore, we recommend that large air handling units be custom-grade, site-built equipment instead of packaged commercial grade equipment. Built-up units offer a wide selection of fan types and sizes that allow design for peak efficiency. The lower operating costs and simpler noise reduction accessories of built-up units tend to offset higher initial equipment costs.
In general, anticipate double wall casings with 4" insulation. The outer casing material should be heavy gage; 16 gage or even 14 gage is usually appropriate. Perforated inner liners should be specified for all mixing, plenum, blank, and fan sections.

2.3 Constant Volume vs. Variable Volume.

Many large buildings being designed today have variable air volume (VAV) systems in order to reduce energy costs or improve zone temperature control. However, these systems are appropriate only if their advantages offset the costs of controlling the noise generated by the variable volume apparatus. Acceptable variable volume systems for acoustically sensitive spaces are those that change air volume at the main system fans by a change of fan speed or blade pitch. Inlet vane throttling increases total fan sound power output and is undesirable, while speed and blade pitch control result in lower total fan noise at reduced outputs. We strongly recommend against inlet vane control. VAV systems can occasionally be appropriate for acoustically sensitive spaces with significant partial load usage or non occupancy (standby) conditioning. Time clocks or manual on off controls may also be appropriate for some projects.

In our opinion, the methods used by industry incorrectly estimate the noise produced by fan powered VAV boxes. Specifically, the room correction factor is 5 decibels too high for most spaces, and the use of an inappropriate reference sound power source calibration causes an additional 5 decibel error in casing radiated noise in the lower octaves. We recommend that terminal controlled VAV systems not be used in acoustically sensitive/critical spaces (RC-34 and below). If VAV systems are used in ancillary areas (RC 35 or greater), the units should be sized based upon catalog discharge noise ratings 5 decibels below the acoustic criteria, and radiated noise ratings 10 decibels below the criteria. In some cases (such as recording room with infrequent recording requirements) we design systems to achieve very low noise levels at reduced airflow conditions, while allowing higher noise levels at full air delivery. This methodology typically reduces the costs of large branch ductwork only.

2.4 Lighting for Acoustically Sensitive Spaces.

If fluorescent lighting is used to serve acoustically sensitive/critical spaces (RC-34 and below), it will be necessary to mount the ballasts in a remote space or to use a quiet solid-state controller instead of normal ballasts. Normal "A" sound rated ballasts typically create objectionable hum. We have found that a few electronic solid-state ballasts are acceptably quiet and suitable for use in acoustically sensitive/critical spaces. We can provide specification language to ensure the installation of quiet ballasts. Mercury or quartz-vapor lighting is not acceptable in acoustically sensitive/critical spaces. Additionally, the transformers used in low-voltage lighting systems must be remotely located.

Performance lighting over the platform and architectural lighting within the audience chamber may be dimmed. To minimize annoying "sing" from the filaments, lighting in the audience chamber and over the performance platform uses high-rise-time dimmers.

2.5 Other Equipment.

Other mechanical and electrical equipment, such as elevators, pumps, transformers, dimmers and steam valves, should be remotely located from acoustically sensitive and critical spaces. All electrical equipment that utilizes a transformer or coil should be evaluated for vibration isolation mountings.

2.6 Dedicated Equipment.

Control rooms for audio and lighting generally require dedicated systems to cool equipment which discharges heat 24 hours per day. Consult the audio and lighting system designers for their cooling load requirements. An audio control room may have acoustical criteria as stringent as the room it serves. The air handler or fan coil must be carefully designed. At a minimum, we recommend locating the unit outside of the control room with a supply-air sound attenuator. Often two supply-air and one return-air attenuators are needed.

3 LOCATION OF MECHANICAL EQUIPMENT

3.1 Large Mechanical Equipment Rooms.

It is usually impractical to locate large mechanical equipment rooms, containing high horsepower fans and large pumps immediately adjacent to acoustically sensitive/critical spaces. The expense of massive intervening double or triple layer construction and elaborate vibration isolation can be reduced by providing buffer spaces between equipment and acoustically sensitive/critical spaces. We strongly recommend providing a structural isolation joint between large mechanical rooms and acoustically critical spaces. A concrete floated floor may be required if the large mechanical room is above grade.

The most prevalent cause of unexpected fan noise problems is space restriction. We strongly recommend that ample space be provided in mechanical rooms for proper fan inlet and discharge duct configurations. It is also critical to allow space for duct lining and lagging, clearance for vibration isolators, and clear volume for suspended noise barrier ceilings (where required). We recommend that vertical section drawings be developed for all mechanical rooms. Adequate space requirements should be coordinated with the Architect in the design development phase of the project.

3.2 Main Power Transformer Rooms.

Large transformers are very noisy and generally increase in noise level over time. They buzz objectionably at 120 Hertz, and this tonal characteristic is more audible than broadband noise at an equivalent level. Quieter transformers can be specified, usually implying a higher first cost, but usually with commensurate reduction in noise control costs. Possible structural excitation and airborne noise paths must be resolved. We require locations and NEMA sound ratings of all transformers early in the project design.

We recommend that large transformers be located remote from acoustically sensitive/critical spaces. In many cases we recommend secondary walls, ceilings and floors to break structural vibration paths. Transformers should incorporate external neoprene vibration isolation mounts and flexible conduit connections. Conduit penetrations must be carefully detailed in this area to prevent airborne sound transmission. Multiple conduit penetrations require special detailing. We

can provide these details, as well as specific recommendations for wall and door assemblies once the final equipment selection has been made.

3.3 Mechanical/Electrical Room Absorptive Treatment.

The noise output from multiple sources in mechanical and electrical rooms can reach unacceptably high levels. This noise can be easily transmitted through the walls and can break through duct walls. It is also transmitted via conduit and piping as vibration. Lining the interior surfaces of the mechanical room with an absorptive material to reduce the reverberant field in the room can be beneficial. Normally we recommend the application of 2" thick Tectum panels over two inches of 3 pcf density fiberglass board in what the Tectum manufacturer refers to as a C-40 mounting system. Typical application would consist of 50% coverage evenly distributed on the walls and 100% coverage on the ceilings.

3.4 Structural Isolation.

Mechanical room noise is often intense enough to excite the mechanical room surfaces, and if these surfaces are structurally continuous with those of acoustically sensitive/critical spaces, noise and vibration may be transmitted to these spaces. Provide structural separation between mechanical rooms and acoustically sensitive/critical spaces. If the mechanical room is on grade, a perimeter floor isolation joint similar to a sidewalk expansion joint may adequately reduce sound transmission. In above grade locations, structural separation and massive double construction, including floating concrete floors, may be required if the room surfaces cannot be shielded by housing the equipment. Since double construction has profound structural implications, it is important that we review the design early enough that isolation can be incorporated into the structural design.

3.5 Mechanical Room Wall and Floor/Ceiling Openings.

Design mechanical room doors not to open into spaces that are acoustically sensitive/critical. Doors should be gasketed at the head, jambs, and threshold (at astragal if used). Depending on the door location, either manufacturer-provided sound reducing doors and frames or contractor built-up doors will be required. Do not use door louvers, door undercuts, or door transoms. Locate intake and exhaust air openings where mechanical noise cannot re enter the building through doors, windows, ventilators or smoke vents and where it will not affect use of outdoor spaces. In jurisdictions where there are ordinances limiting the amount of noise at property lines, it is generally not feasible to intake or exhaust air from large fan equipment near the property line without large, acoustically lined air wells.

3.6 Wall and Floor/Ceiling Penetrations.

Duct, pipe, and conduit penetrations in walls, floors, and ceilings can transmit airborne noise and structure-borne vibration. All penetrations in acoustically sensitive/critical areas must be acoustically sealed to minimize noise and vibration transmission by providing an airtight and permanently resilient seal. Acoustical seals must be provided at all mechanical and electrical equipment rooms, toilet rooms, elevator equipment rooms, transformer rooms, and dimmer rooms. Most pipes and conduit less than 1 1/2" diameter can be grouted airtight into the wall. Other penetrations should be sleeved such that they are 1/2" to 1" larger than the object penetrating the structure. The resulting clearance should be packed loosely with glass or mineral fiber, and should be caulked on both sides with a resilient compound such as Tremco "Acoustical Sealant".

Pipe penetrations through gypsum board or plaster walls or ceilings may be packed and caulked as described above or isolated with prefabricated sleeves. The above recommendations are likely to be overlooked if buried in the Specifications; we recommend that they also appear on the mechanical drawings in the form of a note and a detail. We will supply these details.

3.7 Mechanical Shafts.

Mechanical shafts should be constructed of heavy materials such as sealed, solid grouted, normal weight concrete block. Lightweight shaft construction near mechanical equipment rooms is likely to allow rumble in adjacent spaces unless lined, spiral round ductwork is used. Over occupied space, ducts near fans may need to be lagged or screened with heavy, airtight ceilings.

4 BASIC EQUIPMENT SELECTION

4.1 Centrifugal Fans.

We recommend centrifugal fans with backward inclined or airfoil impellers instead of fans with forward curved blades because they are quieter and more efficient over a wider range of operating conditions.

The most important aspect of fan selection is operating efficiency. A centrifugal fan operating at peak static efficiency will be about 12 decibels quieter in the low frequencies than one selected at 60% of peak static efficiency. Efficient fan selection is one of the least expensive means of achieving fan noise reduction, and the Owner benefits from reduced energy costs for the life of the building. We strongly recommend selecting fans to operate in the range of 90 to 100% of peak static efficiency for the fan type being used. For example, airfoil blade centrifugal fans have a characteristic peak static efficiency of 80%. At 90% of the peak static efficiency, actual static efficiency is 72% (90% x 80% = 72%). Forward curved blade centrifugal fans have a characteristic peak static efficiency of 60%. Axial fans are generally rated on the basis of total efficiency. Select axial fans near the top of the efficiency curve on their performance graphs.

We strongly recommend against under-sizing fans. Under-sizing fans can result in excessive rumble due to low efficiency and operation in an unstable mode. It is best to select backward-inclined fans just to the "right" of peak static efficiency. This allows for system resistance greater than anticipated while avoiding the "flat" (unstable) region of the fan performance curve. Extremely accurate total static pressure calculations for all fans serving acoustically critical spaces are important. We require fan curves including brake horsepower data for all major fans serving acoustically critical spaces. We recommend that maximum brake horsepower be included in all fan schedules.

In line centrifugal fans (sometimes called tubular centrifugal or tube-axial) generate more noise than other types and are not generally appropriate for acoustically sensitive/critical spaces (RC 34 and below).

4.2 Axial Fans.

Noise from axial fans is concentrated at the blade passage frequency, typically near the 125 to 250 Hz range. Poor inlet conditions can cause strong harmonics, resulting in "whine" in the 250 to 1000 Hz range. We recommend controlling ductborne and radiated noise by using inlet and outlet attenuators, as well as high transmission loss housings. Potential paths for flanking to sensitive spaces require our careful review. Floated slab floors may also be required to reduce airborne noise through floors.

We recommend against most vane axial supply fans for acoustically sensitive/critical spaces due to their high noise levels at the blade passage frequency. Vane-axial fans can be used for return because the total sound power output is highly dependent upon fan total pressure.

4.3 Plug Fans.

In acoustically lined plenums, plug fans are generally quieter than equivalent duty vane-axial or centrifugal scroll fans. The integral plenum acts to significantly reduce discharge sound levels. Plenum lining should be 4" with perforated inner walls.

4.4 Mixed Flow Fans.

Mixed flow fans have become more common over the last few years, and for good reason. They are very efficient and very quiet, particularly in the low-frequency octave bands which are difficult to attenuate. Basing the design on this type of fan can often provide savings (cost, pressure drop, duct run) by eliminating the need for a secondary duct attenuator. They can be located within the AHU housing or hung separately as an inline fan. They typically are offered with an option to improve the quality of the fan housing in order to control casing-radiated noise. Some models tend to have sizable footprints so locating them in the equipment room early in the process is beneficial.

4.5 Fans for Variable Volume Systems.

The method of fan modulation has significant acoustic impact. Adjustable inlet vanes generate substantial additional low frequency noise when the vanes shut down. Additionally, an energy penalty is incurred due to increased system resistance. These are the primary reasons this type of modulation should not be selected. The two acceptable methods of modulation, variable speed drives and variable pitch fan blades, are actually quieter at reduced air output than at full volume.

4.6 Packaged Air Handling Units.

Where packaged units are mounted on external vibration isolators, internal spring isolators must not be used. This could create an unstable system via excitation of a second degree of freedom. Since external mounts result in superior isolation efficiency we recommend selecting equipment without internal isolators. Otherwise, specify that internal isolators be replaced with neoprene mounts. In some cases it may be more expedient to short circuit the internal spring isolators by either welding shipping bolts in their secured position or by welding blocks across the internal isolator mounts.

4.7 Pumps.

Select centrifugal pumps to operate at maximum efficiency. The diameter of the pump impeller should not exceed 80% of the inside casing diameter of the pump, measured on a line through the cutwater and center of rotation. Low pump efficiency and small impeller clearance can cause excessive pump noise and transmission of sound energy to the piping and fluid.

4.8 Rooftop Packaged Air Conditioning Units.

Duct breakout of fan and air turbulence noise from rooftop equipment can be a major problem, especially when supply air ductwork from a downshot unit turns

to travel horizontally in a ceiling cavity immediately below the roof penetration. We strongly recommend against using this class of equipment to serve buildings where acoustics are the primary concern.

When rooftop units must be used, we recommend locating these units at least 25 feet away from acoustically sensitive/critical spaces. It is better to attenuate fan noise before ductwork enters the building, implying the use of exposed rooftop ductwork with attenuators or expansion plenums. Where penetrations must occur near acoustically sensitive/critical spaces, we recommend careful detailing of duct transitions and sheet metal gauges, use of acoustical round ductwork, and other items as determined on a case-by-case basis. Self-contained rooftop air-conditioning units pose very special problems that tend to offset their initially lower cost; we urge you to consult us on these units before planning for their use.

4.9 Unitary Refrigeration Equipment.

Unitary refrigeration and ice making equipment is not acceptable in acoustically sensitive/critical spaces such as concert hall lobbies. Since this equipment is often contracted for by the concessionaire after substantial completion, provision should be made for future installation of split systems with remote compressors and condensers.

4.10 Motors.
In many cases we recommend the use of high efficiency fan motors; they are quieter than standard efficiency motors and are generally well suited to variable speed drive applications. In sizes as small as 10 horsepower, there is typically a substantial life cycle cost advantage as well.

4.11 Drinking Fountains.

Noise generated by the drinking fountain water chiller is often distracting and obtrusive if located in acoustically sensitive/critical areas. We recommend remotely locating the chiller away from the drinking fountain to avoid excessive noise. Drinking fountains without integral chillers do not require special isolation.

5 DUCTBORNE FAN NOISE CONTROL

5.1 Acoustic Duct Lining.

Standard coated 1" and 2" duct linings should be used in all low pressure ductwork serving acoustically sensitive/critical spaces. Two inch thick lining should be used in all ducts with short side dimensions or diameters greater than 24"; smaller ducts use 1" lining. The requirement for 2" lining may be relaxed for some systems; this modification is based on an analysis conducted by us on a case by case basis. Half inch duct lining should never be used for acoustical reasons. The lining should be coated and have a density between 1 1/2 and 3 pounds per cubic foot.

Specify the duct lining to have the following sound absorption coefficients as tested on an Acoustical Materials Association Standard A-type mounting in accordance with ASTM Standard C423 90:

MINIMUM SOUND ABSORPTION COEFFICIENTS FOR DUCT LINING
Octave Band Center Frequency (Hz)

Lining Thickness	125	250	500	1000	2000	4000	8000
1"	.09	.19	.48	.65	.78	.83	.90
2"	.22	.47	.76	.89	.89	.91	.95

5.2 Round vs. Rectangular Ductwork.

Round ductwork is less likely to pick up noise as it passes through noisy spaces or to radiate noise into quiet spaces. Round ductwork is also less likely to transmit vibration or to radiate aerodynamic noise. We strongly recommend using round ductwork where runs near the fan pass through acoustically sensitive/critical spaces. All exposed ductwork in audience chambers should be round double wall ductwork similar to United Sheet Metal K 27, or it should be lagged with a rigid outer skin. An acceptable alternative that is much less costly than K-27 is Johns-Manville “Spiracoustic”, a lined single-wall duct.

5.3 Duct Sizing.

We recommend showing ducts sized according to internal dimensions to allow direct coordination with duct attenuator dimensions. However, be sure to allow enough clearance for the final sheet-metal dimensions that result from the additional thickness of the duct lining.

5.4 Glass Fiber Ductwork.

Sound passes very readily through the walls of glass fiber ductwork, which can be either an advantage or a disadvantage. If a glass fiber duct passes through a noisy space, it is likely to pick up noise and transmit it to other spaces. Conversely, it is possible to "bleed" low frequency fan noise out through glass fiber ductwork to large quiet rooms or to the outdoors. After fan noise is attenuated, glass fiber ductwork can be used at the terminal end.

5.5 Duct Attenuators.

It is usually less expensive and/or more practical to attenuate ductborne sound by providing duct attenuators instead of long lengths of lined ductwork. Rectangular attenuators are available between 3 and 10 feet in length and over a wide range of pressure drop (corresponding roughly to their acoustical performance). Rectangular attenuators are typically available only in certain modular cross-sectional sizes, usually based on 12 inch modules. Cylindrical attenuators are available in various diameters and lengths and in two different resistances. At relatively high cost, custom sized attenuators are available. In general, rectangular attenuators attenuate more noise than cylindrical attenuators.

Acoustically critical spaces (RC-24 and below) will typically require two 7 to 10 foot long rectangular attenuators in series separated by 10 feet of straight ductwork, on both the supply and return mains before the first branch. Be sure to provide space for this assembly. Sensitive spaces (RC 25 34) often require a single 7-foot attenuator in both supply and return mains. Where there are very long duct runs to the space or other ameliorating factors, such as high fan efficiency, this requirement may be relaxed. An elbow attenuator is a very viable alternative where insufficient straight duct exists, although it carries a slight premium.

A pair of attenuators will incur roughly 1/10” to 1/3” of additional static pressure, which should be included in initial estimates of fan operating points. Static pressure ratings for attenuators are based upon ideal location in the duct run. Poor geometry can cause the estimated static pressure to be 2 to 3 times higher than catalog values. Thus, the pressure drop for a pair of poorly located attenuators can be 1” or more.

Not all brands of attenuators are equal: though some are slightly more expensive, they are a much better buy on a decibel per dollar basis. Attenuators are generally selected on the basis of their performance in the first two octave bands (63 and 125 Hz). It is essential that minimum dynamic insertion loss values in these and preferably all octave bands be a part of the specifications.

5.6 Attenuator Location.

It is desirable to locate attenuators at least three duct diameters from the nearest transition, elbow, or duct division to minimize actual pressure drop. Catalog pressure drops are based upon tests of attenuators in ideal duct configurations. An attenuator located close to duct elbows on either end can create a pressure drop up to ten times the catalog value (much higher than 1" total pressure). The engineer must include these factors in the total pressure calculation. We recommend scheduling attenuators with "catalog" and "actual" maximum pressure drop values. Any attenuator relocation should be evaluated for its impact on total system pressure.

Separate multiple attenuators in a duct run by 10 to 15 feet. Take care to provide smooth transitions between rectangular attenuators and axial fan inlets since poor inlet conditions may force these fans into unstable and noisy operation. Cylindrical attenuators are generally used in conjunction with axial fans. See Industrial Acoustics Company (IAC) or Vibro-Acoustics literature for additional data on attenuator locations relative to other system components.

In mechanical rooms, attenuators are optimally placed at or near the wall penetration. In order to prevent mechanical room noise from re-entering ductwork between the attenuator and the wall, we often recommend lagging the attenuator and the ductwork that connects it to the mechanical room wall. Lag ductwork by wrapping 2" fiberglass of 3pcf density completely around the duct; then add a vapor barrier. Cover with a heavy, dense outer skin of 4 pounds per square foot, equivalent to 1" plaster, two layers of 5/8" gypsum board or sheet lead. The skin must be airtight and must not be rigidly connected to the ductwork contained within. Elimination of this lagging can be evaluated on a case-by-case basis. Allocate clearance for lagging during design. Carefully coordinate the extent and dimensions of the lagging among the construction trades, especially when lagging is included in another specification section.

Air flowing through attenuators creates noise. For acoustically critical applications (RC-24 and below), we recommend that attenuators be located no closer than five equivalent duct diameters to the supply and return air openings. This duct should be internally lined.

We will provide a detail showing the recommended method of joining an attenuator with acoustically lined ductwork (not covered by SMACNA).

5.7 Sound Attenuating Expansion Plena.

Where low frequency attenuation is required, as is usually the case, we sometimes recommend a plenum instead of an attenuator. In general, a plenum provides approximately the same attenuation as a duct attenuator, but with better results at low frequencies. A plenum requires more volume but imposes fewer constraints on location relative to other ductwork components. Pressure drop is equal to the velocity pressure multiplied by a factor that ranges between 1.5 and 4.5. The factor is a function of the evenness of the velocity profile at the plenum entrance.

General details for sound attenuating plena include a minimum expansion/contraction ratio of 1:4 relative to connected ductwork. The plenum lining should be a minimum of 2" thick and preferably 4". Four-inch linings can be made up of two 2" layers. Plena with a 90-degree orientation of entrance and exit openings are superior to rectangular plena with openings in opposite ends.

Larger distances between entrance and exit openings improve plenum attenuation. Five feet is a typical minimum length. Rectangular plena should have dimensions that are not small fractional multiples of each other. In other words, strive for rectangular boxes instead of cubes. Dimensions close to the ratio of 1: 1.26: 1.59 have proven to be desirable.

5.8 Duct Elbows.

Contrary to popular belief, elbows provide little attenuation of low frequency fan noise unless the duct diameter is very large (50" or greater). Because duct diameters are usually small compared to the wavelengths of low frequency noise, these sound waves will bend around the elbow. However, duct elbows with 1" thick lining are useful in attenuating noise in the speech frequencies (500-2000 Hz). For critical spaces, aerodynamic noise produced by turbulence should be reduced by using long radius elbows in round ductwork or double thickness turning vanes in rectangular elbows.

5.9 Attenuation in Duct Systems.

It is important that ducts not cross high transmission loss walls, such as from equipment rooms to audience chambers, or between practice rooms.

Because the speed of sound is much higher than normal system velocities, sound travels upstream almost as well as downstream. Thus, fan noise control is as important in return ductwork as it is in supply ductwork. Underground concrete encased ducts or concrete trenches require lining to provide attenuation.

6 AIRFLOW NOISE CONTROL

6.1 Air Velocities.

Although it is fairly well understood that aerodynamic noise is generated at terminal devices, elbows, extractors, volume dampers, fire dampers, air valves, and sharp transitions, aerodynamic noise is also generated as air flows through long straight ductwork as well. In general, aerodynamic noise will be produced anytime a pressure drop occurs, since both pressure drop and aerodynamic noise are related to flow resistance. The following table presents recommended air velocity limits at terminals.
Maximum Air Velocity (FPM) (in branch ducts serving air diffuser terminals) not to exceed criteria listed below.

	CRITERIA					
	RC 15	RC 20	RC 25	RC 30	RC 35	RC 40
Maximum Average Approach Velocity	250*	300*	400	450	550	700

* For these acoustically critical spaces, if air discharges into the space from long straight ducts with no diffuser or grille, these velocities may be increased by 25%. By eliminating the diffuser and increasing discharge velocity, greater throw is possible. Consult with us prior to increasing velocities.
As duct air velocity steps down, air velocity ratios should not exceed 2:1. Therefore, a branch from a main that serves a sensitive space may have to be stepped down in two stages. After a velocity transition, duct of length equal to 3 to 5 equivalent diameters should be used so that airflow can

even out prior to the terminal. Otherwise, locally high velocity of air traveling past diffuser blades could cause turbulence noise greater than that expected from air at the average approach velocity.

6.2 Maximum Main Duct Air Velocity.

We recommend that airflow velocities in main ducts serving acoustically sensitive spaces not exceed 800 FPM. Within sensitive spaces, air velocities should not exceed 600 FPM, or 800 FPM for ducts within masonry shafts. Within critical spaces, air velocities should not exceed 300 FPM, or 500 FPM within masonry shafts. Duct shafts may be required for purposes other than air-turbulence noise control. Where duct transitions are better than average or acoustical round duct is used, these velocities can be exceeded somewhat on a case by case basis. Discuss this matter with us prior to doing so.

6.3 Space Requirements.

To meet the above requirements, ducts will be comparatively large, and space must be allocated for them early in the design process. For example, if six air changes per hour are required in an 800,000 cu. ft. concert hall, then 200 sq. ft. (cross sectional area) of supply and return duct combined will be required if air velocities are not to exceed 800 FPM.

6.4 Dampers.

In order to achieve background noise levels lower than RC 30, it is necessary to provide at least 6 ft. of lined ductwork between balancing dampers and terminal devices. Do not locate dampers serving these spaces immediately behind the terminal devices. Balancing dampers require very careful placement when serving acoustically critical spaces. When laying out ductwork, size the ducts so that the systems are as self balancing as possible.

Fire dampers should be specified as blade-out-of-air stream type whenever they are within 20 feet of air terminals in acoustically sensitive/critical spaces.

6.5 Terminal Devices.

In using published noise ratings for terminal devices such as diffusers, grilles, and registers, it is important to identify for each terminal its specific room, the number of terminals in the room, and the distances between the terminals and the nearest listeners. Manufacturers' published NC predictions are generally optimistic by 5 decibels or more, and are based on straight entrance conditions with balancing dampers (if any) wide open. If there is any doubt about selection, terminal devices should be sized to correspond with the velocities in the table in Section 6.1.

Turns or transitions immediately upstream from a terminal will create uneven airflow, higher noise levels and uneven air distribution. We strongly recommend 3 to 5 equivalent diameters of straight duct length before all terminals in acoustically sensitive/critical areas (RC 34 and below). If this condition is not met, mid and high frequency airflow noise will be hard to predict and terminals may have to be oversized, reducing throw. Poor terminal configuration is often difficult to resolve in the Construction Documents phase of a project; therefore, this matter should be addressed in Design Development.

The typical problem configuration is a main or branch duct with a series of diffusers tapped directly into the side or bottom of the duct. Instead, provide volume dampers at the tap and straight lined ductwork (of length equal to 3 5 equivalent duct diameters) before the register or grille.

6.6 Ductborne Crosstalk.

Ductborne crosstalk occurs when noise originates in one space and is transmitted through interconnecting ductwork to another space. Crosstalk problems must be examined on an individual basis, but some problems can be avoided by using lined interconnecting ducts at least 6 ft. long with two lined elbows. Return air paths are especially tricky if air is returned through ceiling plenums.

6.7 Under-seat Diffusers.

A variety of aesthetically pleasing and acoustically viable options are available for air delivery via a small element located below seats. In order to deliver air quietly and draft-free so close to the audience, the devices must be liberally sized and well distributed. Relatively small devices that can handle up to 40 cfm each at an acceptable noise level are available from:

Trox USA Alpharetta, GA tel: 770-569-1433 web: www.troxtechnik.de

Krantz (Euro-Tech Products, Inc.) Denver, NC tel: 704-483-2050 web: www.krantz.de

REPUS (via Trox USA)

7 VARIABLE VOLUME TERMINAL BOXES (VAV BOXES)

7.1 Published Sound Ratings.

Recent tests of a number of different makes of VAV boxes in a realistic configuration and comparison of the results with the manufacturers' published sound ratings suggests that many manufacturers are under reporting discharge and radiated sound levels by 5 10 decibels. Special care must be taken in selecting, locating and specifying VAV boxes if they are to be used. The problems in this area should be resolved when the ARI/ADC test standards 880/885 are revised and manufacturers begin certifying their products in conformance with these standards. We can provide a sample specification section incorporating these standards as a guideline.

7.2 Fan Powered Terminal Boxes.

It is our general recommendation that these boxes not be used in spaces with acoustic criteria less than RC 40 due to the characteristic noise levels generated by typical production models. An alternative is to remotely locate the box in a space where casing radiated noise will not be a problem as opposed to the space being conditioned. Lined supply and return ductwork must be provided. Select the box for fan operation in the middle of its rated air volume range. In an open plenum ceiling application, locate the box as far as practical from the return air opening.

Boxes larger than 1000 CFM generate much more noise than smaller units. Greater attenuation of casing radiated noise than indicated in manufacturers' literature can be achieved by using an airtight plaster or gypsum board ceiling. Access must be provided when an airtight ceiling is used.

7.3 Air Valves.

Air valves generate louder mid and high frequency noise levels the more they are throttled. Select the air valves so they are wide open during the most frequent operating mode; do not oversize. We recommend that 5 decibels be added to manufacturer's reported noise levels for these devices when estimating resultant noise levels.

8 VIBRATION ISOLATION

8.1 Introduction.

Proper vibration isolation is necessary to prevent vibration from entering the building structure, traveling through the structure, and being radiated by various building surfaces as audible noise. There is no practical way to predict how far the vibration will travel before it emerges as noise, and it is not uncommon for vibration to travel several floors through a building before being radiated as noise. Structure borne noise problems are extremely difficult to diagnose and solutions range greatly in cost and ease; the most effective solution is to provide vibration isolation between the vibration source and the structure before construction.

8.2 Space Requirements.

Although it is difficult to recommend exact vibration isolation until equipment selections are finalized, provision for accommodating vibration isolation should be made during early design. A 2" minimum clearance should be made between vibrating equipment and building surfaces below, above, and on all sides. If the installation is above grade, the equipment operates at a speed below 600 rpm, the building structure is lightweight, or the equipment has a large start up torque (e.g., pumps or top heavy air compressors), it is likely that an inertia base will be required. If so, a clearance of at least 1 1/2" but no greater than 2 1/2" should be provided between the inertia base and the housekeeping pad. Similar spacing is required between structural steel frames and housekeeping pads.

8.3 Equipment Locations.

Equipment should generally be located on grade, near columns, or over major beams; mid span locations should be avoided wherever possible. Suspended equipment should be hung from major beams and not from lightweight slabs or roof decks.

8.4 Supporting Structure.

Structure supporting vibration-isolated equipment should be very stiff and generally must be designed to support the equipment plus inertia bases weighing 1 1/2 to 2 times the weight of the isolated equipment. In general, incremental structural deflection due to placement of the equipment should not exceed 0.1"-0.2".

8.5 Housekeeping Pads.

Housekeeping pads can provide local stiffness to the floor structure and reduce the accumulation of debris that might short circuit the isolators under the equipment. Where they are provided, we recommend careful coordination between the architectural and mechanical drawings showing their locations and dimensions. Specifically, pads should be wide enough to carry vibration isolation hardware, especially where outboard height saving brackets are used. Housekeeping pads may be 8 12 inches wider than the footprint of the unit supported.

8.6 Inertia Bases.

Inertia bases lower the center of gravity of vibrating equipment and decrease lateral movement of the isolated assembly due to starting torque. Typical applications are above grade equipment including pumps, fans, and control air compressors. Inertia bases are usually 6" to 10" thick concrete filled steel frames, but cannot be thinner than either 6" or 10% of the distance between supporting isolators.

8.7 Selection of Vibration Isolators.

Most equipment needs to be spring isolated, but the exact nature of the isolation can only be determined after final equipment selection. In no instance should housed spring isolators be used on this project since they tend to short circuit to the building structure. We recommend that the vibration isolation specifications be written so that isolators can be referenced in three ½" wide columns on each equipment schedule, titled "Base", "Isolator Type", and "Minimum Static Deflection". We recommend including this information on the drawings to ensure that vibration isolation products are identified and included in the cost estimating procedures during bidding. We can provide an example of such a schedule.

8.8 Conduit Connection.

To prevent a short circuit of the vibration isolation by conduit, electrical connections to equipment should have 360 degree loops or grossly slack flexible conduit. In certain situations, it is necessary to vibration isolate the conduit.

8.9 Duct Connections.

To reduce the transfer of fan vibration to ductwork, use flexible duct connectors with at least 2" slack covering a metal to metal gap of at least 2" between ducts and all fan inlets and outlets.

8.10 Piping Isolation.

Piping can transmit equipment vibration over long distances and can also transmit sound from a noisy space into a quiet space. Consequently, it is not unusual to isolate much or all piping in this type of building with neoprene or spring isolators. It may be less costly to isolate all piping in machine rooms as a unit by providing a spring isolated steel frame overhead for all piping supports. Please coordinate this with us as early as possible in the design stage.

8.11 Pipe Connections to Air Handlers.

If coils are separated from fans by flexible connections, the piping connected to the coils may not require vibration isolation. Where coils are integral with the fan assembly, hang piping with vibration isolation hangers of the same deflection as the equipment for a distance of at least 50 ft from the fan assembly. The exact manner of isolation depends on the nature of the fan installation. Flexible piping connectors will also be required.

8.12 Pipe Connections to Pumps, Chillers, and Air Compressors.

Flexible connections meeting the mechanical requirements of the installation should be provided for alignment and vibration isolation in piping connected to pumps, chillers, and air compressors. We recommend twin-sphere neoprene connectors, which are superior to braided metal types since they can reduce transmission of vibration due to fluid pulsation. If only one flexible connector is used in a pipe run, it should be oriented parallel to the shaft of the impeller. Two flexible connectors at right angles provide the best isolation. We recommend against braided metallic connectors where neoprene connectors can meet the service requirements.

8.13 How to Specify Pipe Isolation.

A pipe hung with an isolator having a static deflection of 3/8" connected to a piece of equipment on 4" static deflection springs is likely to pull away from the equipment during operation, damaging the piping and the hanger, and possibly causing water damage and personal injury. Therefore, do not specify one standard static deflection for all the piping; pipe hanger static deflection must be based on the static deflection of the isolators supporting the equipment to which it is connected.

8.14 PVC Piping.

PVC and other plastic piping typically transmit fluid flow noise more readily than metal types. We recommend using cast iron pipe for exposed waste and drainpipes in acoustically sensitive spaces.

8.15 Sump and Jockey Pumps.

In noise sensitive areas such as orchestra pits, resiliently mount sump pumps on neoprene pads, with elastomeric grommets around all anchor bolts. Isolate jockey pumps (used to maintain pressure across fire protection pumps) on neoprene pads.

8.16 Elevator Equipment.

Isolate hydraulic equipment including piping from structure using neoprene pads; a hydraulic muffler should generally be used. Include neoprene pads under motor generator sets and lifts in electric systems. Resiliently connect and hang all piping.

8.17 Boilers.

Mount fan induced draft boilers on neoprene vibration isolation pads of bridge-bearing quality. Suspend the boiler breaching for these boilers from neoprene hangers. Naturally aspirated boilers do not require vibration isolation.

8.18 Transformers.

Mount transformers on neoprene vibration isolation pads of bridge-bearing quality. Resiliently connect the conduit or cable connected to the transformers in as limp a manner as possible.

8.19 Packaged Air-Handling Units.

While we recommend specifying custom spring isolators for large air-handling units, often the unit comes "as is" with the fans on spring isolators inside the casing of the unit. In this case, place neoprene pads under the load points of the unit to provide a break for any high-frequency vibration being carried by the unit's casing. The weight of the equipment is often enough to keep the pads securely in place; if a mechanical connection is required, sleeve or grommet the bolts with neoprene and secure with a neoprene washer to prevent rigid metal-to-metal contact that would provide a path for vibrations to bridge the vibration isolation.

8.20 Specifications.

We strongly recommend that all vibration isolation materials be grouped into one separate section of the specification rather than spread through the various sections. We can provide a sample specification section as a guideline, or can provide a complete specification for approval by the Design Engineer and inclusion in Division 15.

8.21 Installation.

Installation of vibration isolation is an error prone process. We recommend making provision for observation by a qualified inspector during construction, with a report certifying that the installation is complete and proper in every respect.

9 SPECIAL DETAILS

9.1 Airtight Construction.

Acoustically sensitive/critical spaces require careful detailing if they are to be isolated from external noise. Construction must be airtight and penetrations for electrical boxes and panels, conduits, light fixtures, ducts, diffusers, etc., must be carefully thought out. Detail these penetrations on the Construction Documents.

9.2 Fixed-Pitch Sheaves.

After airflow adjustment of built-up air-handling systems, replace variable pitch fan drive-belt sheaves with fixed-pitch sheaves.

9.3 Pneumatic Controls.

Do not locate aspirating temperature control sensors within acoustically sensitive/critical spaces.

9.4 Floated Concrete Floors.

Floated floors are not used for vibration isolation. They are used to shield the structure from high intensity noise levels in mechanical rooms. We recommend floated floors in most mechanical rooms not on grade, which are in close proximity to acoustically sensitive/critical spaces. We often recommend secondary independent walls and resiliently suspended noise barrier ceilings in conjunction with floated floors.

There are two basic types of floated floor construction, the formwork system and the jack-up system. While the formwork system sometimes has a slightly lower first cost, the jack-up system is much more resistant to errors in construction, possibly making it more economical in the long run. We strongly recommend the jack-up system over the formwork system. We typically recommend a four-inch concrete slab over a two-inch airspace. We can provide full specifications for either assembly.

9.5 Circulating and Storm Drain Piping.

Piping can radiate substantial turbulent flow and pump pulsation noise. Therefore we recommend that circulating and storm drain piping not be routed through acoustically critical spaces. For less critical spaces (RC 30 -35), chases or lagging may be required to contain piping noise. Size circulating piping which must be routed through acoustically sensitive/critical spaces for a maximum pressure drop of 3 feet per 100 linear feet. Do not allow control valves within the sensitive space, and use non-slam check valves if required anywhere in the circuit.

10 FINAL REVIEWS

10.1 Information Required.

While it is ultimately necessary to use final equipment selections, we can accomplish a great deal with rough approximations. The sort of information required is that usually shown on schedules, such as brake and motor horsepower, CFM, rpm, total static pressure, efficiency, and cooling capacity. Provide manufacturers' noise data to us if it is available.

As the design of major fan systems nears completion, we require fan curves including point of operation and brake horsepower. We also need NEMA sound ratings for all transformers in or near acoustically sensitive/critical spaces.

10.2 Timing.

When system design is well advanced but there is still opportunity for adequate review and changes, submit drawings to us for final review.

10.3 Submittal Review

We should review submittals and shop drawings for all products and equipment listed in specification sections that we provide as well as fans and other vibration isolated equipment. We should receive fan curves and fan efficiency calculations as part of the submittal. We will stamp submittals for compliance with the acoustical requirements of the project. This review will be in conjunction with the engineer's review for all other requirements. We

should also review submittal data for all fans, attenuators, vibration isolators, chillers, cooling towers and VAV boxes. We will issue a complete list of all items for which we should review submittals.

10.4 Construction Observation.

Design work should always allow provisions to allow the designers to observe the progress of construction. Sometimes, however, due to distance and the relatively small portion that our specialty represents of the overall work, we must rely upon others for progress reports. We urge the Architect and Engineers to attend to acoustically important details of construction. It is important that we are contracted to make progress and final observation visits. We must also be alerted to the most auspicious times for these visits.

10.5 Air Balance Report and As Built Drawings.

Air distribution systems generally become significantly quieter during the final balancing. Therefore, we cannot conduct our final checkouts until balancing is complete; neither can we troubleshoot certain HVAC system noises until we are provided with a copy of the complete air balance report and a set of "as-built" system drawings. It is crucial to schedule testing and balancing sufficiently in advance of opening performances or services so that we may conduct our evaluations with a balancing report in hand.

END OF DOCUMENT

10. PERFORMANCE EQUIPMENT

Concert Hall Performance Accommodations and Technology

The following narrative describes our recommended approach for the technical systems related to the Concert Hall at U of O's Erb Memorial Union. The musician, dancer, presenter and their audiences are aided and supported by the facilities in which the performances take place. The performers are always *accompanied* by environmental and technical conditions of the facility. The ultimate goal in planning such facilities is to focus on the architectural and acoustical design, technical operation and what it takes for audiences to have rich and captivating experiences, what it takes to inspire and support the artists, what it takes to maintain financial viability for the project and the working facility, and what it takes to design and build a successful performance venue.

These recommendations are further based conversations with the User's committee, our interpretations made from experience on similar projects of this type, and incorporating tried and true *and* progressive directions in performance support.

Certainly in a concert hall, most elements in the building are subject to a great deal of acoustical criteria. Please refer to the guidance of our colleagues at Kirkegaard Associates for those aspects. The following advice, production systems budget recommendations and engineering criteria for production systems and functions should be reviewed by the Clients and Architects as well as the consultants in acoustics, lighting, electrical, mechanical, structural, and cost estimating.

1. Program vs. Budget and Operations

We have established and evolved a space program, current as of version 9 dated 1/10/12. There is a distinct relationship between the budgets allocated for the *investment* in operational systems, the related impacts on the space requirements and the ongoing operational cost and schedule capabilities for the facility. In short: if the investment is made in highly functional systems that convert the venue from one use to another quickly and with minimal staffing, a more dense and hospitable calendar can be booked, which in turn goes to mission achievement, lessened operational costs in time and revenue generation. The opposite is true as well. Further, if elements must be physically removed from the premises, additional area in storage must be accommodated. This manifests itself most prominently in the stage configurations with the need for combinations of orchestra risers, choral risers, open flat floor areas, an orchestra pit and stage overhead support.

Two ranges of systems are described below and the most important thing to keep in mind is that they each establish a different range of function and facility usability:

Baseline range has lower initial costs, but will take more labor and calendar time to make changeovers and may relegate some programmatic functions out of the facility.

Extended range is higher capital costs but maximizes operations and facility adaptability.

2. Production Systems Narrative – Concert Hall

Musician and Choir Risers (FF&E, Baseline)

Per the recommendations of the Acoustical Consultant, the brass and some wind sections of large orchestras will require robust, elevated risers. Additionally, choirs larger than the (60) fixed seats provided in the choir loft will need risers. Still other uses, such as Opera and Dance will need the entire performance platform floor to be at a single, flat elevation. To suit these various needs, combinations of portable risers will be employed. Each specific use requires different riser sizes and elevations, so the ability to share is limited. The method of manipulation is key, and relates to the discussion in Section 1.

For instrumental use, one or two levels of portable musician's risers would be placed as needed on the performance platform. For extended choir use, portable choir risers would be placed in front of the choir loft.

Recital Screens (FF&E, Baseline)

Based on the Acoustical Consultant's recommendations, a series of rolling, architecturally finished "recital screens" will be provided. These screens, similar to a small orchestra shell, would provide an acoustically reflective backdrop, located closer to a smaller ensemble than the side walls of the performance platform. The screens will either store off stage or below stage, depending on height. A specialty sub-contractor would provide the tower frame with honeycomb panels and counterweighted base. Finish carpenters would add architectural millwork and finishes. The Recital Screens would also be used to provide a reflective wall in front of the seat wagon storage area and the panels would tip to the necessary angle for acoustics.

Orchestra Pit

An orchestra pit provides a recessed area for a small ensemble to play while accompanying singers, typically for opera or dance. 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 as a musicians' orchestra pit (lowest setting), an area for additional audience (intermediate setting) and as a stage extension (highest setting).

The program for this facility indicates that it will be mostly set at audience level, so the +/-80 seats in this area are part of the Hall's 1,110-seat capacity. Usually these seats are desired to be the same quality as the rest of the audience, so they are mounted on "seat wagons" that store below the front seating area when not in use.

When the area is needed as an orchestra pit, an electro-mechanical "orchestra pit lift" is used. The lift is critical if changeovers happen several times a week or day, as is anticipated for the Oregon Bach Festival. An electro-mechanical orchestra pit also offers the ability to move large elements (pianos, instruments, risers, seating, etc) into a storage basement below the performance platform, thus reducing building footprint. (**baseline** approach)

As a deductive alternate for cost saving purposes, it may be viable to use an orchestra pit

platform system with telescoping legs. The system's understructure looks similar to scaffolding, with large platforms placed on top. Systems that we would specify are robust and quiet under foot. While this approach offers cost savings, it would take several staff members approximately four person-hours to changeover, and would likely preclude the use of audience seating that matches the rest of the hall due to weight and storage issues.

Variable Acoustics – Canopy

The Acoustical Consultant is recommending an overhead acoustic canopy as a baseline system that is used to direct unamplified sound coming from the platform, and to suit various sizes of ensembles and their respective sound levels. The canopy is to be adjustable vertically, and it is also an armature to suspend platform lighting (discussed below).

Variable Acoustics – Absorption

In order to give the Concert Hall the acoustic range to support the various types of performance envisioned, a significant amount of sound-absorbing materials that are adjustable are required. There are several means to achieve this such as fabric banners, draperies, and acoustic panels. In this case, a combination of properly placed two-layer fabric banners that lower into the hall and retract into the attic, as well as some tracked draperies are the preferred methods. The control system will allow preset configurations or customized adjustment. This is inherently a **baseline** system. Refer to Acoustical Consultant's narrative for additional detail.

Overhead Support

For the support of other event types, such as lectures, dance and opera, and popular music temporary elements such as loudspeakers, lighting and masking draperies will need to be suspended overhead. This can be achieved in several ways, again according to the initial budgets invested.

As a part of the **baseline** infrastructure, we would recommend that a series of attachment "rigging points" be provided over the Platform. This would allow temporary elements to be safely attached using production industry standard methods. The points would be rated for one-ton each. The points can be hidden in the ceiling and accessed from above.

The **extended** approach would provide a faster system of attachment and hoisting, using motorized dead haul "pipe battens" or "lift line sets" incorporated in to the ceiling.

Service access via catwalk to overhead support elements, including architectural and production lighting fixtures, rigging points, and variable acoustic drapery devices and motors is critical. Either the entirety of the attic area can be walked upon, or approximately (10) cross-room catwalks should be assumed, as well as full-length catwalks on either side of the room.

Production Lighting Control

A production lighting system suitable for both orchestral and performing arts programming would be provided. Control of the system would be both by simple wall panels and sophisticated control console.

Dimmers would be "high rise time" dimmers to minimize filament noise. Dimmer racks are to

be located within an electrical room remote from the stage for noise purposes. Approximately 150 (**baseline**) or 250 (**extended**) dimmers would be provided for performance and architectural lighting.

Platform front lighting will be mounted and accessed by technical catwalks within the ceiling and cross lighting will be incorporated into the walls. Down lighting will be mounted in or between the acoustical ceiling elements.

An inventory of performance lighting fixtures would be provided.

Production AV (Audio Visual) Systems

The audio system will include capabilities for both vocal and instrumental reinforcement (amplification), as well as audio playback. This would typically include loudspeakers, amplifiers, signal processing, a mixing console, and source equipment, such as microphones, CD players, computers, etc. A system for making multi-track digital audio recordings will be provided. Microphone positions will be located throughout the facility.

A production intercom system will be provided for technical communications between backstage personnel. Audio program will be distributed to backstage support spaces, such as dressing rooms, offices and shop areas.

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.

A video display system capable of high definition video projection will be provided. This would typically include a video projector, motorized roll-down projection screen, production video switcher, and source equipment, such as computers, media players and cameras. 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.

A touch screen control system will be provided to allow for control over the AV system. The touch screen will be simple in its programming, and allow access to the most typically-used presets only. Touch screens will be located in the booth and on-stage at the AV rack.

Audio Recording Facilities

The audio recording suite would include a digital multi-track computer recording system, capable of recording audio directly from either the Concert Hall or the Multipurpose Room, or used as a post-production editing suite. A vocal and/or tracking booth would also be provided.

Audience Seating

The approach to audience sightlines will provide comfortable view to the performance platform. With the inclusion of dance as one of the uses of the Concert Hall, the stepping of the auditorium more steeply than might be considered for solely a music venue will provide appropriate views to the platform floor. This will also benefit the Opera uses by providing directorial flexibility (such as when our hero dies on the floor) and is part of the acoustic geometry with the orchestras playing on a predominantly flat floor. The chairs will be staggered

for “every other row” sightlines.

Approximately 1,110 fixed theatre chairs will be provided, with acoustic requirements that may include solid seat assemblies and other acoustic accommodations. The audience area in this space is required to have (11) spaces for wheelchairs, each with a companion seat. The positions for the wheelchairs will be well dispersed “vertically” meaning at several locations forward and backward and including in the balcony, and “horizontally” meaning left to right and including the side boxes and choral terrace, giving patrons a choice of perspective and seat costs, per the building code and the ADA. Approximately 1% of the seating must be equipped with lift-up or swing-out armrests to provide “transfer” seating.

Control Booth & House Mix

An adequately sized control booth will be provided, with facilities for the operation of lighting, stage management, variable acoustics, audio and video.

A house mix position will also be provided for events where the sound engineer is required to be in the same acoustic environment as the audience.

A followspot booth will be provided at an upper level.

Production Power

One 400A, 3-phase, 120/208VAC “company switch” power outlets with “camlok” connectors will provide a generic power source to miscellaneous temporary systems such as portable lighting and multimedia systems.

One 200A, 3-phase, 120/208VAC “company switch” power outlets with “camlok” connectors will provide a generic power source to miscellaneous temporary systems such as portable AV systems.

Three 100A, 3-phase, 120/208VAC “company switch” power outlets with “pin & sleeve” connectors will provide a generic power source to miscellaneous temporary production systems, such as motor hoists and followspots.

3. Production Systems Narrative – Multi-Purpose Room

Overhead Support

In order to provide a nominal amount of mounting capability for overhead event lighting, banners and the like, simple overhead support for this facility would include theatre-style structurally rated pipes on centers between 8’ and 10’.

Variable Acoustics

In order for the room to serve also as a rehearsal room, some simple variability in the acoustic characteristics of the room may be desirable. This would be accomplished with the use of manually adjusted tracked draperies.

Production Lighting Control

A basic presentation and event lighting system would be provided. Control of the system would be both through simple wall panels and a small control console.

Approximately 24 (**baseline**) or 96 (**extended**) dimmers would be provided for performance and architectural lighting, and an inventory of theatrical lighting fixtures would be provided.

Production AV (Audio Visual) Systems

The audio system will include capabilities for both vocal and instrumental reinforcement (amplification), as well as audio playback. This would typically include loudspeakers, amplifiers, signal processing, a mixing console, and source equipment, such as microphones, CD players, computers, etc. Tie lines to the recording studio would be provided.

A production intercom system will be provided for technical communications between backstage personnel. Audio program will be distributed to backstage support spaces, such as dressing rooms, offices and shop areas.

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.

A video display system capable of high definition video projection will be provided. This would typically include a video projector, motorized roll-down projection screen, video switcher, and source equipment, such as computers, media players and cameras.

A touch screen control system will be provided to allow for control over the AV system. The touch screen will be simple in its programming, and allow access to the most typically-used presets only. Touch screens will be located in the booth and on-stage at the AV rack.

Audience Seating

A motorized and retractable seating system would be provided, with approximately 200 integral, upholstered theatre seats on relatively steep tiered rows. The seating area in this space is required to have 5 spaces for wheelchairs, each with a companion seat. 1% of the seating must be equipped with lift-up or swing-out armrests to provide “transfer” seating.

Production Power

One 100A, 3-phase, 120/208VAC “company switch” power outlets with “pin & sleeve” connectors will provide a generic power source to miscellaneous temporary production systems, such as lighting or AV.

4. Budget Recommendations

Below are listed the budget recommendations for production systems. 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 16/26. Those major needs are described within the other sections of this report.

The recommendations below are listed in 2012 dollars and do not include General Contractors mark-up and general conditions, escalation or overall contingencies.

The ranges indicate **baseline – extended** approaches as described above.

Concert Hall

Musician's Risers (FF&E) **$100,000 – $100,000**
Portable system including accessories and storage carts

Choir Risers (FF&E) **$40,000 – $40,000**
Portable system including accessories and storage carts

Recital Screens (FF&E) **$60,000 – $60,000**
Budget includes (6) rolling towers with metal tube frames, plywood nailing backer, rolling and counterweighted bases.
Related Exclusions: architectural millwork, finishes and storage accommodations.

Orchestra Pit Lift/Platforms
Baseline budget includes electro-mechanical, non-production orchestra lift ("LinkLift" or "Slinky"), installed and storage room load-through platforms. **$265,000**

-OR-

Deductive Alternate approach is manually operated platforms. **$60,000 (-$205,000)**

Related Exclusions: Electrical service and connections for power and control/safety systems, stage flooring and surrounding safety carpentry.

Orchestra Pit Seat Wagons **$25,000 – $150,000**
Baseline budget provides carts to speed movement of individual theatre chairs into storage.
Extended budget includes wagons that match the adjacent finished floor conditions and move large banks of fixed seats into storage.
Related Exclusions: Finished flooring. Chairs listed below.

Variable Acoustics – Canopy **$300,000 – $300,000**
Includes a canopy over approximately 60% of the performance platform with shaped and coated fabric reflector panels and concert lighting.
Related Exclusions: Structural and electrical accommodations.

Variable Acoustics – Absorption **$320,000 – $320,000***

Budget includes motorized variable acoustic draperies, banners and associated mechanisms, installed. Drapery criteria per acoustical consultants' recommendations.

* pricing exercise currently underway

Related Exclusions: Structural accommodations and Electrical service and connections for power and control/safety systems.

Overhead Support **$40,000 – $150,000**

Baseline includes portable hoists with fixed rigging points.
Extended includes an integrated system of motorized hoists and control, installed.
Related Exclusions: Structural accommodations and Electrical service and connections for power and control/safety systems.

Production Lighting Control **$200,000 – $250,000**

Baseline includes (~150) dimmers for production & architectural lighting, control console with focus remote, control processor and network components, control and circuit wiring devices and stage cable, equipment only.
Extended includes an additional (~100) dimmers for production lighting.
Related Exclusions: Div. 16/26 work including infrastructure as described below, all distribution and control wire, conduit, and complete installation.

Production Lighting Fixtures (FF&E)

Allowance **$50,000 – $50,000**

AV Systems **$350,000 – $350,000**

Comprehensive system to include wiring infrastructure, audio reinforcement and playback system, video projection system, production intercom and monitoring to all technical areas, FM assistive listening, touch panel control system wire, pull and system integration and installation.
Related Exclusions: Div. 16 work including electrical infrastructure as described below, isolation transformer, isolated ground, motorized breaker panel, and complete installation of AV systems low-voltage conduit.

Fixed Theatre Seating **$500,000 – $555,000**

Budget includes 1,110 fixed, upholstered theatre chairs, installed at $450-$500/chair.
Related Exclusions: Electrical connection for aisle lighting and 8" core-drill for HVAC diffusers under every other seat.

Multi-Purpose Room

Variable Acoustics **$0 – $40,000**

Baseline moves all costs into architectural budgets as the system does not move.
Extended includes perimeter wall, manually operated variable acoustics draperies and mechanisms, installed. Drapery criteria per acoustical consultant's recommendations.

Production Lighting Control **$25,000 – $65,000**

Baseline includes (24) dimmers for production & architectural lighting, control console with focus remote, control processor and network components, control and circuit wiring devices and stage cable, equipment only.
Extended expands system to a total of (96) dimmers for production lighting.
Related Exclusions: Div. 16 work including infrastructure as described below, all distribution and control wire, conduit, and complete installation.

Production Lighting Fixtures (FF&E)

Allowance **$50,000 – $50,000**

AV Systems **$150,000 – $150,000**

Comprehensive system to include wiring infrastructure, audio reinforcement and playback system, video projection system, production intercom and monitoring to all technical areas, FM assistive listening, touch panel control system wire, pull and system integration and installation.
Related Exclusions: Div. 16 work including electrical infrastructure as described below, isolation transformer, isolated ground, motorized breaker panel, and complete installation of AV systems low-voltage conduit.

Fixed Theatre Seating **$200,000 – $200,000**

Budget includes 200 upholstered theatre chairs on motorized retractable platform system.
Related Exclusions: Electrical connection for motor and aisle lighting.

Audio Recording Studio

Audio Recording Studio **$200,000 - $200,000**

Digital multi-track mixing console & computer-based recording, monitoring system, digital tie-lines to hall & Multi-Purpose Room, wire, pull and system integration and installation.
Related Exclusions: Div. 16 work including: Infrastructure as described below.

Miscellaneous Aspects To Be Included In Other Sections

Electrical & Mechanical Accommodations

As indicated below

Specialty Architectural Lighting

As indicated by the project architectural lighting designer

Concert Hall:

Catwalks – 850 linear feet at 3'-0" wide with double railings at both sides of catwalks OR the provision of a walk-able access attic above the concert hall
Stair- Assume full size technical staircase from basement level to catwalk level

Multi-Purpose Room:

Mounting Pipes – 1.9" O.D. schedule 40 black steel pipes on 8' centers, one direction

Portable/Temporary Cable Paths:

Loading dock to basement below stage- ~150' of enclosed cable duct
Orchestra Pit to House Mix position- ~75' of 10" PVC pipe w/ terminations
House Mix position to Control Booth- ~50' of 10" PVC pipe w/ terminations
Stage Area Wall Penetrations- ~20 in-wall fire-rated cable pass-thru penetrations
Stage Area Floor Penetrations- ~5 in-floor fire-rated cable pass-thru penetrations

AV Low-Voltage Conduit System (by elec):

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 Level
B: Line Level
C: Video & Communications Level
D: Loudspeaker Level
E: Empty
F: Fiber

As becomes clear, the amount of conduit becomes a significant cost factor, and should be accounted for accordingly. While the exact design is forthcoming, some general guidelines:

Concert Hall:

Stage to Booth: 2 home runs, each ~150' length x 5 conduits, 1.5" typical
On stage panels: 10 panels, each with ~25' length x 5 conduits, 1.5" typical to JB
Catwalk panels: 6 panels, each with ~50' length x 5 conduits, 1.5" typical to JB
Misc Panels: 4 panels, each with ~50' length x 5 conduits, 1.5" typical to JB

Multi-Purpose Room:

Stage to Booth: 2 home runs, each ~75' length x 5 conduits, 1.5" typical
On stage panels: 4 panels, each with ~50' length x 5 conduits, 1.5" typical to JB
Catwalk / Grid panels: 6 panels, each with ~50' length x 5 conduits, 1.5" typical to JB
Misc Panels: 6 panels, each with ~50' length x 5 conduits, 1.5" typical to JB

Recording Studio AV Tie Lines (Fiber runs):

Concert Hall to Recording Room: 1x: 100' conduit, 1.5" typical
Multipurpose to Recording Room: 1x: 250' conduit, 1.5" typical

Recording Studio (Local):

Local panels to AV rack: 5 panels, each with ~25' length x 5 conduits, 1.5" typical to JB

Millwork: allowance for cabinets

Control Booths and Recording
Dressing Rooms and Green Room - counters, mirrors, shelves
Storage (pipe racks with 200sf of total)

Specialty Floors:

Concert Hall and Multi-Purpose Room - "sprung" floor assembly of:

¾" hard wood T&G or end grain hard wood panels
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. Electrical Accommodations

Production Lighting Control & Fixtures

Scope

We will design and specify the production lighting control system equipment and fixtures in dedicated drawings and in Division 11 specifications. The system will be installed in its entirety under Div. 26. Our documents will be oriented to show/specify the equipment and devices only. The infrastructure for the system such as conduit size and route, wire, back boxes, and all parts of the power systems must be designed by the Electrical Engineer and shown within their documents. We will provide CAD layers of devices and review and coordinate with the electrical documents. For low voltage production control systems, our documents will include point-to-point diagrams, and wire types, but not design or documentation of the Div. 26 infrastructure as required to complete the installation. Production lighting fixtures are "temporary loads" that are clamped on and changed for each performance. They will be installed by the Owner's forces or the Div. 11 supplier.

Dimmers (Concert Hall & Multi-Purpose)

Dimmer rack electrical load:	**395.0 kW**
Feed:	Transformer "PL-1", dedicated 120/208VAC 3-phase, K-13 rated transformer.
Transformer:	500 KVA (assuming power factor of 0.9)
Feeders:	Copper, with neutrals 2x oversized as current carrying conductor.
Breaker:	Concert Hall: (2) 400A and (1) 200A, 120/208VAC 3-phase, Multi-Purpose Room: (1) 400A, 120/208VAC 3-phase, Must be inside dimmer room. Provide local disconnect if not.
Space required:	Total for one rack 2'-0"w x 2'-0"d (+3' clearance) x 8'-0" high; rear access not required; run feeders into bottom of rack and branch loads into top. We recommend providing an enclosed gutter, pull box or wireway above dimmer racks to land branch conduits, then stub down into rack with large conduits.
Location:	Secured dimmer or electrical room at platform level or second level (preferred).

Branch Loads

Wiring devices:	Production lighting wiring devices to be provided under Div. 11 and installed by Div. 26. Devices come prewired with labeled terminal strips for branch wiring to dimmer rack. Circuits are numbered at the device with a corresponding dimmer 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 1000w (normally #10 unless runs are very long). We anticipate a total of approximately (336) branch circuits for production and architectural dimmed lighting.

Architectural lighting:	All dimmed house lighting should be run to the dimmer racks to consolidate the control system. Dimmer rack branch lugs typically accept two #10 wires, provide circuit management if required. Architectural loads will be circuited and scheduled by the Electrical Engineer with input from The SC. Due to the limitations of dimming technology as it relates to the need to provide a flicker-free, smooth dimming curve to and from zero percent, we recommend that LED lighting sources *not be used* in the Concert Hall or Multi-purpose Room.
Emergency lighting:	A method of dealing with emergency egress lighting is required. We suggest an emergency lighting transfer switch (ELTS- UL 1008) be specified by the Electrical Engineer with products recommended by The SC.
Aisle lighting:	Seating aisles are required to have egress lighting at all times when occupied. If the emergency lighting is adequate, they may also not be required to be on an emergency circuit. Aisle lighting will be connected to production relay panels.

Production Lighting Company Switch: Concert Hall - 400A

Temporary device load:	**36.0 kW** total – 25% simultaneous with dimmer load above.
Feed:	On theatre lighting transformer "PL-1".
Feeders:	Copper.
Device:	Provide theatre industry UL listed standard company switch which includes one 400A, 120/208VAC 3-Ø cam-lock safety connection panel. This would be specified in Div. 26 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 side wall.

Miscellaneous Power Company Switch: Multi Purpose Hall – 100A

Temporary device load:	**9.0 kW** total – 25% simultaneous with dimmer load above.
Feed:	On theatre lighting transformer "PL-1".
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 14" tall each, mounted 2'-0" a.f.f.
Locations:	Rehearsal Hall Storage Area

Relay Panels (Concert Hall)

Relay Panel electrical load:	**28.8 kW** peak anticipated (25% capacity)
Feed:	(24) 120VAC feeds from standard building power.
Breakers:	(24) 20A, 120VAC. Must be adjacent to relay panel.
Space required:	24" H x 17" W x 7" D. Wall mounted, adjacent to breaker panel.
Purpose:	To consolidate and integrate non-dim circuits, run/work lights, and cue lights on to a cohesive network using typical production lighting control system protocol.
Location:	Dimmer room or several racks distributed and interconnected as appropriate.

Rigging & Machinery Systems (Concert Hall)

Variable Acoustic Banners

Motor loads:	(16) Sixteen 1 HP motors.
Feed:	Standard building power *other than* transformer "PL-1".
Required power:	480/208 VAC, 3-Ø.
Locations:	Banner Boxes
Notes:	The drapery motors (with onboard starters) are provided under Div. 11. Low voltage relay control panel will be located within the attic. Conduit, back boxes and wire and wire pull are provided under division 26.

Variable Acoustic Draperies

Motor loads:	(6) Six 1/2 HP motors.
Feed:	Standard building power *other than* transformer "PL-1".
Required power:	120 VAC, 1-Ø.
Locations:	Drapery pockets
Notes:	The drapery motors (with onboard starters) are provided under Div. 11. Low voltage relay control panel will be located at stage level. Conduit, back boxes and wire and wire pull are provided under division 26.

Motorized Rigging Systems - Canopy

Motor load:	(4) Four 5.0 HP motors.
Motor feed:	Standard building power *other than* transformer "PL-1"
Required power:	480 VAC, 3-Ø.
Control system:	Minimal 120V power.
Disconnect:	Breakers at stage level. 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: (5) Fixed canopy hoists

Orchestra Pit Lift Machinery

Device load:	(2) Two 15.0 HP motors
Required Power:	480VAC, 3-Ø.
Feed:	Standard building power *other than* transformer "PL-1".
Location:	Motor control: In orchestra pit vicinity, below stage. Motors: In machine pit, below orchestra lift.
Notes:	All parts of the lift system are provided and installed by the division 11 orchestra pit lift contractor. Conduit, back boxes and wire and wire pull are provided under division 26.

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 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

Miscellaneous Power Company Switch: Concert Hall – 100A (Three total)

Temporary device load:	**18.0 kW** total each
Feed:	Other building 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 14" tall each, mounted 2'-0" a.f.f.
Locations:	(1) at Hall stage level, (1) at Hall catwalk level, (1) at Followspot Booth

Rigging & Machinery Systems (Multi-Purpose)

Retractable Seating

Device load:	(2) Two 2.0 HP motors
Required Power:	480VAC, 3-Ø.
Feed:	Standard building power *other than* transformer "PL-1".
Location:	Motor control: behind seating unit. Motors: integral to seating unit.
Notes:	All parts of the seating system are provided and installed by the division 12 seating contractor. Conduit, back boxes and wire and wire pull are provided under division 26.

Production AV Systems

Scope

The Shalleck Collaborative will design and specify the AV system equipment and devices in dedicated drawings and in Division 11 specifications. The system will be installed in its entirety under Div. 11. 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:	**104.0 kW** (100% of supply to sub panels & company switches)
Feed:	Dedicated 120/208VAC 3-Ø from K-13 rated Delta-Wye transformer or equivalent HMT type.
Size:	125 KVA (assuming power factor of 0.9)
Distribution:	Feeds panel sub panels and AV company switch.
Configuration:	Single breaker or disconnect.

Sub-panel AV-1A (Concert Hall)

Panel Location:	Amplifier Room
Electrical load:	**38.8 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 MSP or MSLC. #3/0 cable & lug from main technical ground panel.

Branch Loads:

Phase A:

- 4- 120V, 20A circuits to main control booth equipment racks
- 2- 120V, 20A circuits to control booth outlets
- 2- 120V, 20A circuits to house mix position outlets

Phase B:

- 2- 120V, 20A circuits to orchestra pit & trap room outlets
- 3- 120V, 20A circuits to stage outlets
- 2- 120V, 20A circuits to catwalks & grid outlets

Phase C:

- 8- 120V, 20A circuits to amplifier racks or self-powered loudspeakers

Phase A+B+C:

- 1- 120/208V, 20A, 3-Ø circuit to video projector

Sub-panel AV-1B (Multi-Purpose Room)

Panel Location:	Control Booth
Electrical load:	**17.2 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 MSP or MSLC. #3/0 cable & lug from main technical ground panel.

Branch Loads:

Phase A:

- 4- 120V, 20A circuits to control booth equipment racks

Phase B:

- 2- 120V, 20A circuits to stage outlets
- 2- 120V, 20A circuits to catwalk & tension grid outlets

Phase C:

- 4- 120V, 20A circuits to control booth equipment racks

Sub-panel AV-1C (Audio Studio)

Panel Location:	Equipment Room
Electrical load:	**11.5 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 MSP or MSLC. #3/0 cable & lug from main technical ground panel.

Branch Loads: Phase A:
- 4- 120V, 20A circuits to audio studio AV racks

Phase B:
- 4- 120V, 20A circuits to powered loudspeakers

Phase C:
- Not used

Production AV Company Switch: Concert Hall – 200A

Temporary device load:	**36.0 kW** total – 50% simultaneous with AV loads above.
Feed:	Main AV transformer
Feeders:	Copper.
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. 26 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 side wall.

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 be 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 Level
B: Line Level
C: Video & Communications Level
D: Loudspeaker Level
E: Empty

As becomes clear, the amount of conduit becomes a significant cost factor, and should be accounted for accordingly. See budget report for further information.

Additional AV Requirements

Hall: An AV amplifier room, sized 8' x 8' minimum, will be required.

Recording Studio: An AV equipment room, sized 8' x 8' minimum, will be required.

Fire Alarm:	The AV system will require a contact closure from the fire alarm control panel. The electrical engineer and division 16 is responsible to get deliver this to each AV equipment rack.
Cable TV:	Provide Cable TV drops at all AV equipment racks.
Data:	Provide two standard copper data drops at each AV rack.

Misc. Electrical requirements (provided under Div. 26)

Misc. production power:	Miscellaneous 120VAC 1-Ø outlets will be required for general and special purpose uses. Locations to be laid out by The SC. Assume a maximum of (50) outlets with minimal loads.
Dressing rooms:	Dressing stations require plug mold or quad outlets above the countertop - assume (1) dedicated 20A circuit per station (30" of counter space). 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.
Work lighting:	Work lighting controls shall be low voltage with local and central controls. See PG drawings to be issued in Design Development Set for recommended fixture layout and zoning. Provide compact fluorescent caged jelly jars at catwalks and ladders, and orchestra pit. Stage run lights: the perimeter of the stage will have walkway lighting by recessed and louvered, blue compact fluorescent fixtures. Stage work lighting: long life caged quartz fixtures located as shown in the PG drawings. Control booths: Recessed 2x2 or 2x4 fluorescent fixtures with minicube louvers and black finished track lighting over the counter locally controlled with wall box dimmers.

6. Mechanical Accommodations

General

The heat generated by systems within our area of responsibility is predominantly from production lighting fixtures located in the audience chambers and theatre stage and the dimmers located in the dimmer room.

Room & Load Type	Load Amount	Ambient Temp
Concert Hall Lighting	40.0 kW average	Comfortable
Concert Hall Control Booth	4.0 kW average	Comfortable
Concert Hall Followspot Booth	3.5 kW average	Comfortable
Concert Hall Dimmer Room	3.0 kW average	80° F
Concert Hall Amplifier Room	6.0kW average	80° F
Multi-Purpose Room Lighting	27.0 kW average	Comfortable
Multi-Purpose Room Control Booth	4.0 kW average	Comfortable
Multi-Purpose Room Dimmer Room	2.0 kW average	80° F
Audio Recording Control	4.0 kW average	Comfortable
Audio Recording Equipment	4.0 kW average	80° F

Piano Storage Room

Dedicated piano storage rooms help pianos to last a long time and maintain a good tone. The optimal piano storage room parameters:

Temperature: 68° F
Humidity: 42% constant

Local controls for both temperature and humidity should be provided, so the room may be temporarily varied to match conditions on stage.

7. Structural Accommodations

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. We are anticipating that we will subcontract a specialty rigging structural engineer to calculate and detail the attachments, and provide engineering calculations and a professional stamp. The specifications will require that the rigging shop drawings bear an OR licensed structural engineer's stamp.

Stage Floor (Concert Hall / Rehearsal)

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

Pick Points – Concert Hall

System description:	"Pick points" rings or holes in steel plate that are used to connect temporary loads. We will review configurations alternatives with the Architect and Structural Engineer.
Load:	Each point should be rated for 1 ton each, with an overall diversity to the roof of 5 tons total. There may be as many as 12 points.

Acoustic Canopy – Concert Hall

System description:	The rigging system that will raise and lower the canopy will include lifting lines that are diverted over "blocks" (pulleys) to a counterweight and drive hoist.
Load:	The +/- 40' x 40' Canopy is estimated to weigh approximately 12.5 tons, lifted with 36 lift lines each with a worst case ½ ton load operating vertically and horizontally over a pulley. The system will be counterweighted with a mass of equal weight as the canopy.

Production Lighting Pipes – Concert Hall & Multi-Purpose Room

System description:	Lighting position pipes of 1-1/2" nominal diameter (1.9" o.d.) schedule 40 pipe to accept standard production hardware will be incorporated into the ceiling and side walls toward the front of the Concert Hall and in a grid at the ceiling in the Multi-Purpose Room. Pipes shall be detailed to provide as much clear attachment areas as possible.
Load:	Pipes should be designed to support 25#/linear foot of pipe, in addition to catwalk loading as required by code.

Catwalks

System description:	Lighting catwalks are located over the stage & audience chamber.
Loads:	The railings at the catwalk and the side pipes should be designed to support 25#/linear foot of pipe, in addition to catwalk loading as required by code.

Orchestra Pit

System description:	The electro-mechanical lift will bear on a concrete slab at a machine level 5' below the orchestra pit level.
Load:	(6) Size 12-kip concentrated loads each bearing on a 12" x 12" area.

AV Systems

System description:	Fixed attachments for loudspeakers, projectors, projection screens and related items.
Load:	(10) locations, not to exceed 1000# each.

END OF REPORT

11. SUSTAINABILITY

The EMU renovation project will be pursuing a Leadership in Energy and Environmental Design (LEED) Gold certification under the LEED NCv2009 rating system. Additional, the project team has identified additional credits, which might allow the project to attain a LEED Platinum certification. (These strategies are noted as add alternates below.) In addition to satisfying all the prerequisites necessary for LEED and SEED (the State Energy Efficiency in Design) program, the project employs a variety of sustainable strategies that support the overall environmental and enhanced performance goals of the project.

Sustainable Sites

To meet the Oregon Model's requirement to treat stormwater runoff from a portion of an existing street or parking are, the proposed project design will incorporate some storm water quality and quantity measures yet to be determined. *An eco-roof over a portion of the atrium is being considered as an add alternate. Assume 4400 sf.*

Water Efficiency

The project will implement strategies and techniques to reduce the use of potable water in the building and on the site. For example high efficiency plumbing fixtures such as HET (high efficiency toilets), low flow showerheads, automatically metered lavatories and kitchen sink faucets with aerators will be specified to reduce the potable water use consumption by more than 35%, compared to a conventional building. Upgrades of existing toilet fixtures will be evaluated for water saving measures.

Energy Efficiency

Minimum goal of being 35% more efficient than Oregon Energy Code requirements with a stretch goal to be 60-65% more efficient than ASHRAE 90.1-2007 for the new portion of the building. To achieve this overall energy performance of the building, the project design will incorporate an energy efficient building envelope, state of the art heating, ventilation, and air conditioning (HVAC) systems, and high performance lighting. (See MEP narrative). Energy conservation measures such as solar shading, preheating / cooling of mass, daylighting and natural ventilation are being designed into the building to provide opportunities to increase energy cost savings beyond the 20% mandated by the SEED process. Only HVAC systems which do not contain CFC's in their refrigerant will be used. Commissioning of all major building systems and a measurement and verification plan will be implemented to verify and confirm the building energy performance and savings compared to the predicted calculations. Additional energy conservation strategies the project will evaluate include heat recovery of the exhaust from kitchen spaces, recovery of the waste heat from all refrigeration equipment, reuse of heat from craft center operations, and a radiant system in the new portion of the building. Photovoltaics are currently not part of the base program, but the infrastructure to make the building PV ready is being included. *Solar Thermal will be explored as **an add alternate**.*

Materials and Resources

The project will focus on reuse and recovery of existing materials from the 1970's wing. Examples include grinding of concrete into paving material, reuse of wood glulams in nonstructural ways and incorporation of wood floors. Additionally, the construction process will maintain a focus on choosing environmentally friendly materials and waste management practices. New building materials, especially the large volume items such as concrete, structural steel and gypsum board will be specified to contain highest recycled content available. In addition, at least 20% of the project's building materials will be sourced from local manufacturers and suppliers located within 500 miles of the project site, thereby reducing transportation energy while supporting the local economy. To reduce the impact due to construction, emphasis will also be placed on waste management during construction. A minimum of 75% of waste from the construction process will be sorted and recycled, thereby diverting as much possible from landfills

and reducing the burden of local disposal facilities. Furthermore, recycling efforts will be continued during building occupancy for which dedicated space will be provided to handle collection and sorting of recyclables such as paper, metal and plastics throughout the project. *Use of wood certified using the FCS certification process will also be considered* ***as add alternate****.*

Indoor Environmental Quality

To maintain good indoor environmental quality and promote healthy and comfortable space for students, employees and visitors, the project will implement the necessary steps during and after construction. After construction, filters on the air handlers will be replaced with new MERV 8 filters for all occupied spaces. Mechanical systems will be designed to provide ventilation air that is required as per ASHRAE 62.1-2004 ventilation standard. Low VOC content materials such as adhesives, sealants, paints and carpets will be selected. Individual lighting and thermal controllability will be designed for occupants in majority of the spaces. The building is being designed such that natural daylighting will be available in all student offices and for most other spaces and views to the exterior will be provided for 90% of regularly occupied spaces.

Innovation in Design

Per the Oregon Model the project will incorporate education and training opportunities with the goal of shifting occupant behavior. Per the Oregon Model, a min. of $35,000 should be set aside for educational and training opportunities ($10,000 for training and $25,000 for permanent features such as signage and dashboards). EMU will also incorporate building signage that has been designed to highlight and educate the occupants and visitors about the green features of the project and its environmental benefits and incorporating green housekeeping practices.

SERA

U of O - EMU Renovation

LEED-NC® 2009 Preliminary Scorecard

Last Updated: 27 February 2012

C/P Base Strategies that are path to Gold (in budget), 74 points

Strategies recommended to get to Platinum, 81 points

FEASIBILITY RANK		TOTAL
Certain	C	29
Probable	P	44
Unlikely	U	26
Not Attempted	N	3

Tracking towards LEED Gold (C + P = 73)

Certified 40-49 / Silver 50-59 / Gold 60-79 / Platinum 80+

CHAMPION		C	P	U	N	max	Sustainable Sites (26 Possible Points)
		5	18	3	0	26	
LCL	c	✓					P 1 **Construction Activity Pollution Prevention**
SA	d	1				1	C 1 **Site Selection**
SA	d		5			5	C 2 **Development Density & Community Connectivity**
SA/LCL	d			1		1	C 3 **Brownfield Redevelopment**
SA	d		6			6	C 4.1 **Alternative Transportation,** Public Transportation Access
SA	d	1				1	C 4.2 **Alternative Transportation,** Bicycle Storage & Changing Rooms
SA/UO	d		3			3	C 4.3 **Alternative Transportation,** Fuel-Efficient Vehicles
SA	d		2			2	C 4.4 **Alternative Transportation,** Parking Capacity
CM	c			1		1	C 5.1 **Site Development,** Protect or Restore Habitat
CM	d	1				1	C 5.2 **Site Development,** Maximize Open Space
BH	d			1		1	C 6.1 **Stormwater Design,** Quantity Control
BH	d		1			1	C 6.2 **Stormwater Design,** Quality Control
SA	c		1			1	C 7.1 **Heat Island Effect,** Non-Roof
SA	d	1				1	C 7.2 **Heat Island Effect,** Roof
SA	d	1				1	C 8 **Light Pollution Reduction**

		2	4	4	0	10	Water Efficiency (10 Possible Points)
SA/GL	d	✓					P 1 **Water Use Reduction,** 20% Reduction
CM	d		2			2	C 1.1 **Water Efficient Landscaping,** Reduce by 50%
CM	d			2		2	C 1.2 **Water Efficient Landscaping,** No Potable Use or No Irrigation
SA/GL	d			2		2	C 2 **Innovative Wastewater Technologies**
SA/GL	d	2				2	C 3.1 **Water Use Reduction,** 30% Reduction
SA/GL	d		1			1	C 3.2 **Water Use Reduction,** 35% Reduction
SA/GL	d		1			1	C 3.3 **Water Use Reduction,** 40% Reduction

		12	13	7	3	35	Energy and Atmosphere (35 Possible Points)
UO	c	✓					P 1 **Fundamental Commissioning**
GL/SA	d	✓					P 2 **Minimum Energy Performance,** 10% N or 5% E
GL	d	✓					P 3 **Fundamental Refrigerant Management**
GL/SA	d	2				2	C 1.2 **Optimize Energy Performance,** 14% N or 10% E
GL/SA	d	2				2	C 1.4 **Optimize Energy Performance,** 18% N or 14% E
GL/SA	d	2				2	C 1.6 **Optimize Energy Performance,** 22% N or 18% E
GL/SA	d	2				2	C 1.8 **Optimize Energy Performance,** 26% N or 22% E
GL/SA	d		2			2	C 1.10 **Optimize Energy Performance,** 30% N or 26% E
GL/SA	d		2			2	C 1.12 **Optimize Energy Performance,** 34% N or 30% E
GL/SA	d		2			2	C 1.14 **Optimize Energy Performance,** 38% N or 34% E
GL/SA	d		2			2	C 1.16 **Optimize Energy Performance,** 42% N or 38% E
GL/SA	d		2			2	C 1.18 **Optimize Energy Performance,** 46% N or 42% E
GL/SA	d			1		1	C 1.19 **Optimize Energy Performance,** 48% N or 44% E
GL/SA	d			2		2	C 2.1 **On-Site Renewable Energy,** 3%
GL/SA	d			2		2	C 2.2 **On-Site Renewable Energy,** 7%
GL/SA	d				2	2	C 2.3 **On-Site Renewable Energy,** 11%
GL/SA	d				1	1	C 2.3 **On-Site Renewable Energy,** 13%
UO	c	2				2	C 3 **Enhanced Commissioning**
GL	d	2				2	C 4 **Enhanced Refrigerant Management**
GL/UO	c		3			3	C 5 **Measurement & Verification**
na	c			2		2	C 6 **Green Power**

CHAMPION		C	P	U	N	max	Materials and Resources (14 Possible Points)
		4	4	6	0	14	
SA	d	✓					P 1 **Storage & Collection of Recyclables**
SA	d		1			1	C 1.1 **Building Reuse,** 55% of Existing Walls, Floors & Roof
na	d			1		1	C 1.2 **Building Reuse,** 75% of Existing Walls, Floors & Roof
na	d			1		1	C 1.3 **Building Reuse,** 95% of Existing Walls, Floors & Roof
na	d			1		1	C 1.4 **Building Reuse,** 50% of Interior Non-Structural Elements
LCL	c	1				1	C 2.1 **Construction Waste Management,** Divert 50% from Disposal
LCL	c	1				1	C 2.2 **Construction Waste Management,** Divert 75% from Disposal
SA	d		1			1	C 3.1 **Materials Reuse,** 5%
SA	d			1		1	C 3.2 **Materials Reuse,**10%
LCL/ SA	c	1				1	C 4.1 **Recycled Content,** 10% (post-consumer + ½ pre-consumer)
LCL/ SA	c		1			1	C 4.2 **Recycled Content,** 20% (post-consumer + ½ pre-consumer)
LCL/ SA	c	1				1	C 5.1 **Regional Materials,** 10% Extracted & Manufactured Regionally
LCL/ SA	c		1			1	C 5.2 **Regional Materials,** 20% Extracted & Manufactured Regionally
LCL/ SA	c			1		1	C 6 **Rapidly Renewable Materials,** 2.5%
LCL/ SA	c			1		1	C 7 **Certified Wood,** 50% of wood-based materials

		5	8	2	0	15	Indoor Environmental Quality (15 Possible Points)
GL	d	✓					P 1 **Minimum IAQ Performance**
UO/SA	d	✓					P 2 **Environmental Tobacco Smoke (ETS) Control**
GL	d		1			1	C 1 **Outdoor Air Delivery Monitoring**
na	d			1		1	C 2 **Increased Ventilation**
LCL	c	1				1	C 3.1 **Construction IAQ Management Plan,** During Construction
LCL	c		1			1	C 3.2 **Construction IAQ Management Plan,** Before Occupancy
LCL/ SA	c	1				1	C 4.1 **Low-Emitting Materials,** Adhesives & Sealants
LCL/ SA	c	1				1	C 4.2 **Low-Emitting Materials,** Paints & Coatings
LCL/ SA	c	1				1	C 4.3 **Low-Emitting Materials,** Carpet Systems
LCL/ SA	c		1			1	C 4.4 **Low-Emitting Materials,** Composite Wood & Agrifiber Products
SA/GL	d	1				1	C 5 **Indoor Chemical & Pollutant Source Control**
SA/GL	d		1			1	C 6.1 **Controllability of Systems,** Lighting
na	d			1		1	C 6.2 **Controllability of Systems,** Thermal Comfort
GL	d		1			1	C 7.1 **Thermal Comfort,** Design
GL	d		1			1	C 7.2 **Thermal Comfort,** Verification
SA	d		1			1	C 8.1 **Daylight & Views,** Daylight 75% of Spaces
SA	d		1			1	C 8.2 **Daylight & Views,** Views for 90% of Spaces

		1	5	0	0	6	Innovation and Design (6 Possible Points)
SA/GL	d		1			1	C 1.1 **Exemplary:** 45% Water Savings
LCL	d		1			1	C 1.2 **Exemplary:** Construction Waste Management
SA/UO	d		1			1	C 1.3 **Exemplary:**Transportation Management
SA	d		1			1	C 1.4 **Innovation:** Green Education
SA	d		1			1	C 1.5 **Innovation:** Green Housekeeping
	d	1				1	C 2 **LEED® Accredited Professional**

		0	0	4	0	4	Regional Priority (4 Possible Points)
SA/LCL	d			1		1	C 1.1 **Regional Priority Credit:** SSc3 - Brownfield Redevelopment
CM	d			1		1	C 1.2 **Regional Priority Credit:** SSc5.1-Site Dev., Protect/Restore Habitat
SA/GL	d			1		1	C 1.3 **Regional Priority Credit:** WEc2-Innov Wastewater Tech.
LCL/SA	c			1		1	C 1.4 **Regional Priority Credit:** MRc7 - Certified Wood

12. PARKING

Install university standard Smart Meters at 100 existing on-street parking spaces including any power & data infrastructure for their proper function.

13. CIVIL

a) CIVIL - DEMOLITION

Scope
- Site utilities demolition includes removal of existing utilities outside the existing EMU building footprint.

Description of Utilities Demolition:
- Existing storm drainage, water distribution, sanitary sewer, and natural gas utilities will be removed as shown on Drawings C001 and C002. The Civil - New Construction section of this narrative includes additional discussion of utilities demolition in the context of modifications, relocation, or replacement of existing utilities. Utility pipes and structures will be removed in entirety unless otherwise noted.

b) CIVIL - NEW CONSTRUCTION

SITE STORM DRAINAGE SYSTEM
Scope
- Site Storm Drainage systems include new and relocated piped and surface stormwater conveyance, treatment, and detention systems external to the building.

Existing Conditions, Destination, and Capacity:
- *Existing Storm Drainage System*: The existing storm drainage system within the project area consists of surface drainage and piped conveyance systems draining to the following three primary collection points, as shown on Drawings C001 and C002.
  - *Collection Point #1 (CP#1):* CP#1 is a manhole located near the northeast corner of Earl Hall. CP#1 currently collects storm drainage from the existing EMU building, the EMU Amphitheater, and the parking lots located south of the EMU. CP#1 also collects roof and ground-level drainage from the area surrounding Straub and Earl Halls, Onyx Street (north of 15th), and the landscaped plaza south of the EMU parking lots. Drainage entering CP#1 flows east through a 12" private storm drain, ultimately entering a 42" public storm drain in Agate Street.
  - *Collection Point #2 (CP#2)*: CP#2 is a manhole located at the intersection of East 13th Avenue and University Street. This manhole collects drainage from University Street and adjacent ground-level surfaces between East 13th and 15th Avenues. CP#2 may also collect surface drainage from Gerlinger Field, the northwest quadrant of Pioneer Cemetery, and a segment of University Street south of East 15th Avenue. Drainage entering CP#2 flows west through an 18" private storm drain, ultimately entering a public 24" storm drain located at the intersection of East 13th Avenue and Kincaid Street.
  - Collection Point #3 (CP#3): CP#3 is shown conceptually on C001, and represents the collection point for surface drainage entering East 13th Avenue and adjacent ground-level surfaces between University Street and the easterly limits of the project..
- *Existing System Destination and Capacity*: The storm drainage collection points described above drain to private and public piped conveyance systems, ultimately draining into the Eugene Mill Race. The Mill Race and contributing storm drain system

are located within the Willamette River Basin, which is generally free of flooding problems associated with limited system capacity. However, the individual private and public storm drains downstream from the collection points described above may have limited capacity or localized flooding/surcharging issues. Consequently, it is assumed that drainage from new pavement and roof areas will require some level of detention (flow control) to avoid increasing stormwater flows to the existing system. The EMU project site is not located within the flood plain.

Stormwater Treatment Requirements:

- The baseline stormwater treatment requirement is dictated by the City of Eugene Code Sections 9.05 through 9.6797 and the Eugene Stormwater Management Manual. In general, the City of Eugene standards require treatment of stormwater runoff from all new or replaced impervious surfaces. The City also allows treatment mitigation credits to be used to offset the treatment requirements for new impervious surfaces. Mitigation credits can be achieved by providing treatment for existing impervious surfaces (that would otherwise not require treatment), and by planting/protecting new/existing large trees adjacent to ground-level impervious surfaces. Mitigation credits may be used for this project to address isolated areas, for which it would otherwise be difficult or costly to provide treatment. In accordance with UO policies, treatment of vehicular pavement areas will be prioritized when using mitigation offsets. In addition to the City of Eugene requirements, this project may pursue additional treatment measures in an effort to meet full or partial credits for stormwater management under the Oregon Department of Administrative Services (DAS) LEED Equivalent “Sustainable Sites” (SS) Credit 1.G. If LEED certification is pursued, additional treatment measures may be required to comply with the performance standards of SS Credit 6.2, "Quality Control". The mitigation approach may not be feasible if LEED credit SS 6.2 is pursued.

Stormwater Rate and Volume Control Requirements:

- At a minimum, this project will pursue stormwater rate control (detention) to maintain pre-development stormwater rates in order to prevent adverse impacts on receiving storm drainage systems. Rate control strategies include filtration rain gardens and planters, pervious pavements, and possibly soil amendments. Providing detention will help to achieve partial credits for stormwater management under the Oregon DAS SS Credit 1.G. If LEED certification is pursued, additional volume control strategies (in addition to rate control) would be necessary to comply with SS Credit 6.1, "Quantity Control".

Proposed Storm Drain System and Relocation of Existing System

- *System Description*: The proposed storm drainage system will include stormwater treatment and detention facilities, surface and overland conveyance systems, inlets, manholes, and underground piped conveyance systems. Storm drainage from roof and ground-level surfaces will be primarily conveyed by gravity to the existing private storm drain systems on site. Drainage collected in subdrainage systems, below grade vaults, or depressed courtyards may need to be pumped to reach the elevation of the gravity-fed drainage system. The proposed Craft Center work yard located at the southwest corner of the EMU may be too low to drain by gravity, and may require a pumped system.
  - *Proposed Drainage Concept*: The overall drainage concept for the proposed building and adjacent improvements will be to maintain predevelopment basin boundaries as closely as practical. Accordingly, the majority of the existing and proposed EMU building, existing amphitheatre, south parking lots, and Onyx Street improvements will ultimately drain to CP#1; The site improvements within University Street will drain to CP#2; and the majority of the site improvements within East 13th Avenue will drain to CP#3. The proposed drainage concept is depicted on drawing C001 and C002.

Possible routing of storm mainlines is shown to indicate the anticipated drainage patterns. Storm drain laterals will extend from the main lines to inlets and stormwater treatment/detention facilities located throughout the site.

- *Stormwater Treatment and Detention*: Stormwater treatment and detention systems may include stormwater filtration planters, rain gardens, proprietary treatment structures, underground detention systems, flow-through swales, filter strips, and possibly green roofs. Due to low permeability soil and a potentially high groundwater table, infiltration facilities are not currently being pursued for this project. For preliminary pricing, the stormwater treatment/detention planter areas shown on C001, C002, and the Landscape Site Plan should be assumed to be a combination of filtration planters and rain gardens. Preliminary pricing should also include underground detention and a proprietary treatment structure as indicated on Drawings C001 and C002. Critical design elements for treatment and detention approaches are summarized below:

  - *Filtration Planters and Rain Gardens*: Filtration planters and rain gardens serve a dual function, providing stormwater treatment and flow control. These facilities consist of a level depression in the ground surface (rain gardens) or level depression within a walled planter structure (filtration planters) to create a reservoir for stormwater storage. The reservoir is typically 1' deep, but the overall depth of the facility may vary depending on surrounding grading constraints. The reservoir is underlain by an 18" thick layer of imported growing medium over a sand/gravel filter course over a 15" thick layer of washed drain rock. The underlying drain rock serves as an envelope for perforated underdrainage piping (typically 6" pipe) extending the full length of the facility. Stormwater entering the rain garden or planter is filtered vertically through the growing medium, temporarily stored within the reservoir, and collected in the underdrainage piping. The underdrainage piping is sloped to drain to the site storm drain system by gravity. Rain gardens and planters will be equipped with overflow drains to limit the maximum water level within the reservoir. Overflow drains may be equipped with orifice-type flow control devices to regulate outgoing flow rates. Due to shallow groundwater and proximity to buildings, the filtration planters and rain gardens will be encased with an impermeable liner and waterproofed where adjacent to building walls.
  - *Proprietary Treatment Structures*: Acceptable proprietary treatment structures include flow-through, hydrodynamic separation-type structures that can be cleaned using a vacuum truck. Filter-cartridge systems are not currently approved for use by the UO.
  - *Underground Detention Systems*: Underground detention systems consist of tanks, pipes, or other storage enclosures, designed to store stormwater during large storms, and release it at a controlled rate. Detention systems will include manholes to provide access, facilitate cleaning, and regulate flows. Based on elevation constraints for the EMU site, underground detention will be limited to systems with an overall storage depth of 4' or less.
  - *Flow-Through Swales*: Swales consist of vegetated open channels, constructed with a mild slope from one end to the other. Swales provide stormwater treatment through settling and adhesion to the vegetation at the swale bottom. In the context of the EMU project, swales are not capable of providing stormwater rate or quantity control. Swales require 12"-18" of imported growing medium placed over native subgrade.

- *Filter Strips*: Filter strips are mildly sloped grassed or planted surfaces located adjacent to impervious surfaces sloped toward the filter strip. Filter strips are generally suitable for long narrow impervious surfaces such as walkways, where a uniform cross-slope can be achieved. Filter strips require 12"-18" of imported growing medium placed over native subgrade.
- *Green Roofs*: Green roofs may be used to reduce the amount of impervious surface requiring treatment.

- *Stormwater Collection and Conveyance Systems*: Surface and overland conveyance systems may include sheet drainage, curb and gutter, swales, or other methods of conveying stormwater to treatment facilities or inlets. Inlets may include prefabricated steel catch basins and area drains, precast or cast-in-place trench drains, and possibly curb inlets. Piped conveyance systems will include mainlines and laterals constructed with plastic pipe. Precast concrete manholes will be required at mainline junctions and changes of direction for pipe 8" in diameter or larger. Cleanouts will be placed at 100' intervals and at changes of direction on 6" diameter laterals or smaller.

SITE WATER DISTRIBUTION SYSTEM

Scope

- Site water distribution systems include new and relocated domestic and fire protection water supply external to the building.

Existing Conditions and System Availability:

Domestic and fire protection water for the existing EMU building is currently supplied from the following three sources.

- *1970s Building Addition - Domestic Water*: Domestic water for the 1970s building is supplied through a 4" service entering the existing building from the south, as shown on Drawing C002. This 4" service is fed through a metered connection to an 8" private main located north of Straub Hall. The existing 8" main is located along the north edge of Onyx Street, oriented in an east-to-west direction. Eugene Water and Electric Board (EWEB) mapping indicates the existing 8" main is a private, un-metered, looped main served from the east by a 16" public (EWEB) main located in Agate Street, and from the west by a 12" public main located in 15th Avenue. Backflow prevention (BFP) is not currently installed between the building and the point of connection to the 8" private main or the public system.
- *1970s Building Addition - Fire Protection Water*: Fire protection water for the 1970s building is supplied through an 8" service entering the building from the north, as shown on Drawing C001. The 8" fire service supplies a fire hydrant located to the northwest of the existing EMU Craft Center, multiple 6" fire sprinkler supply lines extending around the perimeter of the 1970s building, and also supplies a metered irrigation service. The fire department connection (FDC) and associated check valves are located near the fire hydrant. The 8" fire protection service is supplied through an unmetered connection to an existing 8" public main located in East 13th Avenue. The existing 8" public main in East 13th Avenue is looped between a 16" public main in Agate Street to the east, and a 12" public main in 15th Avenue to the west and south. With the exception of the single check valves associated with the FDC, backflow prevention is not currently installed between the building and the point of connection to the public main.
- *1940s and 1950s Buildings - Domestic and Fire Protection*: Domestic water for this section of the building is supplied through the utility tunnel, as described in the Plumbing section of this narrative. The source of fire protection water for this section of the building is assumed to be supplied through the utility tunnel. Refer to the Plumbing section of this

narrative for further discussion. The FDC for the 1950s and 1960s buildings is located at the south loading dock. The area of coverage for this FDC has not yet been determined.

- *System Availability*: Historical flow test data for the existing 8" public main in East 13th Avenue indicates static pressures in the range of 60 to 70 pounds per square inch (psi), with flow rates ranging from 3000 to 4000 gallons per minute (gpm) at 20 psi residual pressure. Current flow test data will be acquired during subsequent design phases. Capacity and flow/pressure characteristics for the domestic and fire protection water supply in the utility tunnel is not currently known.

Proposed Fire Protection Water System:

- *Modification to Existing System*: The proposed building expansion and associated site improvements will displace the majority of the site fire protection water system associated with the 1970s building. The existing 8" and 6" fire protection supply lines, FDC, post indicator valve, fire hydrant, and check valves associated with the 1970s building will be removed. The existing 8" fire protection service connection to the public main in East 13th Avenue will remain, serving as the point of connection for the new/reconstructed fire protection system within the existing building and a portion of the new building expansion. To comply with current EWEB standards, a new double check detector BFP will be installed near the point of connection to the existing main. It is anticipated that a new FDC and fire hydrant will be installed adjacent to the backflow preventer, similar to the configuration shown on Drawing C001. Refer to the Plumbing section of this narrative for modifications to the fire protection systems internal to the building.
- *New Fire Protection Service*: The proposed building expansion fire protection system will be served by a new service supplied from the existing 8" public water main in East 13th Avenue, as shown on Drawing C001. Backflow prevention and a new wall mounted or exterior free-standing FDC will be installed near the riser room.
- *Site Fire Hydrants*: Numerous existing fire hydrants are located within close proximity to the EMU building and surrounding fire apparatus access routes. The existing hydrants are expected to satisfy the minimum number, spacing, and coverage requirements if the entire building can be designated as fully/automatically sprinklered. However, a new hydrant may be required in the vicinity of the of the existing FDC for the 1950s and 1960s buildings to satisfy minimum fire hydrant-to-FDC separation requirements.

Proposed Domestic Water System:

- *Modification to Existing System*: The proposed domestic water system design includes removal/abandonment of the existing 4" domestic water service to the 1970s building. Domestic water service for the renovated areas within the existing building will tentatively be supplied from the existing domestic water within the utility tunnel, as described in the Plumbing section of this narrative.
- *New Domestic Service*: The proposed building expansion will be served by a new metered domestic water service supplied from the existing 8" public water main in East 13th Avenue, as shown on Drawing C001. Backflow prevention will be provided internal to the building, as described in the Plumbing section of this narrative.

SITE SANITARY SEWER SYSTEM

Scope

- New and relocated sanitary sewer systems external to the building.

Existing Conditions and System Availability

- The existing EMU building is served by two separate sanitary sewer systems as shown on Drawing C001 and C002. The 1950s building and 1960s buildings are served by an 8" gravity-fed pipe entering the north side of the existing 1950s building, draining from

south to north. This 8" sanitary line extends under the entire length of the 1950s building, and terminates with a manhole at its upstream end, located near the loading dock at the south end of the building. The 1970s building is served by a 6" gravity-fed pipe entering the building at the southeast face of the 1970s building, draining from northwest to southeast. Both sanitary systems are private systems and ultimately drain to the north to connect to the public sewer system in Franklin Boulevard. Current hydraulic loading and capacity of the existing private sanitary sewers serving the EMU building are unknown. Capacity will be verified in subsequent phases.

Proposed Sanitary Sewer System

- *Repair/Relocation of Existing Systems*: The existing 8" pipe located underneath the 1950s building is in poor condition and needs to be repaired, replaced, or relocated. The University conducted a sanitary sewer assessment in 2004 and concluded that this segment of pipe needs to be repaired. At that time, the recommended repair alternative was to install a PVC liner. In light of the currently proposed renovations to this building, the approach to repairing this line may vary. Refer to the Plumbing section of this narrative for further discussion.
- *Proposed Building Sewers*: It is anticipated that sanitary drainage for the renovated portions of the 1950s and 1960s buildings will be provided by the existing repaired or replaced 8" sewer located internal to the building, as described in the Plumbing section of this narrative. A new sanitary lateral will need to be extended near the loading dock to receive drainage from the covered loading dock area and the exterior covered Craft Center work yard. Sanitary drainage for the proposed building expansion will tentatively be routed to the existing 6" pipe serving the 1970s building, as shown on Drawing C002. In general, the building sewer will consist of plastic pipe and precast concrete manholes. Additional cleanouts will be provided at changes in direction of 6" or smaller.

SITE NATURAL GAS SYSTEM

Scope

- Site gas distribution system external to the building.

Existing Conditions and System Availability:

- Natural gas service is readily available, and currently serves the EMU building through three metered connections to the Northwest Natural gas distribution system surrounding the project site.

Proposed Natural Gas System:

- Proposed System Description: The existing metered natural gas service located near the existing Craft Center building will be removed and abandoned. The existing metered natural gas services entering the west and east sides of the building will be relocated to accommodate new construction. Refer to Drawing C002 for possible relocation.

SITE VEHICULAR PAVEMENTS

Scope:

- Proposed site vehicular pavements include asphalt and concrete within private roadways and parking lots, vehicle-rated pedestrian pathways, and reinforced lawn fire lanes. Refer to the Site Plan and Landscape Narrative for limits of vehicular pavement types. The proposed vehicular pavement sections described below represent assumptions to be used for pricing. Final pavement thickness design will be provided by the Geotechnical Engineer during subsequent design phases.

Proposed Vehicular Pavement System

- Reinforced Lawn: Reinforced lawn areas will consist of mildly sloped grassed surfaces within delineated fire lanes. The cross section will consist of 4” of sand/growing medium over geotextile fabric over 24” open-graded crushed base rock over geotextile fabric.
- Impervious or Pervious Vehicular Concrete: Vehicular concrete will be constructed per campus standards section 32 10 00, consisting of 8” reinforced concrete over 6” minimum crushed rock base. Pervious concrete will be fine grain architectural pervious concrete. Refer to the Site Plan and Landscape Narrative for concrete coloring and finishing.
- Asphalt Pavement: Asphalt pavement in private roadway areas and parking lot drive lanes will be 4” asphalt over 12” crushed rock base. Asphalt paving in parking stalls will be 3" asphalt over 8" crushed rock base.

14. LANDSCAPE

GENERAL APPROACH:

The site development for this project will comply with the University of Oregon Campus Construction Standards, CSI Master Format, Third Edition May 2011. The primary approach to building entries and access accommodate the lower finish floor elevation of 440.40 ft. All walkways and paths will consist of light broom finish concrete (except where specifically noted). All walks shall be universally accessible and will not require landings or handrails (except where specifically noted). All new stairs will be CIP concrete with decorative metal handrails. The typical rise / run of stairs will be 6" rise / 14" tread depth.

Landscape planter walls will be used throughout the site to allow for elevation changes, out door seating, and for aesthetics. The planter walls will vary in height from a minimum of 12" to a maximum of 48". Brick planter walls shall closely match in appearance the existing EMU planter walls along the west side of the 50's portion of the EMU. Bricks salvaged and cleaned from the building demolition will be used at these planters. Some planters may be CIP concrete to match Amphitheater concrete walls, steps or seating. The EMU type planters will be constructed of CMU, on a CIP concrete footing, with a brick veneer face and precast concrete cap. All planters shall have 4" perforated drain pipe and shall be damp proofed below the finish grade of the soil. The different wall types will be noted on the Site Plan and wall heights noted on the Grading Plan.

Storm water treatment planters are shown on the Site Plan. These will be either vegetated swale planters with concrete weirs and six-inch curb surround or filtration storm water planters (similar to HEDCO). CIP concrete walls and basin with 18" planting soil over filter fabric and 12" minimum drain rock. Perforated pipe in drain rock and storm pipe over flow.

Important trees to remain and be protected are shown on the Site /and Landscape Plan. Clearing and grubbing of all existing landscapes not shown to remain shall comply with Campus Construction Standards. All new lawns will be 12" minimum depth. All new plant beds will be 18" minimum depth. All irrigation systems and components and all new or refurbished lawns and/or plant beds will comply with Campus Construction Standards Division 32. Native or native analogue type plant materials will be used primarily for climactic adaptability and minimal future irrigation requirements. Selective landscape opportunity areas will be explored for urban agriculture connected to EMU's food services.

Nine (9) existing UO standard pole mounted lights (Visco type) within the project area will remain at their current locations and will need to be examined to determine if they need to be refurbished to meet current UO construction standards. Seven (7) existing pole will be salvaged, powder-coated, retrofitted with new cut-off type fixtures/globes and reinstalled within the project area. Five (5) new pole lights will be purchased under this project and installed within the project area. Refer to the site plan for locations. The UO Standard ornamental pole and globe fixture will be installed along campus open space pathways. All site lighting at the building courts, plazas and walkways will be determined by Architecture.

Covered bike parking shelters shall match the University standard and will contain UO standard surface-mount hoop style metal racks for 32 bikes. All uncovered bike racks shall be hoop style surface mount in 5 hoop (10ft) and 3 hoop (5 ft.) lengths. All racks will be powder coated UO dark green.

a) 13th Avenue:
The existing turn-around on 13th (on axis with the Volcanology building) will remain. The landscapes and bollard behind the curb along the south side of the turn-around will be removed and new curbside concrete walk will be installed. All existing curb, walk and landscapes within the project area along 13th will be removed. The existing Red Oak west of the turn around will be protected.

The road profile will remain unchanged. Asphalt paving between existing road and new work will be required. The flow line of the existing south curb will remain and will be converted to vegetated swale planters or CIP concrete channels with decorative grate covers (at concrete between planters).

Between 13th and the new building (i.e.: ASUO, Bike Center, Outdoor Program etc.), will be brick planters. Concrete steps separate the two planters (5 risers / 4 treads). The concrete walk at the 440 elevation is the fire lane and will be 6" thick 4000 psi concrete (reinforced with fiber mesh) over 8" compacted crushed rock. The lower walk will shed drain to the base of the walls and a slot drain will be install along the entire length. Five UO standard Visco pole lights will be installed along 13th. Six 5-hoop bike racks will be installed on 13th.

b) Main EMU Entry at 13th Avenue and Amphitheater:
The elevation change between 13th and the new EMU Main entry is approximately six feet. New brick planters (vary in height) make the grade separation. The existing post office flagpole will be salvaged, and reinstalled at the top of entry stairs. The stairs will be CIP concrete with decorative handrails. The concrete paving along the building and including the walk (20:1) leading up to the Campus Heart is the fire lane and will be vehicle rated. Channel or slot drains will be at the bottom of walk, stairs and base of walls. Lower brick planter walls and broad concrete steps will be in front of the bookstore expansion. Site lighting will be by architecture.

The existing ramp to the Amphitheater stage will be removed and a new ramp will be installed from the south. New concrete seat walls and steps matching concrete construction of the Amphitheater will be installed between the Mill Center retaining wall and the Amphitheater. Maximum height of the Amphitheater concrete seats/steps at this location will be 48". New Ethernet, phone line and minimum 240 amp electrical hook-ups to Amphitheater stage need to be provided. See Electrical.

c) Concert Hall Entry Plaza (and fountain):
The elevation of 13th Avenue at the Concert Hall entry allows for direct on-grade access to the 440.40 elevations. The drop-off zone and paving is on grade at the road and shall be vehicle rated. A larger portion of the street will need to be removed to accommodate flatter grades at the drop-off zone. Detectable pavers, and in-ground lights separate the drop-off zone and the walk (approx. 115 lf). The concrete at the concert entry will be sand washed, an possibly colored with sawn control joints. A masonry or stone wall surrounds a small fountain pool that will accommodate a water feature or a possible placeholder for 1% for Art. Assume 500 sf of pool area. The steps east of the fountain wall are 5 risers and 4 treads.

Three important trees are to be protected at the NE corner of the Concert Hall, the Moon Tree, a European Beech, and a historic Deodar Cedar. Assume air spade of root zone and hand pruning of roots to allow for construction of building and planter walls. Canopy pruning will be required at the cedar and possibly Moon Tree. Excavation of the existing berms at the base of trees shall be minimal. The planter wall around the trees will be brick on both outside and inside face and will be approx. 36" in height at the concert stairs and step down to 18"

along the entire trees perimeters. Only infill of soils where existing walks between trees are removed. No irrigation or planting under the tree canopies is permitted. Carefully strip sod and cover with 4-6" bark mulch.

d) Emerald Axis (between Concert Hall and Carson Hall):
The existing walks are to remain. The berm along the east and south face of the Concert Hall is approximately 10 feet higher than the 440 lower elevations. If on-site stockpiling of soil is practical the excavated soils (after stripping) could remain on site and used as sub-soils for all berms and elevated lawn areas. A walkway connects exits from the east side of the Concert Hall to the Emerald Axis. Two 3 hoop bike racks will be installed. Assume one Visco light pole. Triangular brick planter wall mid way along walk is 18" tall. A crescent shaped concrete retaining wall is located around an existing Red Oak at the SE corner of the project. The footing for this wall will be drilled piers and spread footing to minimize disturbance to the root zone of the tree. The wall will retain portions of the lawn berm at the concert hall corner.

e) South Lawn and the Promenade:
Assume raised brick planters at the south atrium court. The planter along the face of the café is a filtration storm water planter planter similar to HEDCO. A cast in sunken seat area with possible gas line (fire pit) is located toward the east of the court. Some of the concrete walks and court paving will be vehicle rated. Refer to the Site Plan. Drainage structures are noted on the Grading Plan. CIP concrete steps and concrete planter walls are at the court by the Pub entry. All court lighting by Architecture.

The South Lawn rises approximately 5 ft. to the south and ends at a CIP concrete retaining wall. Refer to Grading Plan for wall height. The south atrium court and the south lawn retaining wall will have vaults, outlets etc. to accommodate electrical, data, phone similar to the Amphitheater. Assume cast in wall lighting at the retaining wall. The lawn south of the retaining wall will be reinforced turf to allow for event parking. This will be a sand based irrigated lawn with invisible grass ring reinforcement system (mfg. Grasspave2).

Existing asphalt drive and curbs north of Straub Hall will be removed and replaced with reinforced turf or vehicle rated concrete paving. Two electrical transformers are to be installed at the east face of the 60's EMU. This equipment will be enclosed by a 5 ft. tall steel prefab fence system, color: UO dark green. The entry to the south lawn (between EMU and Straub) will be reinforced concrete and new plant beds, Two (2) UO standard covered bike shelters are shown on Site Plan to create 32 bikes per shelter. Four decorative bollards mark the entry. The two outermost bollards are light and fixed and the two inner bollards are removable. The space between bollards is approx. 10 ft. and daily smaller vehicle traffic can pass through without removal. Three Visco pole lights to be installed along the Promenade.

f) Loading Dock and existing vehicle parking:
The existing parking lot will serve as contractor staging and will be repaved by project completion. The overall layout of the parking lot will remain unchanged. A new landscape storm vegetated swale planter will be installed along the entire north edge of the lot. Flow through grated channel will be installed at the walks to allow for run-off into the planters. The entry drive to the loading dock from Onyx will be rebuilt with vehicle rated concrete. An 8 ft. tall CMU and brick veneer wall will screen the entire loading dock. A steel fabricated automatic rolling gate with keypad or card reader will be installed at the east entry. There will also be a person gate at this location. The west delivery exit facing University Street will be an automatically controlled swinging gate. The existing (east most) stair to the lower level will be removed and the loading dock will be reconfigured for three angled bays. The straight dock area to the west will accommodate dumpsters and recycling. The entire dock will be

covered and drain to sanitary sewer. The elevation of the dock matches existing floor elevation. New fabricated steel steps will be installed at the west end and 1:12 concrete ramp with handrails at the east end. Center drain catch basin within asphalt paving at the vehicle surface.

g) Craft Center Outdoor Court:
The existing brick retaining wall and landscapes will be removed to the 440 elevations. There will be a brick planter seat wall along University St. and a 6 ft. tall CIP concrete retaining around the entire outdoor court perimeter. The court floor will be concrete, 2/3 covered and drain to sanitary. Provide electrical outlets/ service to court. Assume stack vents for ceramic kilns. Refer to Mechanical and Electrical. Two pair of exit stairs from the court to University St. and loading area are steel fabricated. Install a decorative steel gate / with locks at both locations. Protect existing EMU brick retaining walls and steps north of the Outdoor Court.

h) University Street Improvements (Alternate 002):
The existing turn around at the intersection of University St. and Johnson Lane will remain. The existing west concrete walk between turn around and Campus Heart will remain. Rebuild the entire street with vehicle rated concrete paving with vehicle rated concrete. The existing east curb, and planting strips will be removed. Install vegetated swale planters where shown. Install four (4) Visco pole lights. Install two (2) lighted Visco bollards (UO standard) at south end by turn around. Reinstall salvaged stop / directional signs at south end. Install two (2) bike shelters with hoop style bike racks.

15. STRUCTURAL

ABHT
STRUCTURAL ENGINEERS
1640 NW Johnson Street
Portland, OR 97209
Tel 503.243.6682
Fax 503.243.6622
www.abht-structural.com

15. STRUCTURAL NARRATIVE

a) DESIGN CRITERIA

The 75% schematic design structural drawings are based on the following design criteria and assumptions:

1) The new buildings will be designed as Occupancy Category III buildings per the 2010 Oregon Structural Specialty Code (OSSC). In other words, they will not be "essential facilities" designed to be used as an emergency shelters or operation centers following a seismic event.

2) Per the preliminary geotechnical recommendations from GRI received via e-mail dated February 10, 2012, the allowable bearing pressure is 3,000 psf for spread footings founded on stiff to hard silt, and 12,000 psf for footings founded on siltstone/sandstone. Per GRI's soil borings, the depth from existing grade to the siltstone/sandstone varies between about 8 and 14 ft. The lowest level of the majority of the new addition to the EMU is at 440' elevation, which appears to be less than 8 ft below existing grade in most cases. Therefore, a 3,000 psf allowable bearing pressure has been assumed for schematic foundation design in most cases. As an alternate, the contractor may over-excavate and bear the footings on the stone to achieve the higher allowable bearing pressure, which would result in a significant savings in the size of the concrete footings.

3) Per the preliminary geotechnical recommendations from GRI, this site is Site Class B for seismic design per the 2010 OSSC.

4) All new structures have been designed for a 100 psf reducible floor live load (except the Concert Hall stage, which is designed for 125 psf per the OSSC). The use of a 100 psf reducible floor live load results in maximum future flexibility of the buildings, allowing them to be accommodate a wide range of occupancies per the 2010 OSSC (except for library stacks, or as a storage warehouse).

5) All new structures have been designed for a flat roof snow load of 25 psf plus snow drift where applicable. No additional loads due to green roofs, solar and PV systems have been assumed.

I. Bar Building (North Student Volume)

The bar building, located at the north side of the site, is a three-story prestressed concrete flat slab structure with reinforced concrete shear walls and columns. The typical slab is 10" thick, with a 14" thickened zone at the first level where the Multi-functional Auditorium cantilevers 12'-6" from centerline of the columns at the north side. If the cantilever is reduced to 10'-0", the slab may be reduced to 10" thick. Where the narrow "L"-shaped piece of floor wraps around the Multi-functional auditorium clear story at Level 2, the slab is a 12" thick conventionally reinforced (non-prestressed) concrete flat slab.

The roof is a 10" prestressed concrete slab, with the exception of the roof area over the Multi-functional Auditorium which consists of steel-framing overlain with 2 ½" of concrete topping over a 3" 18 GA. metal deck. The building is supported on conventional reinforced concrete spread and strip footings. The first floor is a 4" reinforced concrete slab-on-grade.

II. South Atrium Building (South Wall)

The structure at the south side of the Atrium is a 13" thick conventionally reinforced (non- prestressed) concrete slab, supported on a regular grid of two rows of 30"x30" reinforced concrete columns with 30" wide by 30" deep concrete beams between all columns in the east-west direction and 30" wide x 24" deep concrete beams between all columns in the north-south direction. (The depth of the beams includes the 13" slab thickness). The slab can cantilever variable lengths up to 11'-0" maximum (measured from

centerline of the columns) in order to allow the "pods" in this structure to project variable amounts from the face of the building on the north and south sides. The columns and beams act as a three-dimensional concrete moment frame to provide the seismic load-resisting system for the structure. The side walls of each "pod" will be non-structural metal stud walls between the slabs. The columns are supported on conventional reinforced concrete spread footings. The first floor is a 4" reinforced concrete slab-on-grade.

III. Southwest Corner Building (Transition Volume)

The building at the southwest corner of the Atrium, bordered on the west by the original 1950's building and on the south by the 1960's addition, is similar to the bar building. The floor and roof slabs are 10" thick prestressed concrete, supported on reinforced concrete columns. The lateral system consists of reinforced concrete shear walls. The building is supported on conventional reinforced concrete spread and strip footings. The first floor is a 4" reinforced concrete slab-on-grade.

IV. Atrium Roof (Hearth)

The roof above the Atrium is clear-spanned with steel trusses, supporting steel roof deck. The trusses bear on columns projecting through the roofs of the Bar Building and the South Atrium Building, typically. The two westernmost trusses bear on columns of the Southwest Corner Building at the south side of the Atrium, and on isolated concrete columns within the Atrium at the north side. For seismic resistance, the Atrium roof is connected to the Bar Building via shear wall piers that project through the roof of the Bar Building, up to the underside of the Atrium roof. Where the trusses bear on the other buildings, the bearings will allow lateral motion in both directions. There is a seismic joint where the Atrium roof abuts the west wall of the Concert Hall. There are steel purlins spanning between the trusses, and diagonal bridging between them. At skylight openings in the roof, there is horizontal diagonal steel cross-bracing to transfer the diaphragm shear through the openings.

V. Concert Hall

The Concert Hall is clear-spanned at the roof by steel trusses. For acoustics, the steel deck on the trusses will be overlain with concrete topping. At each side of the Concert Hall, there is effectively a double 18" thick concrete wall, separated by approximately 8 to 15 feet. The outer wall is purely structural; the inner wall exists for acoustic reasons, but it is also serves as a bearing wall. The inner wall is discontinuous and is supported on concrete columns within the lower part of the Concert Hall. The inner wall also does not extend up to the roof; therefore, the top of the wall is braced by the roof trusses.

An attic space and acoustical ceiling for the Concert Hall is created by spanning wood I-joists between the bottom chords of the 8 ft deep roof trusses, with plywood on the top for a walking surface, and on the bottom surface for acoustics. For acoustic purposes, the wood I-joists are to be installed at random spacing so that the natural frequency of the floor varies. The ceiling must be convex for acoustic reasons, so the joists will be installed at varying elevations across the width of the hall. The bottom chords of the roof trusses will be straight, so hangers from the bottom chords will be used to do this.

Between the stage/ground level seating and the roof, there are three narrow intermediate levels extending the length of the building on each side. These levels consist of concrete topping on steel deck slabs, supported on steel beams that span between the inner and outer wall lines. They also serve structurally to transfer loads between the inner and outer walls, which is required for the outer wall to brace the inner wall for out-of-plane seismic loads, since the inner wall is discontinuous.

The seating area and balcony are supported on sloped steel framing, with a concrete topping on steel deck slab. The seating risers will be formed in the concrete topping on the steel deck. The stage is also steel framed with a concrete topping on steel deck slab.

VI. Concert Hall Back-of-House Building (Support Volume)

To avoid sound transmission to the Concert Hall, the Back-of-House Building is acoustically (and therefore seismically) separate from the Hall. The Back-of-House Building is similar to the Bar Building: 10" thick post-tensioned concrete slabs on 24"x24" reinforced concrete columns, with a lateral system of 12" thick reinforced concrete shear walls. Columns and walls are founded on conventionally reinforced concrete spread footings. The basement slab is a 4" reinforced concrete slab-on-grade.

VII. Mills Center

The existing Mills Center structure is supported along its perimeter on a series of concrete wall piers founded on the rock layer at approximate elevation 439'. In order to lower the finish grade outside the Mills Center to elevation 440', the earth beneath the existing Mills Center structure will be retained with a permanent cantilevered steel soldier pile with concrete facing shoring system around the building perimeter. The existing first floor slab-on-grade will be removed and replaced with a new 6" thick reinforced concrete slab-on-grade with 3'-0" x 3'-0" perimeter grade beams. The new slab-on-grade will be doweled into the existing structure along the entire building perimeter. Rock anchors with 100KIP Tension/Compression capacity will be provided along the building perimeter and anchored into the grade beam to transfer building lateral forces directly into the ground. Potential challenges include an existing concrete tunnel running north-south along the west edge of the Mills Center.

VIII. Outdoor Craft Center

In order to accommodate the proposed Outdoor Craft Center at elevation 440', new cantilevered concrete retaining walls will be required along the perimeter of the excavation. The major challenge is support of the existing soil beneath the "green room" structure which has foundations at the 460' elevation. The current design assumes a permanent cantilevered steel soldier pile with concrete facing shoring system at this location. However, due to the approximate 20' retained height, tiebacks would be required to make this system work. The use of tiebacks may not be feasible due to the proximity of the existing building basement walls. Further study of this area is required with input from the Geotechnical Engineer.

IX. Bridges

Bridges between the Bar Building and the South Atrium Building consist of reinforced concrete slab and beam decks supported on reinforced concrete columns. The columns cantilever from reinforced concrete spread foundations and serve as the lateral force resisting system for the bridges. The bridges have seismic joints at each end where they meet the two buildings.

Seismic Joints

All of the new additions are separated from the existing buildings by seismic joints to eliminate the need for a seismic retrofit of the existing buildings. There are also seismic joints between each of the buildings that comprise the addition.

16. MECHANICAL

17. PLUMBING

18. FIRE PROTECTION

19. ELECTRICAL

20. LOW VOLTAGE

16. Mechanical
    a. Design Criteria
        i. Code and Standard Compliance:
            1. University of Oregon Campus Construction Standards, May 2011 Third Edition
            2. 2010 Oregon Structural Specialty Code (OSSC) based on 2009 International Building Code (IBC).
            3. 2010 Oregon Mechanical Specialty Code (OMSC) based on 2009 International Mechanical Code (IMC) and 2009 International Fuel Gas Code (IFGC) with State Amendments.
        ii. Design Parameters
            1. Site Location: Eugene, Oregon (0.4% ASHRAE Climate data)
            2. Summer Design Conditions: 91.4 DB / 66.6 WB
            3. Winter Design Conditions: 22.4 DB
            4. Elevation: 374 ft
        iii. Ventilation Design Criteria:
            1. Building to be designed to be positively pressurized relative to the outdoors to limit infiltration.
            2. Ventilation rates designed to meet ASHRAE 62.1-2010 + 30% per LEED NC requirements. The flows to areas provided with radiant systems are to be based upon the dehumidification requirements.
            3. Demand ventilation control will be used in high occupancy spaces and in offices where feasible to turn down outside air quantities to maintain an indoor carbon dioxide level of not more than 400ppm above outside levels. Minimum rates during occupied hours dictated by space occupancy category.
            4. Exhaust strategies for transferring ventilation air will be utilized as recommended by code.
            5. The mechanical and electrical rooms will be mechanically ventilated to maintain an internal temperature of 90°F in the summer and 65°F in winter. The data and communication rooms will be air conditioned to maintain an internal temperature of 75°F in the summer and 65°F in winter.
        iv. HVAC Flow Criteria:
            1. The following sizing guidelines will be used in selecting equipment subject to acoustical recommendations:
                a. Medium pressure supply velocity: 1,500 fpm
                b. Low pressure supply velocity: 1,200 fpm
                c. Exhaust air velocity: 1,200 fpm
                d. Return air velocity: 1,200 fpm
                e. Coil and filter face velocity: 450 fpm

v. Preliminary Loads Estimate:

	Net sf	Gross sf	OSA cfm	Cooling ton	heating btuh
Food Service	25,943	38,231	9,012	109	955,775
Retail Suite	6,484	10,050	2,302	20	201,000
Student Union	21,599	33,480	7,668	56	669,600
Recreation Suite	9,715	15,057	3,449	30	301,140
Media Suite	6,988	10,831	2,481	31	270,775
Lounge Spaces/Atrium	14,700	22,785	5,219	65	569,625
Conference Services	38,354	59,450	13,616	170	1,486,250
Union Support Zone	11,972	17,006	4,095	28	340,120
Concert Hall	26,090	44,002	9,618	88	1,100,050
Total Student Union Facilities	**161,845**	**250,892**	**57,458**	**597**	**5,894,335**

vi. Notes:

1. Motors greater than 5 hp driving fans or pumps for variable applications will be provided with variable frequency drives (VFDs). VFDs shall drive no more than a single motor per drive.
2. Noise control systems will be based on recommendations from acoustical consultant.
3. Fiberglass duct liner to be limited to downstream of terminal units, transfer ducts, and as directed by the acoustical consultant.
4. Return air plenums are to be minimized. Ducted return will be provided where feasible.
5. Supply and exhaust ductwork: Ductwork is to be galvanized sheet metal.
6. Combination Fire and Smoke Dampers: Dampers will be provided at all required occupancy and code boundaries.
7. VAV terminal units: Terminal units will be of the single duct variety with primary air damper modulated to meet ventilation needs independent of system pressure variations.
8. Diffusers and Grilles: Design selection will be coordinated with architecture.

b. Existing Conditions

i. Campus Utilities

1. The Erb Memorial Union (EMU) Building is located at 1228 East 13th Street, Eugene, Oregon. A walking utility tunnel passes under the original building and adjacent to the additions. There

are two connection locations from the campus steam and chilled water to the EMU; the original connection at the west side of the 1951 building, and connection to the north side of the 1974 addition.

2. The 16" steam pipe within the utility tunnel delivers 60psi steam. Steam condensate is collected in the tunnel by a 4" pipe. There is a 6" steam (3" condensate) connection to the 1951 building and a 4" steam (1-1/2" condensate) connection to the 1974 addition. The steam is converted to heating hot water in shell and tube heat exchangers and delivered to the building systems.
3. The chilled water was added to the tunnel system sometime after the original construction and before the 1974 addition. There are 10" chilled water supply and return (CHWS/CHWR) pipes routed under the steam piping within the tunnel. Campus chilled water is provided at 42°F and a 16°F delta T with reset chilled water supply temperatures up to 48°F. There is a 4" CHWS/CHWR connection to the 1974 building and a 3" (to be verified) connection retrofitted into the 1951 original building.
4. All utility distribution pipes are to be located below grade. Direct burial of main utilities is not allowed without consent of the University. The renovated EMU will utilize the existing mechanical room in the SW corner of the 1951 building, but fully renovate the entry equipment. There will be an additional mechanical entry room at the NW corner of 1951 building. This will be located at the 450' invert elevation under the Mills International Center and will require excavation down to the existing utility tunnel where new connections to the existing chilled water and steam piping will occur. The excavated opening will allow for vertical maintenance access from the utility tunnel to the mechanical room.

ii. Deferred Maintenance:

1. Refer to the Appendix 3 "Building HVAC Condition Report" prepared for the EMU Building in January 2007. Contacts for the report are:
    a. Dana Winitzky, EMU Facilities Director
    b. David Flock, EMU Maintenance Mechanic

iii. 1950's Building

1. This is the original building. It is served by a central plant located in the southeast corner of the 1950's building. A steam converter, heating water pumps, expansion tank, supply fans, return fans and other support equipment is located in the mechanical room.

2. On the fourth floor there is a fan room with built up supply fans, heating coils, cooling coils, filters and distribution through multizone ductwork and some dual duct systems. There are separate return fans to relieve the supply air from the building. The fan room itself is used as a plenum for recycled air to the building.
3. Crossing the mezzanine level is a horizontal grease duct from the food service hoods. This was retrofitted into the building during the food service expansion. The horizontal grease duct is housed within a rated enclosure and has a number of cleanouts for routine maintenance. The termination of the grease exhaust blows air horizontally to the east, during certain outdoor wind conditions there may be cross contamination of the fourth floor fan rooms intake air. The current configuration of the grease duct is difficult to service and interferes with access to areas of the mezzanine. Relocation of the existing grease duct system is desirable. The ballroom above makes relocation of the existing grease duct challenging.

iv. 1960's Building

1. This is the first addition to the original building. It is served by the same central plant located in the southeast corner of the 1950's building.
2. On the third floor there is a fan room with supply fans, heating coils, cooling coils, filters, pumps and distribution through multizone ductwork. There are separate return fans to relieve the supply air from the building. This space is has inadequate access to aging equipment.
3. There is an outdoor dining area enclosed by a translucent ceiling. This area is large open to the outdoors and is considered an outdoor space without any mechanical ventilation. Overhead, gas fired, radiant heaters provide heating to the space.
4. On the roof of the 1960's building is a grease exhaust and make up air system serving the Panda express. The grease exhaust air and make up air is located close to one another, possibly within the code required clearances. These termination points have potential for cross contamination.

v. 1970's Building

1. This is the last major addition to the EMU. It is served by a separate central plant located on the roof of the addition. Separate steam, chilled water, and condensate are routed to this room. The roof is provided with a few large axial flow fans that

provide supply air through heating and cooling coils to the building.

2. VCV terminal units provide air to individual HVAC zones and are provided with reheat coils for space temperature control. Separate thermostats are provided to control the amount and temperature of the air to the zone.
3. The 1970's building has a large atrium space at the NE end of the building. Smoke control systems are provided for this area. Supply air is delivered to the atrium and relieved through smoke control hatches at the top of the atrium space. The smoke control doors are located at an angle and have a tendency to blow open during certain wind conditions.

c. General Narrative for Renovation Areas
   i. The heating, ventilating, and air conditioning systems in the existing buildings to be retained are at the end of their useful life (Refer to Building HVAC Condition Report, January 2007).
   ii. Mechanical equipment, piping, controls, etc. in existing mechanical rooms will be demolished and replaced with new.
   iii. Existing HVAC risers will be demolished and replaced with new.
   iv. Existing HVAC distribution will be generally be demolished and replaced with new with the exception of existing areas which will not be renovated and in which the existing systems can be reused (eg. Ductwork and piping above hard ceilings to remain).
   v. Refer to the schematic drawings for the extent of existing HVAC systems to be demolished and replaced with new.
d. General Narrative for New Construction Areas
   i. Mechanical systems shall comply with all national and local codes along with complying with University of Oregon Campus Construction Standards, May 2011, Third Edition.
   ii. Dedicated Outside Air Handler Systems:
      1. A central ventilation system will serve the program space. The strategy of decoupling ventilation air from building air allows for smaller distribution ductwork and flexibility to serve varied occupancies and future renovations. Distribution of ventilation air to the high occupancy areas will use VAV terminal units with hot water reheat coils (controlled by CO2 sensors) to provide full demand control ventilation to all areas.
   iii. Mechanical Cooling Plant:
      1. The HVAC system will utilize chilled water provided from the campus central chilled water plant. Available capacity of the campus central chilled water plant to be confirmed. The low

temperature chilled water will be used to serve the air handling cooling coils where a tempered chilled water system will serve the radiant systems. Separate variable flow chilled water pumps (lead/lag) will be located within the central mechanical room to pressurize water through the low temperature and tempered chilled water systems. Temperature will be maintained to prevent condensation at the chilled beams. Coils will be sized to meet the desired campus chilled water plant supply temperature and delta T. Future campus chilled water temperatures to be determined.

iv. Mechanical Heating Plant:
    1. The HVAC system will utilize steam from the campus central heating plant. A tube and shell heat exchanger in the mechanical entry rooms will convert steam to hot water for base building heating system. Available capacity of the campus central steam plant to be confirmed. A high temperature heating water system will serve the air handling units heating coils. A low temperature heating water system will serve the radiant systems. Variable flow heating pumps (lead/lag) will be located within the central mechanical room to pressurize water through the heating water system. Coils will be sized to meet the low temperature heating water requirements for the building.

v. Fire Protection and Life Safety
    1. Fire/Smoke Dampers:
        a. Fire/smoke dampers would be provided at the shaft penetrations for both supply and exhaust ductwork. In the event of a fire alarm, all air handlers would stop, all outside air and relief dampers would close. All fire/smoke dampers are to be locally controlled to close. Fire/Smoke dampers are to activate by signal from associated duct detector. Fire/smoke dampers shall be fully accessible to ensure proper function (testing), maintenance and servicing.
    2. Smoke Control Systems (add alternate):
        a. A smoke evacuation system may be required for interconnected floor areas in the atrium. Louvers and dampers at a low level will allow outside air to replace smoke exhausted by exhaust fans at the roof. This system will be on emergency power and will be connected to the building fire alarm system.

vi. Meter Utilities
    1. To be determined based on the requirements of the Building Dashboard. Below is a list of preliminary recommended points.
        a. Domestic Water
        b. Campus Chilled Water
        c. Campus Steam
        d. DOAS Units (Make use of VFDs as measuring device)
        e. Landscape Irrigation
        f. Retail Spaces
        g. All utilities listed above shall have addressable IP allowing real time internet access by the owner.

vii. Test and Balance
    1. Test and balance criteria to be specified per Owner's requirement and LEED acceptable methodology.

viii. Building Commissioning
    1. The contractor will be responsible for testing of equipment including checkout, start-up, and functional testing. The Test Engineer will be responsible for commissioning including coordinating of the required efforts of the A/E Commissioning Authority and the Owner's Representative.
    2. Responsibilities will include review of planning, functional test procedures at both the component and system levels, review of documentation, participation in training, and acceptance of commissioning efforts.
    3. Commissioned systems are to be designated by the consultant with the assistance of the Owner.

ix. Heat Recovery System
    1. Heat recovery strategies will be used where possible. The heat recovery system is intended to recover energy from the ventilation exhaust air stream and return it to their air handling units during periods of temperature below 50°F or above 80°F.

x. Natural Ventilation Systems
    1. Natural ventilation systems will be provided where feasible. Operable windows will require contacts connected to the Building Management system to disable mechanical heating and cooling for zones utilizing natural ventilation.

xi. Controls
    1. Electronic direct digital controls (DDC) will be provided to ensure accurate and reliable operation of the various HVAC and other building systems. Siemens will provide this system and interface with the existing campus via modem.
        a. Occupancy sensors will be used for HVAC control in high occupancy spaces and offices and will incorporate setback temperatures rather than shutoff HVAC.
        b. HVAC will be zoned to allow sections of the building or entire floors to be shut-off when not used.
        c. Owner will specify the Faculty Management Control System (FMCS).

e. Program Specific Narratives
    i. Food Service:
        1. Ventilation air to be provide by the dedicated outside air handling system to serve the dining and support areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the dining areas will be provided by radiant and convective means. Heating and cooling of the support areas will be provided by convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads.
        2. Exhaust from type I and type II hoods will be taken separately from the kitchen areas and exhausted at the roof level where appropriate. Pollution control systems for controlling exhaust odors will be explored for heat recovery and air quality opportunities. Make up air will be provided through the dedicated outside air handling system.
    ii. Retail Zone:
        1. Ventilation air to be provide by the dedicated outside air handling system to serve retail areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the retail areas will be provided by radiant and convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads. Provide separate metering of retail utility services.
    iii. Student Union Zone:
        1. Ventilation air to be provide by the dedicated outside air handling system to serve student union zone areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the student union zone areas will be provided by radiant and convective means. The mulipurpose room will be provided by

convective heating and cooling. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads.

iv. Recreation Suite:
    1. Ventilation air to be provide by the dedicated outside air handling system to serve the student activity areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the student activity areas will be provided by radiant and convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads.
    2. The craft center will have special exhaust and make up air requirements. Separate systems are required to exhaust the glass blowing, wood shop, and other areas. The exhaust termination from these systems should be carefully located away from ventilation air supply. Concentrated loads will occur in this space.

v. Media Suite:
    1. Ventilation air to be provide by the dedicated outside air handling system to serve the media suite areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the media suite will be provided by radiant and convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads.

vi. Lounge Spaces and Atrium:
    1. Ventilation air to be provide by the dedicated outside air handling system to serve the atrium areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the media suite will be provided by radiant and convective means. Displacement ventilation strategies will be used to deliver air to the occupied zone and increase breathing zone effectiveness.

vii. Conference Services/Meeting Room Zone:
    1. Ventilation air to be provide by the dedicated outside air handling system to serve the conference and meeting areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the conference and meeting areas will be provided by radiant and convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads.

viii. Support Zone:
    1. Ventilation air to be provide by the dedicated outside air handling system to serve the support zone areas. Ventilation rates will be

controlled by CO2 sensor and VAV terminal units. Heating and cooling of the support zone areas will be provided by radiant and convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads.

ix. Concert Hall:
    1. Ventilation air to be provide by the dedicated outside air handling system to serve the concert hall areas. Ventilation rates will be controlled by CO2 sensor and VAV terminal units. Heating and cooling of the concert hall areas will be provided by convective means. The back of house areas will be served by radiant and convective means. Where concentrated loads are encountered, a fan coil will be provided to meet zone loads. Displacement ventilation systems will be provided in large performance zone areas to increase air quality and extend airside economizer hours.

x. Enclosed Corridors:
    1. Ventilation air will be provided through air transfer from adjacent spaces. Where spaces are susceptible to significant heat gain/loss, cooling and heating will be provided.

17. Plumbing
    a. Design Criteria
        i. Plumbing systems shall comply with all local codes along with complying with University of Oregon Campus Construction Standards, May 2011, Third Edition.
        ii. Building plumbing systems will utilize copper for domestic water and no-hub cast iron for storm, wastewater and vent piping. Domestic water will be extended to the new plumbing fixtures. Cap and remove any fixtures slated for demolition.
        iii. Relocation of the existing food services area will require demolition of existing plumbing services and the installation of new services.
    b. Storm Water
        i. Storm water will be routed in no-hub cast iron piping from drains on the new roof as well as the existing drains isolated by the new construction. Overflow drains will be provided and day-lighted near grade. Horizontal piping will be insulated to prevent condensation.
    c. Sanitary Sewer
        i. Sanitary sewer will be routed in no-hub cast iron piping from all new fixtures and drains as well as any existing drains or fixtures isolated by the new construction. A sump pump will be provided for the new elevator. High level and pump failure signals will be connected to the DDC system.

d. Domestic Water (Existing 1950's building)
    i. Domestic water will replace the existing steam to water heat exchanger and reconnected to the existing system. Insulated copper pipe with soldered joints will be routed to all fixtures. Valves will be provided at each block of fixtures. The domestic hot water will be provided by a hot water return loop. Shock absorbers will be provided for flush valves and other quick closing valves and will be located behind an access panel.
e. Domestic Water (New construction)
    i. Domestic water will be provided by water heater and connected to the plumbing system. Insulated copper pipe with soldered joints will be routed to all fixtures. Valves will be provided at each block of fixtures. The domestic hot water will be provided by a hot water return loop. Shock absorbers will be provided for flush valves and other quick closing valves and will be located behind an access panel.
f. Domestic Water (existing)
    i. Domestic water will be provided by a new steam to water heat exchanger and connected to the plumbing system. Insulated copper pipe with soldered joints will be routed to all fixtures. Valves will be provided at each block of fixtures. The domestic hot water will be provided by a hot water return loop. Shock absorbers will be provided for flush valves and other quick closing valves and will be located behind an access panel.
g. Plumbing Fixtures
    i. Plumbing fixtures will be selected for their reliability, durability and low flow features.
        1. Water Closets: 1.28 gpf.
        2. Urinals: 0.5 gpf.
        3. Lavatories: 0.5 gpm.
        4. Showers: 1.5 gpm.
        5. Automatic flushing devices will be provided, which will be battery powered, solar powered, or hardwired to power.
h. Alternate Solar preheating for food service
    i. (36) Heliodyne Gobi 410 panels.
    ii. 4,000 gallon, cement lined storage tank.
    iii. Complete drain back system design.
i. Alternate Storm Water Recovery system (flushing water closets)
    i. (1) 2,600 gallon tank.
    ii. Complete system with pump for flushing water closets.

18. Fire Protection Systems
    a. Design Criteria
        i. Fire protection systems will be provided in accordance with referenced standards.
        ii. Fire sprinkler systems will be provided throughout the new and renovated areas in accordance with NFPA 13 and insurance company requirements. The existing and new portions of the building will be provided with a wet-pipe system with individual floor zones and distinct water flow alarms by zone at a central location.
        iii. Quick response sprinklers will be utilized throughout. Schedule 10 piping with roll grooved fittings for mains and Schedule 40 steel with screwed fittings for branch piping are recommended. Finished areas will have concealed heads installed. Unfinished areas will have upright heads on 1-inch tees.
        iv. The fire protection sprinkler system will be designed to NFPA standards and will be hydraulically calculated by the fire protection contractor.
        v. Existing fire department hose connections may be relocated and replaced to suit the new project requirements.
        vi. Standpipes will be provided in stairwells where required.
        vii. Seismic restraint will be provided on critical system components.
        viii. Special fire protection sprinkler systems may be required to suit equivalency requirements for interconnected floors or fire rated separations with glass areas exceeding those allowable by code.
    b. Existing Fire Protection Sprinkler Systems
        i. 1950's Building:
            1. Part of the top floor is covered by the 1970 Building sprinkler system.
        ii. 1960's Building:
            1. Lower level - fully sprinklered.
            2. Main level - no existing sprinklers.
            3. Second floor - no existing sprinklers.
            4. Mezzanine - no existing sprinklers.
            5. Third floor - no existing sprinklers.
        iii. 1970's Building:
            1. Lower level - fully sprinklered.
            2. Main level - fully sprinklered.
            3. Second floor - fully sprinklered.

19. Electrical Systems
    a. Design Criteria
        i. Electrical systems shall comply with all national and local codes and shall comply with University of Oregon Campus Construction Standards, May 2011, Third Edition.
        ii. Project to be LEED Gold certified.
        iii. Seismic Bracing:
            1. Exit signs, egress lighting fixtures, overhead electrical conduit/racks and electrical equipment will be installed and braced for a Seismic Zone D location.
    b. Existing Conditions
        i. All electrical systems need to be complete and fully functional as outlined below. All items impacted by remodeled area will be reconnected or removed.
    c. Electrical Service and Distribution
        i. The new expansion and remodelled areas will be served from a new 4000 Amp, 480/277 volt main distribution panel at the south end and revised reconnection to the existing 1600 amp, 208/120 volt main distribution service at the south end of the existing 1950s building. A new 480/277V, 3000KVA pad/vault mount transformer will be located on the south side of the property. A standby power 480/277V 750KVA pad/vault mount transformer will also be located on the south side of the property near the normal power transformer. A new 208/120V, 750KVA will be located on the south end of the building and re-feed the existing 208/120V service. Owner will provide two new transformers for the contractor to install. The 750KVA (480/277) transformer will be salvaged from the North end of the existing building.
        ii. New primary feeders will need to be provided to the primary of all three transformers and new secondary feeders will need to be provided from these transformers to the respective Electrical Room location on the lower level. The campus has a 12.47KV, 3 phase normal and emergency/standby distribution system served from the central plant through the utility tunnel system which is utility primary metered at the central plant.
    d. Emergency/ Standby Power System
        i. The campus has a 12.47K volt emergency distribution system served from the three 2.25 meg emergency diesel generators at the campus central plant. Emergency/standby power from the campus emergency distribution system will be stepped down to 480V and then distributed via 200 amp four pole isolation transfer switch for emergency loads and 400 amp four pole isolation transfer switch for standby loads. Emergency

power will be provided for code required egress lighting, fire alarm and life safety mechanical equipment. University requested Standby power will be provided for DDC control, dewatering pump, sump pump, heat trace, telecom equipment, security equipment, elevators and radio station KWVA. Branch panels with 480/277V and 208/120V for emergency and standby power will be located in the various electrical rooms throughout the building.

e. Building Power Distribution
    i. The new 4,000 amp, 480/277 volt floor mounted MDP switchboard and distribution equipment will be located in the Main Electrical room on the lower level on the south side of the new building. A new electrical room will be provided to house the new 4,000 amp MDP switchboard and distribution equipment. Emergency power will be located in a separate emergency power electrical room adjacent to this normal power electrical room. An additional electrical room will be located on the north half of the lower level near the Concert Hall with a 480/277 Volt, 1200A distribution board and distribution panels dedicated to serve the Concert Hall and Multi-Purpose room.
    ii. New 480/277 and 208/120 volt 3 phase, 4 wire, sub-distribution panels and branch panelboards will be located in electrical rooms throughout the building to serve building lighting, receptacle, mechanical and miscellaneous equipment requiring the various voltages. All panelboards will have hinged covers with screwed dead front construction, Cat 70 or 60 lock in inner section, bolt-in breakers and copper busing. Transient voltage surge suppressors (TVSS) devices will be provided on 208/120-branch circuit panels where required. The MDP will feed large mechanical loads. UO standards require main breakers in all panels. Branch panel loads need to be separate to allow for requirement for metering as outlined below. Provide selective coordination for breakers per UO standards.
    iii. The 208/120 volt power will be derived from dry-type step-down transformers. The dry type transformers will be 150 degree C., class H, 220-degree insulation, copper windings, indoor ventilated, and TP-1 rated. Transformer sizes used on this project are not anticipated to create a fault current in excess of 10,000 amperes to allow the use of standard branch circuit breakers of the same rating.
    iv. Wiring Methods:
        1. All feeder and branch circuit conductors to be stranded copper wire in metal conduit. No solid copper conductors will be allowed. No MC cabling will be allowed in walls. Provide a separate neutral conductor for each circuit to comply with NEC 240.4(B). Up size

conductors to limit voltage drop to 3% where required, the 120-volt branch circuit lengths should not exceed 120 feet. Homeruns to be in ¾ inch conduit minimum, branch wiring to individual devices can be in ½ inch conduit.

2. Satellite electrical rooms will be located on each floor to cover approximately 30,000 s.f. These electrical rooms will house power panels, step down transformer and lighting control panels for the floor they serve. Panels will not be located in corridors or within public use rooms.

v. Grounding:
   1. A new grounding system is to be provided. The NEC requires all electrical equipment to be grounded and all metallic piping, structure or other equipment which may accidentally be energized and become a safety hazard, be bonded to the same electrical grounding system. The objective of these requirements is to provide safe operating conditions by reducing the difference of voltage potential between any two metal parts that are likely to be energized. This consists of copper ground wires in all feeders and branch circuits. A copper ground bar will be provided in any new telecommunication rooms with a single #3/0 connection to the main service electrical ground of the facility.

vi. Power Monitoring:
   1. Power monitoring will be provided throughout the power distribution system. The following items need to be metered: Total normal power to the building and total standby power to the building. Lighting, mechanical equipment and miscellaneous receptacle/equipment loads need to each be metered separately. In addition the metering list above the craft center, computer center, radio station KWVA, ballroom, concert hall and food services will also require separate metering of electrical loads. Square D Power Logic monitoring will be provided per UO Standards. The power metering must be completely programmed and must tie into and report to the campus network. Cabling shall be run in conduit where required for physical protection. Open cabling is acceptable on j-hooks and basket tray.

vii. Identification and Testing:
   1. Label all electrical distribution equipment with name, voltage, arc fault information and source. Panel directories are to be updated and typed. Label all receptacles with panel and circuit numbers. Label receptacles with Brothers P-Touch, model PT-20/25 stick on labels or similar equipment. Wire and cable identification must be

maintained throughout the length of the wire or cable with campus standard color coding scheme.

f. Equipment Connections
    i. Mechanical Equipment:
        1. Connections will be made for all mechanical equipment. All motors ½ hp and larger will be wired for 480 volt, 3-phase power. Motors less than ½ hp will be wired for 120 volt, 1-phase power. Except where magnetic starters or VFDs are factory installed on the factory assembled mechanical equipment, magnetic starters will be furnished by mechanical contractor and installed by the electrical contractor with the necessary power wiring to the starter and from the starter to the motor. VFDs will be furnished and installed by the electrical contractor per UO standards. In the case of factory installed starters, the necessary power wiring to the starters will be installed. All VFD's not integral to the factory assembled equipment will be physically mounted at the equipment by electrical contractor. Necessary power wiring to the VFD and from the VFD to the motor is to be installed. Restroom exhaust fans are to be controlled by occupancy sensor. Paddle fans, where installed are also to be controlled by PIR occupancy sensor.
    ii. Elevator Equipment:
        1. Power, signal and raceways for elevator equipment will be provided by electrical contractor per the elevator equipment vendor in addition to providing all provisions required by the State Elevator Inspector. Requirements for elevators and elevator equipment rooms will be coordinated with the City of Eugene and fire alarm system manufacturer (Notifier).
    iii. Convenience Power Outlets:
        1. Receptacles will be provided as required by the users, and as mandated by the University of Oregon Campus Construction Standards, May 2011, Third Edition. 120-volt receptacles will be provided in all janitor closets, toilet rooms, corridors (space not to exceed 50 feet on center), mechanical rooms, electrical rooms and within 25 feet of all mechanical equipment as required by Code. In hallways, lobby and corridors where students can sit, receptacles will be provided 10 feet on center. In addition, convenience outlets will be provided immediately adjacent to all equipment disconnects of all ceiling hung mechanical equipment. Ground fault circuit interrupting (GFCI) devices will be provided as required by Code, and specifically on the exterior of the building,

the roof and within all restrooms. Flush floor devices will be placed throughout the building where requested by the Owner. These will be special purpose boxes to integrate power and voice/data needs. General purpose receptacles to be 120V, 20A circuited with 4-6 receptacles per 20A circuit.

2. No plastic cover plates are to be used throughout the facility, provide nylon or metal only.

iv. Miscellaneous Equipment Connections:

1. In addition to the items listed above, connections to miscellaneous building equipment such as ADA doors at entries to the building, building equipment, etc. are to be provided.

g. Electrical Scope By Building Area – Special Requirements

i. Demolition

1. Existing site lighting impacted by the new expansion will be disconnected, relocated or removed. Electrical services and devices in remodeled area will be disconnected, relocated or removed as required. Most all existing signal systems will be removed and replaced with new systems. See demo drawings for demolition scope of work.

ii. 1950s Building Renovation

1. Electrical Power – New service distribution equipment will be provided with the exception of the existing 208/120V distribution equipment to the south remaining. Main normal and emergency distribution will be located in the south portion on the lower level of the 1950's building. Craft Center will be relocated to this portion of the building and new distribution equipment will be provided for it and will be fed from the main electrical room. Power panels that are newer than 1995 will remain and be back-fed from new electrical distribution system serving the building unless located in a demo wall. Electrical services and devices past their useful life in remodeled area will be disconnected and removed as required.
2. Lighting and Lighting Controls - Upgrade lighting and controls to energy effiencent equipment consistent with UO campus standards and current energy codes. Selective existing rooms that have been remodeled to have current luminaire types and controls will remain as is. All new lighting provided will be changed from the existing 120 volt power to 277 volt.
3. Fire Alarm System – Replace all components and cabling.
4. Telecom, AV, Security – Replace all components and cabling for telecom system. AV system serving selective rooms such as Ballroom to remain as is. Provide security system consistent with

new construction, presently no security system exists in the building.

iii. 1960s Building Renovation
    1. Same as description for 1950s Building Renovation above.

iv. Food Services
    1. High power usage and many power connections to electrical equipment. Allow 50 w/sf for kitchen electrical equipment. The food service area remains in the same location as it currently resides but will be heavily remodeled and will mainly be fed from the existing 208/120V service.

v. Concert Hall
    1. The concert hall is provided as a new addition, attached to the east side of the existing building. Special lighting, lighting controls, mechanical rigging system and AV systems as defined by other consultant narratives. No special power requirement other than those required to support the lighting and AV systems and rigging systems.

vi. Multi-Functional Auditorium
    1. Special lighting, lighting controls and AV systems as defined by other consultant narratives. No special power requirement other than those required to support the lighting and AV systems.

vii. Existing Ballroom
    1. Retain electrical connections to existing 208/120V system. Disconnect and reroute any branch circuits as required for adjacent remodels.

viii. Craft Center
    1. High power usage and many power connections to electrical equipment. Allow 20 w/sf for craft electrical equipment. Craft center will have dedicated electrical panels for the area which will be fed from the new main electrical room.

ix. Atrium
    1. No special electrical requirement other than those outlined elsewhere in this narrative.

x. Site Event Area
    1. Special power connections for 60 amp, 208 volt, 3 phase event power at two locations.

xi. Electrical PV System
    1. Reconnect and provide additional new PV array and connect to building electrical system.

h. Lighting Controls

i. Exterior lights will be controlled by a photocell “on” and time clock “off” function and will incorporate a scheme for maintaining security level lighting at night.
ii. Per the Oregon Structural Specialty Code, the building shall include a low voltage lighting control system including “sweep off” capability. The system will use manual “ON” operation and be interconnected with the building’s Energy Management System (EMS) or DDC panel. The system will be zoned and programmable to allow for flexible use of the building. In addition, the lighting controls will include daylight harvesting in spaces located in the daylighting zone, controlled by interior building photocells coupled with occupancy sensors.
iii. All enclosed spaces will be provided with local wall switches for lighting control. Conference/meeting rooms, offices and restrooms will include occupancy sensor lighting controls. All occupancy sensors will have auxiliary contacts for HVAC controls.
iv. Conference/meeting rooms will have step switching or dimming in addition to occupancy sensor and day lighting control.
v. Concert hall and Multifunctional Auditorium will have general housekeeping and emergency egress lighting. Specialty performance lighting to be outlined by A/V or Theatrical lighting consultant.
vi. See attached Appendix L1 - Lighting Criteria Schedule.

20. Low Voltage Systems
    a. Telecommunications Systems
        i. Existing Conditions
            1. Most of the existing telecom infrastructure and cabling to be completely removed from existing building and replaced with new. New telecom rooms and telecom distribution will be provided throughout the renovated building and new addition.
        ii. Telecommunication Service to the Building
            1. Two (2) 4-inch conduits from existing utility tunnel will be provided to a new Main Telecommunication room (TSER/TER) located in the northwest corner. New Main Telecommunication Room will be connected to existing campus telecommunications distribution systems including UTP backbone cabling, single mode and multimode fiber from the campus hub facility, quantities need to be verified.
        iii. Voice and Data Distribution in the Building
            1. New copper and fiber backbone cables will extend from main Telecommunication Service Entrance Room/Telecommunication Equipment Room (TSER/TER) to new telecommunication rooms (TR) on each floor. New telecom rooms will be lined with ¾” A-C

plywood painted white with fire retardant paint. Plywood backboards shall be mounted at +4" AFF up to 8'-4". All equipment shall be rack mounted. Equipment racks will be provided as required.

2. Satellite telecom rooms (TR) will be located on each floor to cover approximately 30,000 sf. These telecom rooms will house telecom equipment, telecom racks, security and fire alarm equipment. Telecom equipment will only be located in rooms dedicated for electrical equipment. Racks will have 25% spare capacity.
3. Provide voice and data backbone cabling between the main telecom room and all satellite telecom rooms (TR) on various floors and areas of the building. The voice cabling will consist of multi pair category 3 ARMM type cable terminated on 110 blocks. Pairs will be provided to allow 2 pair per workstation. The data backbone will consist of 62.5 micron fiber optic cabling with ST connectors on each end. Category 6A backbone shall consist of a minimum of 12 cables from the TER to each TR. Category 6A cables shall terminate on patch panels at each end.

iv. Raceways/Cable Trays

1. Cabling shall be concealed in EMT inside walls and in exposed areas. Conduits shall be terminated with bushings on both ends. The minimum size conduit allowed is a 1" EMT with a 4"x4"x2-1/2" deep box. Conduit to be provided from telecom outlets to within 2' of the cable tray or telecom rooms. Cable trays shall be sized to provide 100% spare capacity and routed down main corridors to telecom rooms or telecom closets for telecom wiring on each floor. Minimum two (2) 4" conduits shall be routed from Main telecom room to each satellite telecom room.

v. Horizontal Cabling

1. Cabling contractor needs to be Panduit certified for installing, terminating, testing, securing and labeling cable. Data drops shall be provided in all areas requiring telecom outlets for equipment and general use. All telecom cabling shall be run to the telecom room and terminated by the contractor. Typical telecom outlets shall consist of (4) Category 5E, 4 pair cables terminated on patch panels in the telecom room. Wireless network system to be provided throughout the building for complete coverage and in selective outdoor seating areas near the building. Provide (2) Category 5E cables to each DDC panel, lighting control panel, power meter and WAPs.

vi. Cable TV
    1. Extend existing campus cable TV (Comcast) from utility tunnel to the Main Telecom room (TER). Provide RG11 type Coax cable from TER to each satellite telecom room (TR) on the various floors and areas floor as required for new and remodeled areas. Provide minimum of 1 inch conduit, RG6 quad shield cabling and F-type connectors for CATV drops. Service provider will provide equipment in telecom rooms and make final connection to equipment.

b. Security Systems
    i. Site Security
        1. Provide site security e-phones with cameras at 3 locations.
    ii. Access Control
        1. Install an access control system consisting of card readers, door position switches, Request to Exit devices, Electrical/Magnetic locks and all controllers as needed on exterior doors and select internal doors. Use campus system manufacturer and it shall be tied into the existing campus system. The contractor will be required to provide all connections back to the campus system. It is estimated that approximately 20 doors will need access controls.
    iii. Video Surveillance
        1. Provide new equipment for video surveillance system including, cameras, recording devices and required software. The cameras for the building will be located in selective areas in the building and on the exterior of the building to provide coverage for selective areas. The system shall be compatible with the existing campus video system and be tied into it to allow viewing from the main campus security station. It is estimated that approximately 20 cameras will be needed.
    iv. Security for Art
        1. Provide surveillance camera and security sensors on art work.
    v. Raceways/Cable Trays
        1. Cabling shall be run in conduit where required for physical protection. Open cabling is acceptable on j-hooks and basket tray.

c. Audio Visual/ Miscellaneous Signal Systems
    i. AV systems defined by other consultants.
    ii. Public Address defined by other consultants
    iii. Clock system – Not required. Campus has a wireless transmitting clock system to set and reset clock. Special clocks are required.

d. Fire Alarm System
    i. Executive Summary
        1. A new Notifier fire alarm system will be installed to replace the existing fire alarm system throughout the new addition and remodeled areas. The fire alarm system will consist of fully addressable devices that are electrically supervised. Manual pull stations will be located at all building exits in the direct path of egress. Speaker/strobes will be used, meeting or exceeding the manufacturer's ratings. Strobe lights will be synchronized. Speakers will use the "slow whoop" tone. Control panels will be modular construction, expandable to take on additional modules. Minimal detection will be required as the building will be fully sprinklered. Detectors will be provided for elevator recall. Duct smoke detection will be provided to comply with the International Mechanical Code, and will include unit shutdown. Duct detectors will initiate all alarms. Sprinkler water flow and tamper switch monitoring will be provided. An LCD annunciation panel will be provided at the Main Lobby and additional entry lobbies or as directed by the Fire Department. Annunciation will be alphanumeric, corresponding to the room designations commonly used within the facility. All cabling will be in conduit even if above accessible ceilings. Fire alarm system will be designed by contractor and comply with AHJ requirements, local codes and all national codes.

21. ALTERNATES

See attached 75% Pricing Alternates list.

Appendix: Code Compliance Analysis & Fixture Schedule

UO EMU: 75% SD Pricing Alternates list

	Alternate Number	Description	Documented by:	Base Bid Scope	Alternate Bid Scope	UO Comments
1	1	Atrium Smoke Evacuation	rob schnare	Provide shaft separation at atrium as indicated in code summary.	Provide smoke evacuation in lieu of shaft separation.	
2	2	University Street Improvements	aaron@cameronmccarthy.com	Limited improvements to University Street as noted.	Additional improvements to University Street.	
3	3	Intensive Eco-Roof all new construction	lisap@serapdx.com	Roof as indicated in narrative.	Install vegetated roof system consisting of fluid-applied waterproofing, leak detection, rigid board insulation and Eco-roof system to accommodate 6-12" of soil for edible plantings, decorative shrubs, etc. Include leak detection system and additional structure required to support additional load. Assume 4400 sf of roof area located in the roof of atrium adjacent to Mills Center.	
4	4	Extensive Eco-Roof all New Construction	lisap@serapdx.com	Roof as indicated in narrative.	Same as described in alternate 3 except 4" soil depth with sedum plantings.	
5	6	Solar Thermal Hot Water System	lisap@serapdx.com	No solar thermal system.	Solar Thermal system to be located on south side of atrium skylight. Assume 4 x 25' linear feet of collector area.	
6	7	FSC Wood	lisap@serapdx.com	Non-FSC wood products throughout.	Provide 50% of all wood finishes, flooring products, trim, etc. to be FSC certified and locally harvested.	
7	8	Traditionally Reinforced Concrete Structure	'Paul Auerbach'	Post tensioned concrete structure as indicated	Traditionally reinforced concrete system. Typical concrete slabs will increase in thickness by 2 to 4 inches. Typical reinforcement will be approximately 8 to 10 psf. Required lengths of shear walls will increase approximately 25%, as will size of footings for columns and walls.	
8	9	Natural Ventilation	lisap@serapdx.com	Operable windows are in base bid. Electrification system and DDC control system integration is in alternate.	Provide allowance for electrified/automated operation of operable windows and/or roof hatches integrated with building HVAC controls.	
9	10	Replace aluminum windows at (E) 1950 & 1962 building	nathanb@serpdx.com	No existing window repair/replacement.	Replace with new clear annodized aluminum-clad wood windows, frame profile, operability & configuration to match existing, U<0.30, glass type to match new construction. Provide new stainless steel flashings at head & sill where missing or damaged and replace perimeter sealant.	What was our assumption in conceptual estimates regarding (E) window replacement? We'll need to analyze (E) windows.
10	11	Repair & upgrade steel frame windows at (E) 1950 building	nathanb@serpdx.com	No existing window repair/replacement.	Repair any corrosion and operation issues, replace glazing with new insulated units where possible, glass type to match new construction. Replace perimeter sealant.	
11	12	Replace wood windows at (E) 1950 building	nathanb@serpdx.com	No existing window repair/replacement.	Replace with new wood windows, frame profile, operability & configuration to match existing, U<0.30, glass type to match new construction. Provide new stainless steel flashings at head & sill where missing or damaged and replace perimeter sealant.	
12	13	Mechanical screens in lieu of enclosed penthouse at both the North Bar and Concert Hall service bar.	ericp@serapdx.com	Provide mechanical penthouses as indicated.	Omit roof structure and wall assembly over rooftop mechanical equipment. Provide fabricated steel screen structure with metal panel cladding around equipment. Provide walkable roof area to, and around mechanical equipment.	MEchanical penthouse to be base, screens or otherwise will not be accepted.
13	14	Roofing replacement	nathanb@serpdx.com	IRMA roof assembly with fluid-applied rubber membrane.	Replacement and new roof assembly (bottom up): sheet vapor retarder, rigid board insulation, protection board, SBS/TPO/PVC adhered sheet membrane	
14	15	Roofing Leak Detection System	nathanb@serpdx.com	No leak detection for IRMA roof assembly	Provide regional leak detection system tied to building control systems	
15	16	Outdoor Terrace Waterproofing	nathanb@serpdx.com	Replacement of topping and waterproofing system	Grind existing surfaces and provide new traffic coating membrane, perimeter sealant, and repair/improve existing drains	
16	17	Fishbowl Glazing	nathanb@serapdx.com	No replacement/change to existing glazing system	Remove existing single-pane glazing & framing system, install new low profile butt-glazed thermally broken aluminum curtainwall system, glass type to match new construction. Provide new perimeter flasings & sealant.	
17	18	Loading Dock Canopy	nathanb@serapdx.com	Full replacement of existing canopy	If not required to be extended by AHJ, provide new roofing at existing canopy & structurally reinforce if necessary	
18	19	Concert Hall orchestra pit operation	nathanb@serapdx.com	Manually installed pit cover	Provide automatic lift mechanism to provide floor height flexibility to 3) levels	
19	20	Building Control System	nathanb@serapdx.com	System described in Mechanical narrative	Provide fully automated building controls for MEP systems, lighting, natural ventilation openings, water & energy usage monitoring, etc. Allow for future system/software upgrades & connection to campus-wide controls as they are implemented. Provide web interface capability for maintenance staff as well as student involvement/monitoring of building performance & operations.	
20	21	Concert Hall exterior cladding	nathanb@serapdx.com	Opaque wall as Stone Veneer cladding	Wall cladding to be 50% Stone Veneer, 50% Brick Veneer	
21	22	Hearth Elevator shaft enclosures	nathanb@serapdx.com	Solid, rated walls	Provide glass enclosure walls facing the hearth	
22	23	Build-out tenant space - Coffee House	Christopher King	Warm shell only	Provide build-out as described in 'Building Interior' narrative section	
23	24	Build-out tenant space - Pub	Christopher King	Warm shell only	Provide build-out as described in 'Building Interior' narrative section	

Client Name:	SERA Architects
Distribution:	Eric Philps/SERA Martina Bill/University of Oregon John McMichael/Interface Ned Green/Interface
Subject:	EMU Building Code Compliance Criteria for New Construction with Allowance as Existing Building
Referenced Codes and Standards:	2010 Oregon Structural Specialty Code 2009 International Existing Building Code – with Oregon amendments 2010 Oregon Fire Code
Building Name:	University of Oregon EMU Building Expansion
Room Area Affected:	Entire Building

University of Oregon EMU Building Expansion

Overview

The EMU Building is a 3 story building with mezzanines on the University of Oregon campus originally built in 1950. The new expansion will be a 3 story structure with 3 story space connecting the existing and new spaces. The existing building is of Type IA construction. The building is fully sprinklered with standpipes in each stair well. Means of egress is provided by two fully enclosed interior stairs at far ends of the building and a Horizontal Exit to the 3 story space. The structure of the expansion is of Type IA construction with non-combustible, non-load bearing interior walls. A 3 story space will be fully separated from the 1,000 seat performance space and from the existing building. The building is fully sprinklered with standpipes in each stair well. Means of egress will be provided by two fully enclosed interior stairs at far ends of the program area block in the building and Horizontal Exits.

Approach

A Key Code Compliance approach will be used to address the spread out nature of the project, the multi-story open space and the large occupant loads. Concerns of fire department access, smoke control systems in the 3 story space and dispersion of people to existing and new exit systems has lead to the following solutions.

Fire Department access will occur at multiple locations around the building and provide easy access to the roof. Access on the site would be via two new access drives off of 13th Avenue on the north and via the renovated loading dock drive on the southwest. Access to the roof will be by enclosed stairways on the east side of the performance space, on the north side at both ends of the new program space and on the south side of the existing building. Ladders would provide access to the different levels of the roof.

Shaft approach to smoke control in the 3 story space separates the 3rd floor of the new program area and the existing building and allows the use of passive smoke venting. The shaft approach requires 2 hour rated separation of the 3rd floor of the new and existing areas from the 3 story space. This can be a fully glazed wall with window washing sprinklers and 90 minute rated doors. 2 hour rated separation from the existing building will require opening protection of openings in existing building. Separation from the 1,000 seat performance space is required and needs to be 2 hour rated.

Separating the 3 story space from the existing areas, the performance space and 3rd floor of office area allows the 3 story space to be a horizontal exit and helps to alleviate some of the high occupant load exiting from the different spaces. The 1,000 seat performance space has a main exit that discharges through the 3 story space as well. Construction of the 3 story space as a horizontal exit provides the required area which the main exit may discharge through to the outside.

Below is a list of areas where the building complies and what requirements need to be met for the building to comply in reference to OSSC.

No	Compliance Requirement for New Construction and Allowance for Existing Building per OSSC	Compliance Status
A – BUILDING CONSTRUCTION		
A.1	Type IA construction allowing unlimited height and area.	Meets
A.2	The existing structure has not been seismically reinforced and will be seismically isolated.	Meets
B - OCCUPANCY AND SPECIAL USE		
B.1	Existing building is B occupancy with F-1 occupancy in basement, A-2, M and S-1 occupancies at first level, and A-3 ballroom, gallery and meeting rooms on 2nd level.	Meets
B.2	New addition is 3 story A-1 performance space and 3 story A-3 occupancy space surrounding a 3 story open space.	Meets

C - FIRE RATED SEPARATIONS AND OPENING PROTECTION		
C.1	All occupancies are presumed to be non-separated for height and area requirements.	Meets
C.2	Existing tenant space separations are assumed to be non-fire rated. Tenant separations are not required.	Meets
C.3	Existing corridor walls are assumed non-fire rated. Non-fire rated corridors in sprinklered buildings are allowed per OSSC 1018.	Meets
C.4	The 3 story space based on the design has the potential to be 3 stories tall which would require smoke control. UO is concerned about using smoke control due to testing criteria, delays in permits and occupancy, coordination during design and construction and maintenance of the smoke control system. UO is also concerned that exterior doors not be used for smoke control air intake, as this would be a security issue. An alternate approach would be using a shaft approach with 2 stories open to the 3 story space and using smoke vents tied to smoke detectors.	Verify
C.5	Separation of 3 story space from 3rd floor of program space and from existing building with 2 hour rated walls and opening protection.	Meets
C.6	Existing central stair exiting out to street is allowed to remain as is per exception 1 to Section 1027.1.	Meets
C.7	Stages and platforms in performance and lecture halls shall have stages constructed of the same material as construction type and have dressing rooms and backstage areas separated from stage per OSSC 410.	Meets
C.8	If stage height is over 50', the stage shall be separated from the seating area with a 2 hour rated wall.	Verify
C.9	Stages larger than 1,000 SF or greater than 50 feet tall shall be ventilated with roof vents tied to heat detectors.	Verify
C.10	Vertical shaft openings are required to be 1 hour. Verify fire rating of new and existing shafts as being 1 hour rated.	Verify
C.11	Doors at vertical exit enclosures have to be 60 minute rated and smoke tight per OSSC T715.4.	Verify
C.12	Through penetrations are to be 120 minute fire-rating when penetrating a 2 hour wall. Penetrations not already meeting this requirement shall be upgraded. Floor penetrations have to be F/T rated.	Verify

No	Compliance Requirement for New Construction and Allowance for Existing Building per OSSC	Compliance Status
D - MEANS OF EGRESS		
D.1	Alternate materials and methods strategies may be used to allow unprotected stairs to be used for egress. Timed egress analysis to show that using smoke vents would provide enough time for everyone to exit down unprotected stairs to an exit.	
D.2	Two existing enclosed stairs at remote ends provide egress from existing building area.	Meets
D.3	Two enclosed stairways at remote ends of the program block in expansion provide egress from program area. A third exit from the 3rd floor through the 3 story space.	Meets
D.4	1,000 seat performance space requires 50% of occupant load to exit through 3 story space space. Remaining exiting to be through stairs exiting directly through to exterior.	Meets
D.5	3 story space space open to 2 stories with 2 hour rated separation to 3rd floor areas, existing building and 1,00 seat performance space to be a horizontal exit.	Meets
D.6	Exit signs to be installed as required at all exits per OSSC 1011.1.	Meets
D.7	Common path for occupancies B and S is limited to 100 feet, 75 feet for M occupancy and 30 feet for A-2 and A-3 occupancies per OSSC 1014.3 and 1028.8	Meets
D.8	Two exits are required from all floors per OSSC 1015.1.	Meets
D.9	Exit access travel limited to 300 feet maximum for B occupancy and 250 feet maximum for all other occupancies per OSSC T1016.1.	Meets
D.10	Minimum corridor width must be 44 inches per OSSC 1018.2.	Meets
E - FIRE PROTECTION & PREVENTION		
E.1	Automatic Sprinkler system is required and will be installed throughout per OSSC 903.1.	Meets
E.2	Existing standpipes in stair wells of existing building shall be verified to comply with 2010 OSSC.	Meets

E.3	New standpipes shall be located at each required egress stair minimum per OSSC 905.	Meets
F – DETECTION, CONTROL AND ALARM NOTIFICATION		
F.1	Automatic fire alarm system required to comply with OSSC 907.2.	Meets
F.2	Smoke detection system will provided in excess of code requirement.	Meets
F.3	Back up and emergency power is required for elevators, emergency lighting and emergency systems.	Verify
G – FIRE DEPARTMENT ACCESS		
G.1	Fire department access to be per Chapter 5 and Appendix D of the OR Fire Code. Aerial fire apparatus access is required for buildings greater than 30 feet above lowest level of access.	Verify
G.2	Fire department site access to be from 13th Avenue and south side of addition. Access routes shall have widths and lengths per OFC Appendix D. Fire hydrants shall be located on fire apparatus access routes or on site to be within required distances to building.	Verify
G.3	Water supply for fire flow shall be provided in accordance with OFC Appendix B.	Verify
G.4	Fire command center has been requested by owner and shall be separated by 1 hour construction and have communication system, status indicators for alarms, elevators, fire pump, emergency power and other emergency systems per OFC Section 508.	Meets
G.5	Two-way communication system required at the elevator landing on each level above or below level of exits.	Verify
H – ACCESSIBILITY		
H.1	New accessibility rules apply March 1, Chapter 11 and several other sections have been revised.	Verify
H.2	Locations of accessible and companion seating in A occupancies has been revised as to be dispersed through all areas of the space.	Verify
H.3	Required means of egress stairs must meet requirements for accessible stairs even though the floor is accessed by elevator.	Verify
H.4	Directional signage to other means of egress shall be provided at elevator landings throughout building.	Verify

Hazardous Materials

Hazardous materials are proposed for the Craft area in the basement of the existing EMU building. The area would be best treated as a single control area and all materials stored and/or used will be within maximum allowable quantities preventing an H occupancy classification. Attached is a list of material types and their allowable quantities. Some materials are restricted in basements and they have been noted. If spraying of paint or finishes is to occur, these activities should be done in spray booths or in limited areas as required by the 2010 Oregon Fire Code.

I – HAZARDOUS MATERIALS		
I.1	Hazardous material control area shall be constructed with 1 hour rated fire barrier walls and 1 hour rated floor/ceiling assemblies per OSSC 414.2.1.	
I.2	Spray booths shall be fully sprinklered, mechanically ventilated and limited in size with non-combustible floors and surfaces per OSSC 1504.3.2.	

PLUMBING OCC TYPE	PLUMBING LF	PLUMBING OCC LOAD	MEN EA/ WOMEN EA	MEN TOILETS	MEN LAVORATORIES	WOMEN TOILETS	WOMEN LAVORATORIES
A	41,960	30	699	8	6	8	6
A FIXED	fixed @ 1,250	fixed + area @ 15	1,783	12	6	20	6
B	80,479	200	201	6	3	6	3
F	12,008	2,000	3	6	3	6	3
M	4,005	200	10	1	1	1	1
S	13,662	5,000	1	1	1	1	1
				34	20	42	20
CONCERT HALL - ABOVE CODE MINIMUM:				8	2	8	2
				42	22	50	22