

MOHAI South Lake Union

Concept Design Narrative

February 7, 2008



CENTER FOR
WOODEN BOATS

MOHAI South Lake Union
February 7, 2008

WHARF

LOADING DOCK

FACE OF BULKHEAD BELOW
LOADING AREA

MOHAI

860 Terry Ave. N

CANOPY

LIMIT OF WORK

SOUTH LAKE UNION PARK

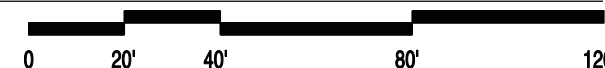
CENTER FOR
WOODEN BOATS
(FUTURE)

TERRY AVENUE

SOUTH LAKE UNION PARK

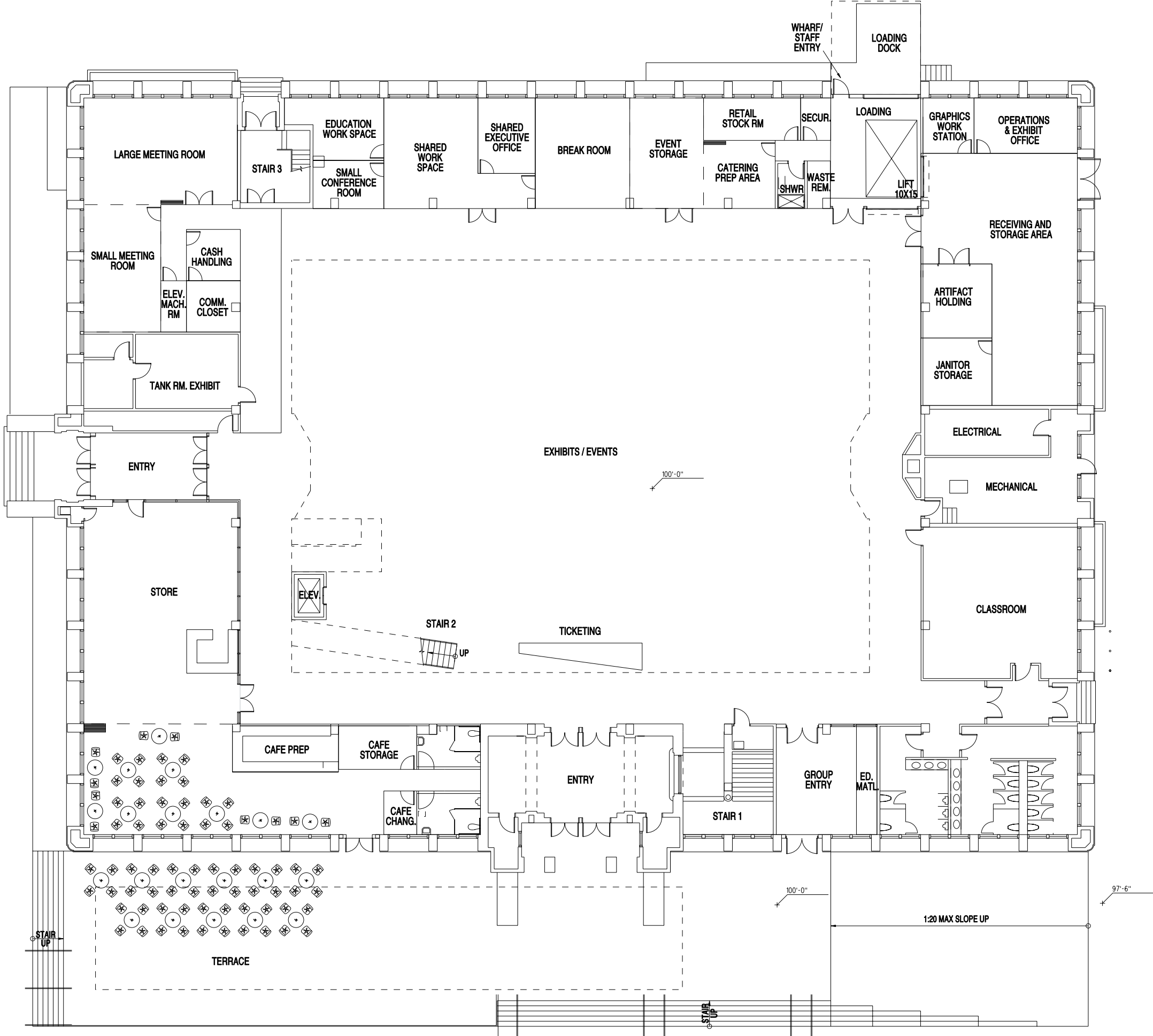
SITE PLAN

SCALE 1"=40'

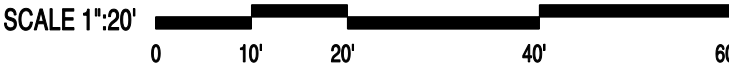


LMN ARCHITECTS

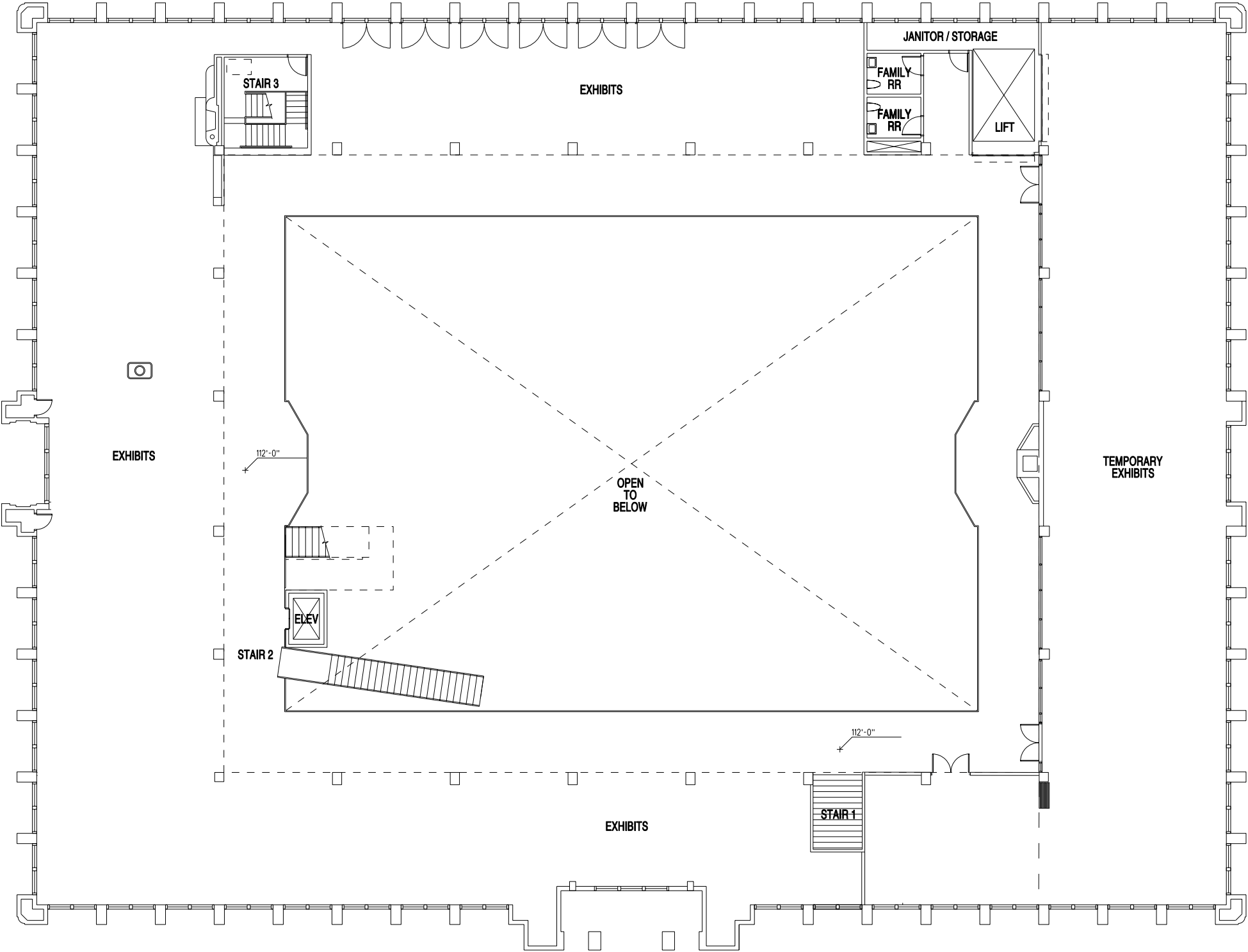




LEVEL 1 PLAN



LMN ARCHITECTS

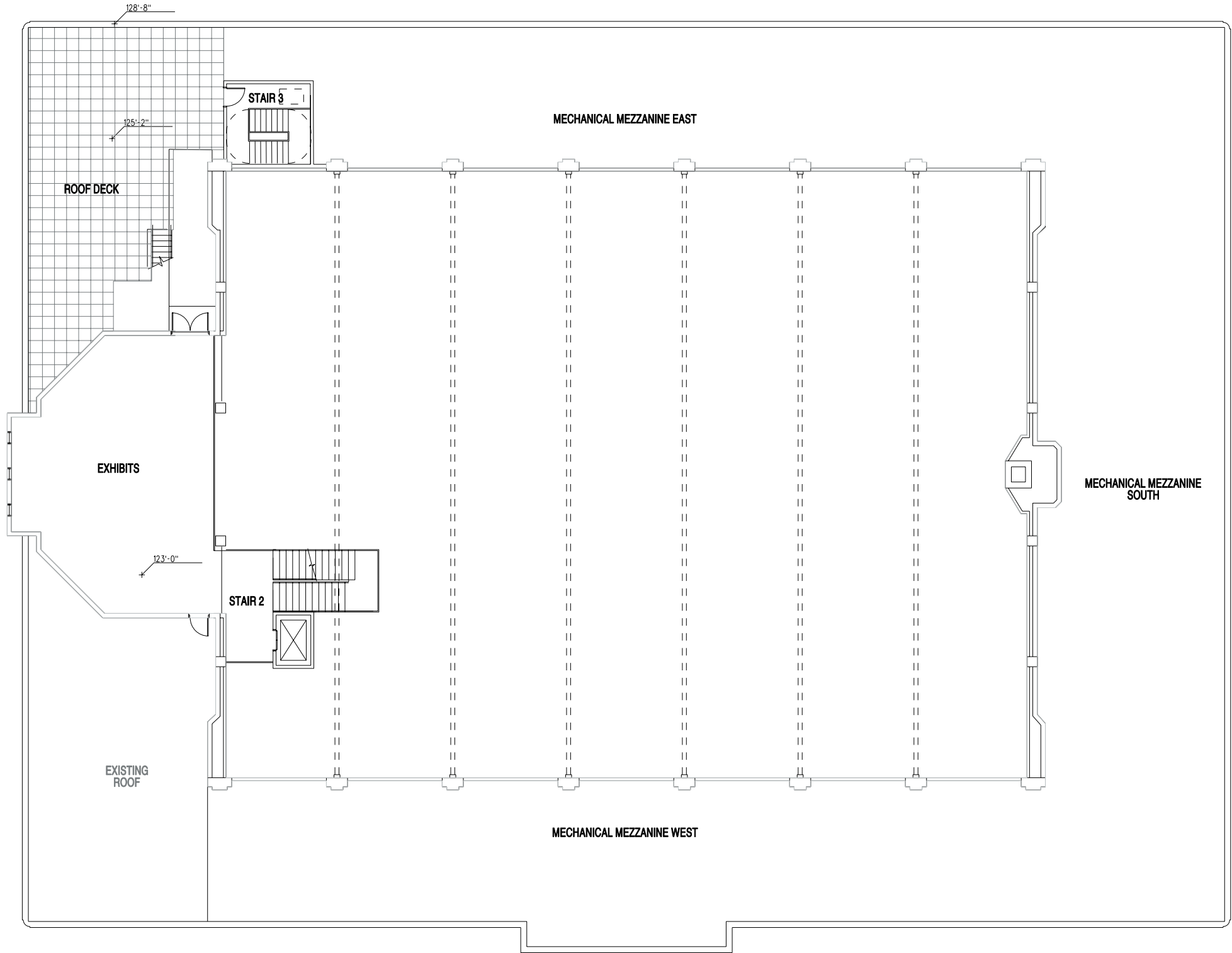


LEVEL 2 PLAN



LMN ARCHITECTS



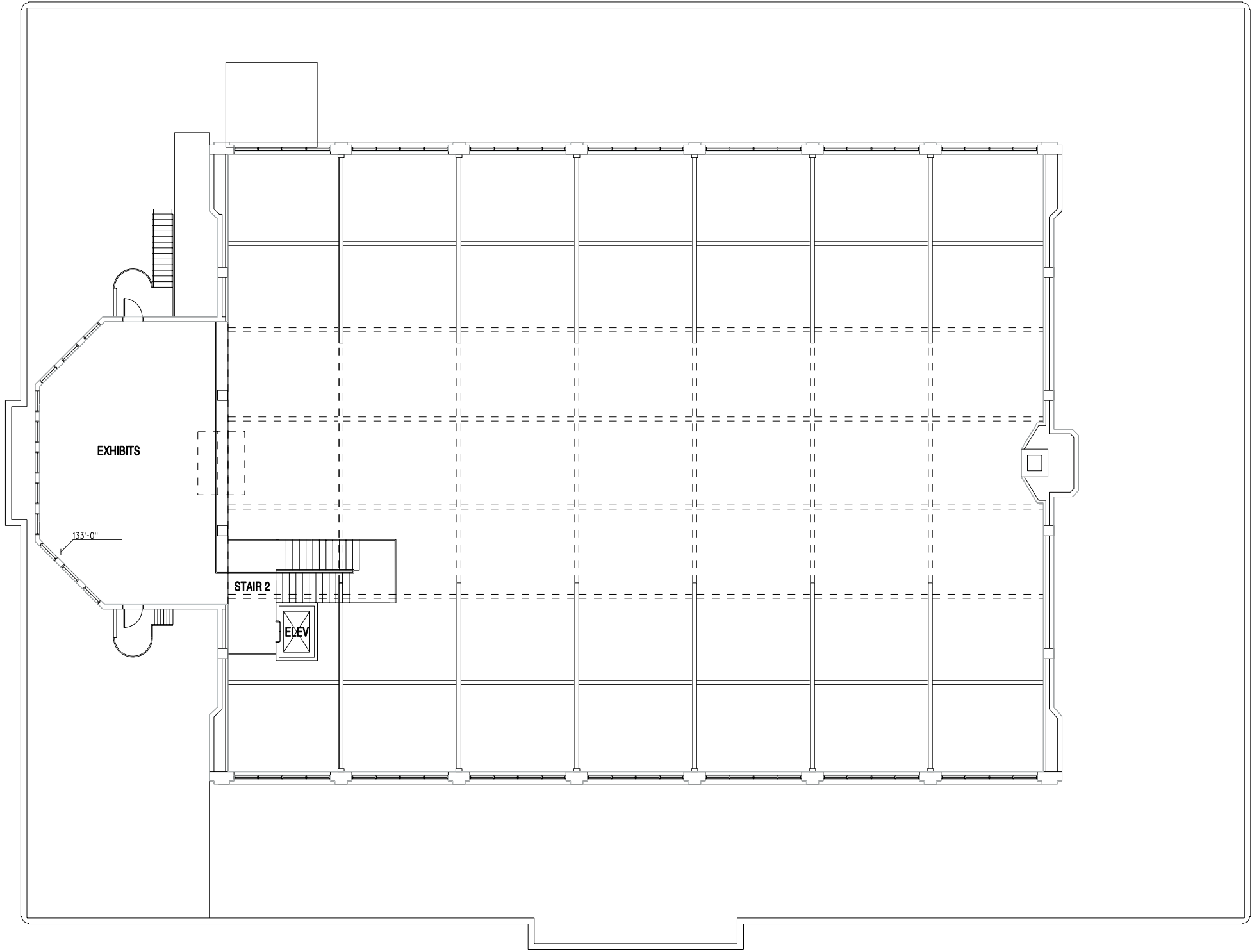


LOWER MEZZANINE PLAN



LMN ARCHITECTS



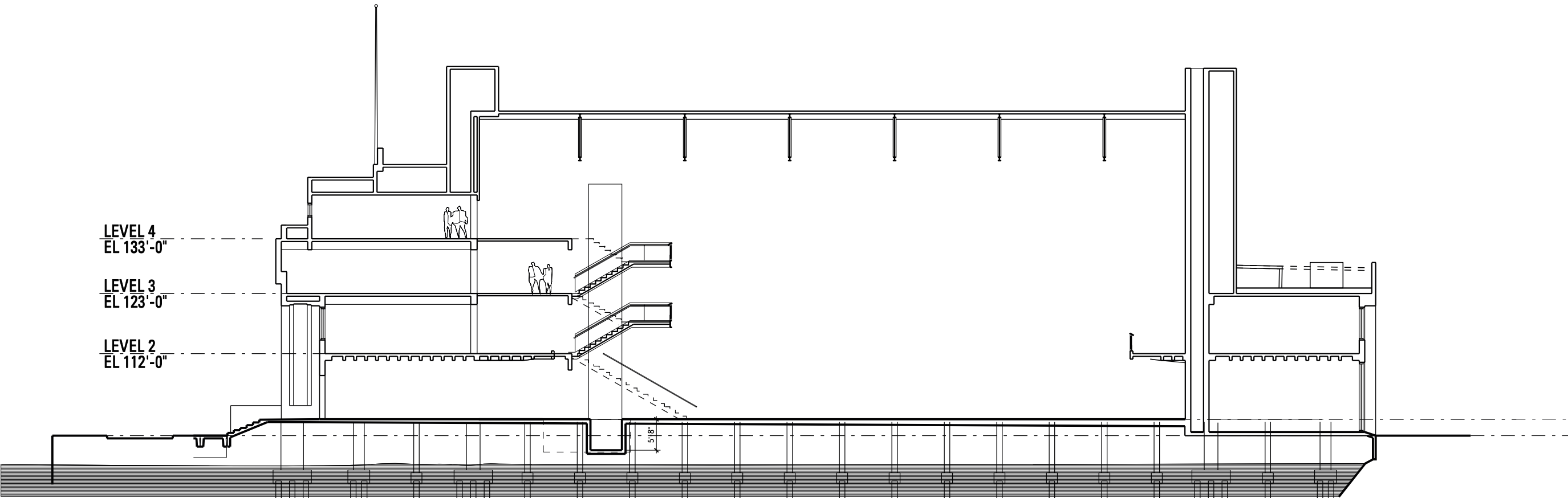


UPPER MEZZANINE PLAN



LMN ARCHITECTS



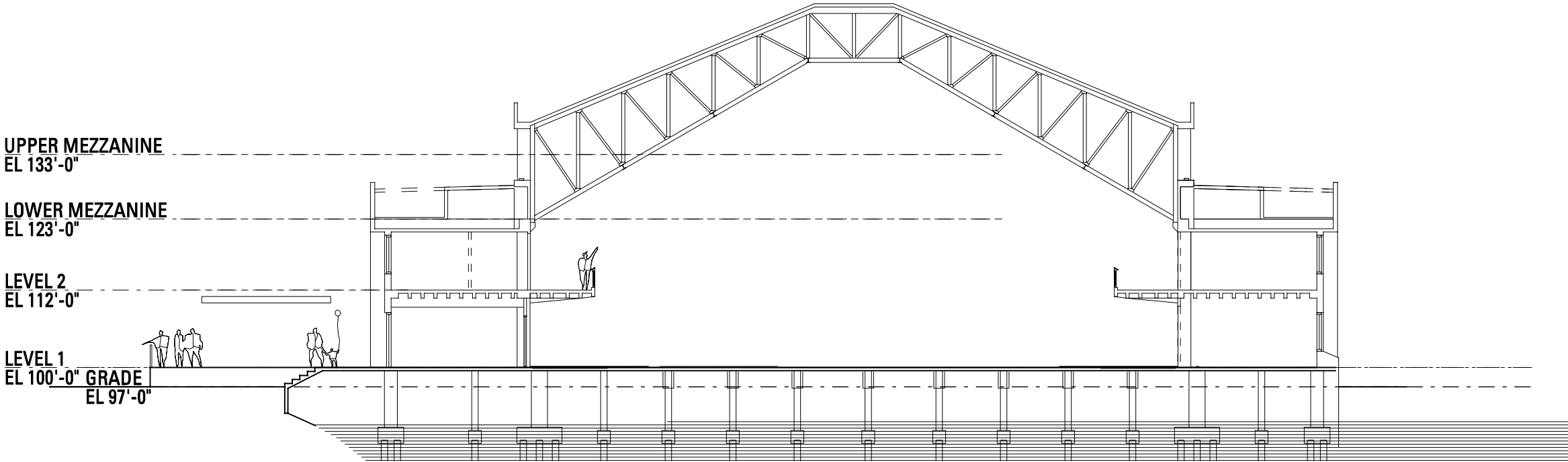


LONGITUDINAL SECTION

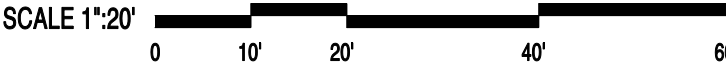
SCALE 1":20' 0 10' 20' 40' 60'

LMNARCHITECTS





TRANSVERSE SECTION



OVERVIEW

The Seattle Museum of History and Industry (MOHAI) will renovate the existing Naval Reserve Armory at the south end of Lake Union for its new exhibit space. The existing building will be upgraded and revised in program, structure and equipment to meet the needs of the Museum. The Museum design and construction will be a follow on to the Seattle Parks renovation of the site surrounding the Armory building. Site design for the Museum renovation will be coordinated with the Park improvements. The following are the Civil/Site improvements for this project:

UTILITIES

Water: Records indicate that there are existing water services to both the south and north ends of the building. There are 3-fire hydrants around the site. The park utility renovation plans (dated 12/20/05) that we have seen are unclear about how much of the existing water system in the area is to be replaced or revised.

The Mechanical Designer has indicated that a combined 6-inch domestic/fire service will meet the needs of the museum. The point of entry for this service will be the south face of the building, into the mechanical space.

A location will need to be determined for a 6’x12’ vault to house this meter, likely under the parking lot to the south of the building.

Seattle Public Utilities will install this meter for a cost of \$33,265, (2008 Rates). There is an additional new service charge of \$22,638.

Sewer: Record information indicates that the building is currently connected to the local sewer main at two points, from the west side, near the main door, and from the center of the south side of the building. These pipes connect to an existing pumped system that runs south off site to public mains in Valley Street. The parks renovation utility work will upgrade the existing system including the pump.

Per the Mechanical designer, the renovated Armory building will require a 6-inch sewer connection from the southwest corner to the new pump station approximately 70-feet southwest of the building. This side-sewer should begin approximately 5-feet below finish floor at the building, and slope at a minimum of 2% to the pump station.

Storm Drain: The existing building has gutters and downspouts that discharge directly to Lake Union. As the roof areas being drained will not change in use, this condition should be maintained.

Replacement of individual downspout and rain leader piping may be required due to age; they should be replaced, in place; routed to existing outfalls along the lake front.

Communications and Power:New Communications and Power services will be installed with the renovation. Exterior routing and coordination with other utilities will be required once points of service and origin are determined. If a new transformer is required, coordination with Seattle Public Utilities and Seattle Parks will be required to locate the transformer and service feeds to and from it on site.

PAVEMENT RESTORATION:

Where existing pavements are trenched for utility installations, the trenches shall be backfilled and restored per City of Seattle Pavement Opening Rules.

Asphalt pavements shall be restored to match existing pavement sections or 2-inches of Class A asphalt over 7-inches of Class E asphalt.

Concrete pavements shall be restored to match existing sections.

Note that some of these utility installations may not require trenching or surface restoration, as they may be suspended under the pier structure, over water.

INTRODUCTION

Formally know as the Naval Reserve Armory, the new home for the Museum of History and Industry (MOHAI) is located at 1000 Valley Street on the south side of Lake Union in Seattle, Washington. The building was constructed in 1942 of reinforced concrete with steel trusses at the roof. The exterior dimensions of the building are approximately 200 feet in the north/south direction and 150 feet in the east/west direction. The building consists of two floor levels and two roof levels. There is a large open space approximately 130’ x 100’ that runs from the first floor to the high roof and is centered in the building. The building lies partially over the low water line of Lake Union and is completely open to the water at the north end and partially open along the east side where a dock abuts the building. The building appears to be on timber piles. There are concrete piers extending below grade and the presumed low water level of the lake at which point there are pile caps and the timber piles. Exterior grade is several feet below the first floor on the south and west sides.

A previous evaluation of the existing structure has shown that it appears to have a live load capacity of 125 pounds per sq. foot at the second floor and 220-250 pounds per sq. foot at the first floor (reference letter dated July 13, 2007) based on structural capacity alone. This evaluation was performed without any additional field verification of the existing structure nor was the capacity of the existing foundations to support these loads verified by a geotechnical engineer. We recommend that the assumptions used to calculate these live load capacities be validated by a testing agency and a geotechnical engineer.

We understand that the building has experienced settlement since shortly after the time of construction. This settlement has been monitored for many years. Several of the new elements planned may increase the loading to the existing foundations and may increase the risk of additional building settlement. Several strategies have been discussed with the geotechnical engineer to better understand and mitigate this risk. Where load to an existing pile or pile group is increased, adjacent piles may be tied in using a concrete or steel beam below the slab to distribute loads.

In 2007 the building was renovated to bring the existing lateral-force-resisting-system up to City of Seattle standards for existing buildings. The building was upgraded to a life-safety standard using FEMA-178 NEHRP Handbook for the Seismic Evaluation of Existing Buildings.

The building is now being updated to meet the demands of MOHAI. The list below schematically discusses the structural implications of the new architectural features on the existing structure. See also attached sketches.

SITE ELEMENTS

Terrace: A new outdoor terrace along the west side of the existing building will consist of an 8-12 inch concrete flat slab supported by driven piles. We understand that driven piles are likely required due to contaminated existing soils. The slab thickness will depend based on what is determined to be the most economical pile layout and the types of piles used. No geotechnical engineering report is available at the time of this narrative. The terrace runs the full length of the west side of the building and has an approximate width of 35 feet.

Canopy: A new free standing steel canopy, with the overall plan dimensions of 20’ x 120’, will be located over the new terrace along the West side of the existing building. The steel canopy will be supported at the foundation with driven piles located under canopy columns.

Loading Dock: A new loading dock will be located at the exterior southeast corner of the existing building. The loading dock will be over-framed on top of the existing wharf and will consist of rigid insulation and a 6” concrete topping slab.

Existing Wharf: The existing timber framed wharf and supporting timber piles on the north and east sides of the building need to be reviewed for their adequacy to support fire truck loading.

BUILDING ELEMENTS

New Elevator: A new elevator will be located in the northwest corner of the exhibits space and will service the first, second and lower mezzanine floors. The existing concrete slab at the first floor will be demolished, locally, to allow for the new elevator pit. This new concrete pit will be hung from the existing first floor structure with a grid system of new concrete or steel beams that will span to existing piles. The elevator will also be braced laterally at the second and lower mezzanine levels with steel elements.

New Lift: A new hydraulic lift will be located in the southeast corner of the existing building and will service the first and second floors. Similar to the new elevator, the existing concrete slab at the first floor will be demolished, locally, to allow the lift pit. The new concrete pit will be hung from the existing first floor structure with a grid system of new concrete beams the will span to existing piles. The second floor concrete slab will also be locally demolished to allow for lift access. New steel beam elements will be added to the under side of the existing structure for support.

New Stairs: Two new steel stairs will be added to the existing building, one located in the northeast corner of the building (stair 3) and the other located in the northwest corner of the building (stair 2), next to the new elevator.

An existing concrete stair is currently located where the new steel stair 3 will be located. This concrete stair will be demolished to allow installation of the new stair. The new steel stair 3 will service the first, second, and lower mezzanine levels. To achieve access to the Lower Mezzanine the existing concrete slab will be locally demolished. New steel beam elements will be added to the underside of the structure to provide support.

Stair 2 will also service the first, second and low roof levels. The stair is broken into two segments that will be supported at the first and second floors by the existing structure. The stair segment accessing the lower mezzanine will be hung from the existing steel trusses that span the exhibition space. These steel trusses will need to be strengthened with steel members to accommodate the additional loads (see below for strengthening).

FIRST FLOOR

In order to support large artifacts and/or temporary exhibit structures strengthening below the slab may be required in 6 to 8 locations. This may consist of new beams tying together the existing concrete piers below in order to better distribute the loads.

LOW ROOF STRUCTURE REPLACEMENT:

To provide greater ceiling height, areas of the low roof structure may be removed and replaced with new structure. The existing concrete beams at approximately 20 feet on-center that frame into columns are part of the lateral-load-resisting-system and must remain. The upturned concrete beams and slab in the area between these beams may be removed. The replacement roof structure consists of intermediate W10 or W12 beams spaced midspan between the existing concrete beams and new 3” metal deck with 3 ½” concrete topping. Miscellaneous steel beams will be required for mechanical unit support. Preliminary calculations indicate that the existing concrete beams to remain are adequate to support the new roof structure and mechanical units. A lightweight mechanical unit support curb is assumed.

ROOFTOP ELEMENTS

Roof Deck: In the northeast corner of the lower mezzanine the existing timber framed roof deck will be removed and replaced with a new roof structure, consisting of concrete pavers, sitting on top of metal deck and topping. The existing concrete beams in this area will need to be strengthened with new steel plates and expansion anchors. Based on the needs of the mechanical system the new roof structure may need to be elevated above the existing concrete upturned beams to allow for pipes and ducts to pass between the new and the existing roof structure. Metal stud pony walls may be used, as required, to achieve this.

New Mechanical Units: Several new mechanical units, weighing approximately 10,000 lbs, will be added to the Low Mezzanine Roof. The existing over-framed timber roof structure will be removed to allow for the new units to sit as low to the existing roof as possible. The new mechanical units will be supported by new steel beams and existing upturned concrete beams. These upturned concrete beams will need to be strengthened with steel plates and expansion anchors. In addition, new metal deck spanning between existing concrete beams will added to support the new roof. Reinforcing beams may be required at new mechanical penetrations through the new and existing roof structure.

Steel Truss Strengthening: The steel trusses over the exhibit space have very little additional structural capacity. These trusses will need to be strengthened with steel plates to support additional hanging loads. To provide an additional live load capacity of 90 pounds per square foot over the entire exhibit space, 40 pounds per lineal foot of additional steel shall be added to the existing top and bottom chords and 14 pounds per lineal of additional steel shall be added to the diagonal and vertical members of each truss.

GENERAL

Overview
The project includes renovating the existing Naval Reserve Building located on the south end of Lake Union to house the Museum of History and Industry (MOHAI), currently located at McCurdy Park. The existing building is approximately 45,000 square feet. The renovation may increase on a temporary basis the Level 2 by approximately 2000 square feet to maximize available exhibit area. In addition, installation of a full coverage wet pipe fire sprinkler system and a preaction system in artifact areas (Temporary Exhibit and Artifact Holding) will be installed in the existing building.

- Mechanical Design Codes/Standards**
City of Seattle 2006 Amendments to the 2003 International Building Code
City of Seattle 2006 Amendments to the 2006 International Mechanical Code
City of Seattle 2006 Amendments to the 2006 International Fire Code
City of Seattle Amendments to the 2006 Uniform Plumbing Code
City of Seattle 2006 Amendments to the 2006 Washington State Energy Code
City of Seattle Amendments to the 2006 Washington State Ventilation and Indoor Air Quality Code
NFPA13 - Standard for the Installation of Sprinkler Systems
NFPA 14 - Installation of Standpipe and Hose Systems

HVAC

General Criteria
Outdoor Design Temperatures:
Summer: 82 F db / 66 F wb*
Winter: 30 F**

Indoor Design Temperatures
Typical Room: 72 F db +/- 5 , 25%-75% RH
Temporary Exhibit: 72° F db +/-2°, 45%-55% RH
Artifact Holding: 72° F db +/-2°, 45%-55% RH*0.5%

*Summer Design Dry Bulb and Wet Bulb from the Puget Sound Chapter ASHRAE Recommended Outdoor Design Temperatures Washington State, April, 1986.
**0.6% Winter Design Dry Bulb from the Puget Sound Chapter ASHRAE Recommended Outdoor Design Temperatures Washington State, April, 1986.

HVAC Systems

The Main Exhibit/Event space will be served by a dedicated HVAC system consisting of two custom rooftop air handling units consisting of supply fan, cooling coil, heating coil, pre-filters, final filters, 100% air economizer, and return fan. The air handling units will be installed in a depressed well. Duct mounted sound attenuators will mitigate radiated and discharge noise levels. Low velocity supply air will be distributed from low-wall displacement ventilation grilles at floor level; stratified return air will be captured as high as possible within the roof support structure and ducted back to the air handling units.

The Level 1 Office and Support areas will be served by two custom rooftop air handling units; the Store/Cafe will be served by one rooftop air handling unit. All three air handling units will be installed in a depressed well and consist of supply fan, cooling and heating coils to temper the air, heat recovery coil, pre-filters, final filters, with associated exhaust fan and heat recovery coil. Minimum ventilation supply air will be distributed to rooms from ceiling diffusers; exhaust air will be in the ceiling, located to eliminate short circuiting. Ductwork will be routed down through the building in shafts. Space cooling will be provided by radiant cooling ceiling panels with zone control. Space heating will be provided by floor mounted hydronic finned tube radiation with zone control.

The Level 2 and Mezzanine Exhibit spaces will be served by two custom rooftop air handling units installed in a depressed well. The air handling units will consist of supply fan, cooling and heating coils to temper the air, heat recovery coil, pre-filters, final filters, sound attenuation, and an associated exhaust fan and heat recovery coil. Minimum ventilation supply air will be distributed to rooms from ceiling diffusers; exhaust air will be in the ceiling, located to eliminate short circuiting. Ductwork will be routed in a mechanical enclosure adjacent to the roof wells. Space cooling will be provided by radiant cooling ceiling panels with zone control. Space heating will be provided by floor mounted hydronic finned tube radiation with zone control.

The Level 2 Temporary Exhibit space will be served by a dedicated custom rooftop air handling unit, providing archival quality air conditioning. The air handling unit will be installed in a depressed well and consist of supply fan, cooling and heating coils, pre-filters, final filters, 100% air economizer, adiabatic humidification, sound attenuation and return fan. Supply air will be distributed to rooms from ceiling diffusers; return air will be in the ceiling, located to eliminate short circuiting.

The Level 1 Artifact Holding room will be cooled and humidified by floor mounted units connected to the condensing units with refrigerant piping.

Multi-level display cases, if incorporated into this project, will be by others, and served by individual HVAC systems built into the casing.

Exhaust fans will serve the Café Prep and support spaces, Public and Private Restrooms, Janitor Storage, and Utility Spaces.

Chilled water will be provided by a 140-ton high efficiency air cooled modular chiller with integral pumping package (Multistack is basis of design), installed in a depressed well on the roof.

Heating hot water will be provided by two 2,000 MBH gas fired high efficiency boilers with variable pumping. The existing gas service is a 2-1/2 inch line; assuming 2 psi at the main the existing gas line should be adequate for the MOHAI project.

A fully integrated DDC building management control system will be installed to control the mechanical system. The building systems will be tested and commissioned in compliance with the Seattle Energy Code.

PLUMBING

There is an existing 3-inch domestic cold water line entering the building into the mechanical room at the south end of the building. Due to the required addition of a wet pipe fire protection system, a combined 6-inch domestic/fire service will be required. A condensing type gas-fired domestic water heater, 120 gph recover with 50 gallon tank will be installed in the existing mechanical. Room localized on-demand wall mounted hot water heaters should be used where practical. New low flow plumbing fixtures will be provided throughout, including dual flush toilets, 1/8 gpf urinals, and sensor operated lavatories.

A 6-inch sanitary waste pipe will exit the building at 5 feet below finished floor in the southwest corner and connect to the new pumps station, installed as part of the Parks renovation project.

Existing rainleader pipes may need to be replaced; to be routed to existing outfalls at the base of the building.

FIRE PROTECTION

A new fire riser and wet pipe system will be routed into the building. It is anticipated that the sprinkler piping will be able to be installed below the existing duct and terminal boxes. According to flow test information provided by Seattle Public Utilities the local water pressure near MOHAI is adequate, thus no fire pump is anticipated.

The existing Naval Reserve Building is located on the south end of Lake Union. This study is to review electrical needs for the building use as the Museum of History and Industry (MOHAI) exhibit and display space.

The following are electrical improvements for this project:

UTILITY SERVICE ENTRANCES:

a) Electrical - new service entrance to be 480Y/277 volt, 2,500 amps. This is sized for the basic estimated needs of the museum. Additional capacity has been included to serve future building additions and possible outdoor events. Service is to be provided via vault mounted transformer provided and located in the Park area to the south of the project building. New (2) 4” conduits from the new electrical room (to be located in the south area of the first floor near the mechanical room) to the Seattle City Light transformer vault approximately 100 feet from the project building.

b) Voice/Data - new service entrance voice and data suitable for museum’s needs, Wide Area Network and Local Area Network environment. Existing fiber and copper to be replaced with new. The new main communication room planned location is in the north area of the first level. Service to connect to Qwest infrastructure provided in the Park south of the project.

POWER DISTRIBUTION:

a) Provide the following distribution systems in the facility: 480Y/277 and 208Y/120 volt normal power

b) Provide electrical rooms specifically dedicated to electrical equipment per NEC. Assume the existing main electrical space will be adequate for new service switchboard and gear. Smaller electrical rooms Closets are to be provided at least two rooms per level.

c) Lighting shall be powered from 480Y/277 volt system where practical and allowed by code. Note there will be a large amount of tack with adjustable fixtures to provide flexible retail, display and exhibit lighting which will require lighting control. 120/208 volt dimming will also be required.

FIRE ALARM

a) Provide an analog addressable fire alarm system as required by the City of Seattle Fire Marshal. System will have manual and automatic detection.

b) Systems requiring fire alarm interface and connection are magnetic door holders including the smoke door detectors, power supplies and controls; smoke damper power and controls; elevator recall, EMCS control interface; sprinkler system interface including valve monitor, pressure and flow switches.

c) The fire alarm systems shall comply with the ADA and WAC requirements.

d) Provide code required fire alarm public address system in assembly occupancies as required by code.

e) Provide central station monitoring capability. Owner will contract separately for the monitoring service.

INTERIOR LIGHTING

a) While specifics of the interior lighting cannot be determined without further development of the architecture, the basic components and proper budget range can be estimated from similar projects. The following sections describe the design assumptions for typical spaces, and appropriate budget numbers based on those assumptions.

b) First Floor Public Spaces, including Entry, Store, Café, Ticketing, Restrooms and Circulation, will function as a gathering place for visitors during daytime and evening. To accommodate this range, the electric lighting will provide general ambient illumination and adjustable accent lighting. Assume a range between \$15.00/sf and \$10.00/sf for installed lighting equipment in these areas.

c) MOHAI Educational Program Spaces will require basic, but flexible lighting to meet the needs of different sizes and types of groups. It is assumed that events will require dimming, and that is included under Lighting Controls below. Lighting equipment will include a combination of direct/indirect fluorescent lighting and wallwashing. Assume a range between \$10.00/sf and \$8.00/sf for installed lighting equipment.

d) Galleries will require both general ambient light that will also function as work and emergency light, and flexible exhibit lighting by others that will have to accommodate a wide range of architectural geometries and exhibit content. This space is shared with artifacts that have a 5 to 10 foot candles limitation. Provide emergency and work lights only in these areas and junction boxes for exhibit systems. Provide panels for connection of exhibit lighting by others. Define the event space of 6,000sq ft in the drill hall and identify the unit cost for fixtures and systems.

e) Administration areas will require good quality ambient office lighting for computer based and print work as well as power for task lighting for specific areas with small detail work. Curitorial and collections areas will require Ultraviolet filters on fixtures.(200 sq. ft. artifact holding) Lighting will be a combination of direct/indirect and wallwash fluorescent and desk or shelf-mounted fluorescent task lighting. Assume \$6.00/sf for installed lighting equipment.

f) Back-of-House Service Spaces, including Loading Dock, Receiving, Storage, Equipment Rooms and other ancillary spaces will require basic but functional lighting equipment such as industrial fluorescent fixtures or fluorescent strips with wire guards. Assume \$3.50/sf for installed lighting equipment. Fixtures to be mounted as high as possible so as not to interfere with artifact movement and storage.

g)Interior Lighting Controls will include a preset dimming system with either a central dimming bank or separate dimming racks distributed throughout the building in association with specific spaces. It is necessary for the following spaces to definitely be included in this system: 1)The portion of the drill hall -approx 50%- that will be used for social events. 2)The classroom, 3&4)the public meeting rooms on the ground floor. The galleries will be developed at a later date and will be a part of the client fit out. For budgeting add an option of 5 spaces within the second floor exhibit galleries to have the simple dimming capabilities. The event lighting system will be developed at a later date and considerations for a control system will be priced at that time. Assume \$2.50/sf for installed dimming equipment.

EXTERIOR LIGHTING

Exterior lighting will include low level and building-mounted fixtures to facilitate circulation as well as some limited accent lighting to enhance architectural features and create a distinctive image for the building. This is extremely difficult to estimate since the Landmarks Board will be involved in much of the decision making. For basic exterior circulation lighting, assume a range between \$15,000.00 and \$25,000 for installed equipment. For building accent lighting, (including at the staff entry and loading dock) assume a range between \$25,000 and \$50,000.

LIGHTING CONTROL

a) Offices, toilet rooms and other interior non exhibit spaces will have motion sensor and automatic daylighting control to comply with City of Seattle energy code. Hallways and stairs will be controlled via low voltage, programmable control system with local override switches.

b) Exterior and building mounted lighting are to use the low voltage, programmable control system with photo cell interface.

SECURITY/ACCESS CONTROL/SURVEILLANCE SYSTEM

a) Provide a new addressable security system to protect the building perimeter and interior areas.

b) Monitor all exterior doors with flush magnetic switches.

c) Provide dual technology detectors in the corridors, administration and other areas.

d) Provide central station monitoring capability. Owner will contract separately for the monitoring service and coordinate with fire alarm monitoring and elevator monitoring needs as well.

e) Provide up to eight card access entry points for staff. To be located at back of house, offices, elevator and at the two bridge levels.

f) Surveillance CCTV system for cameras at Entry Vestibule (1), Group Entry (1), Main Gallery (1), Level 2 Gallery (2), Level 3 Gallery (1), Level 4 Gallery (1), Temporary Exhibits (1), Retail POS (1), Cafe POS (1), Large Meeting (2), Cash Handling (1), Loading Dock (1), Loading Area (1), Artifact Holding (1). System to be digital with monitors and recording at security station.

VOICE/DATA

a)Provide a complete inside cable plant with cables, junction box, termination blocks, patch panels, raceway, cable tray and sleeve system for voice and data.

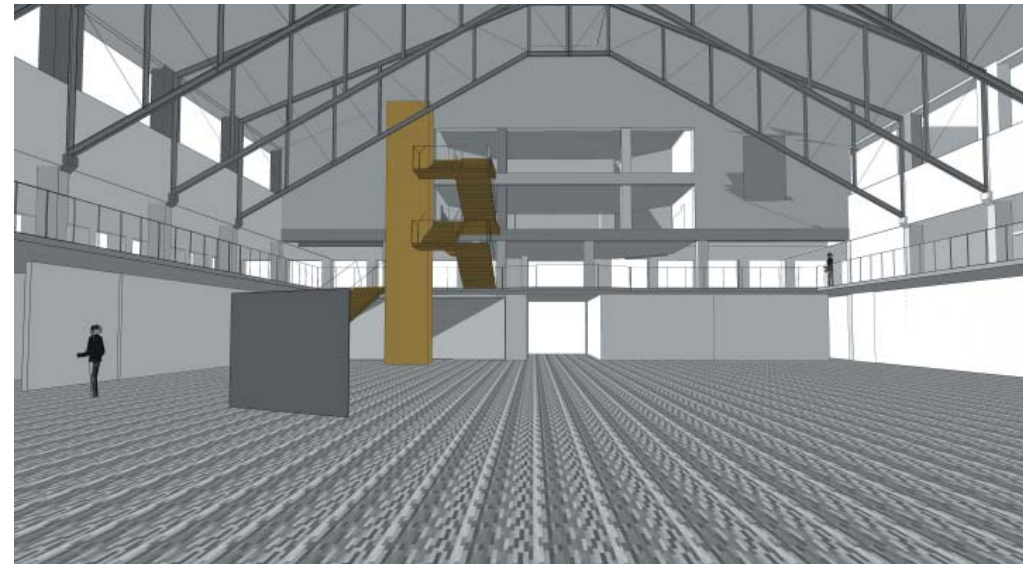
b)Provisions for wireless distribution is to be included.

c)Voice/Data system shall include:

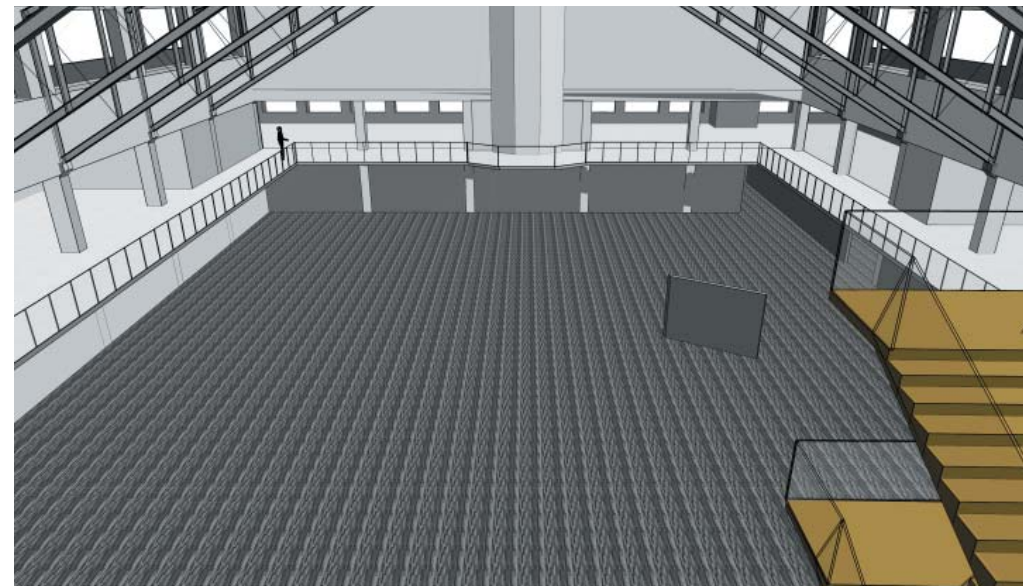
d)Service entrance (local telephone service entrance point). Note trenching and raceways to Qwest service point for fiber and copper connections will need to be coordinated with City of Seattle Parks department renovation plans.

e)Main distribution facility (MDF).

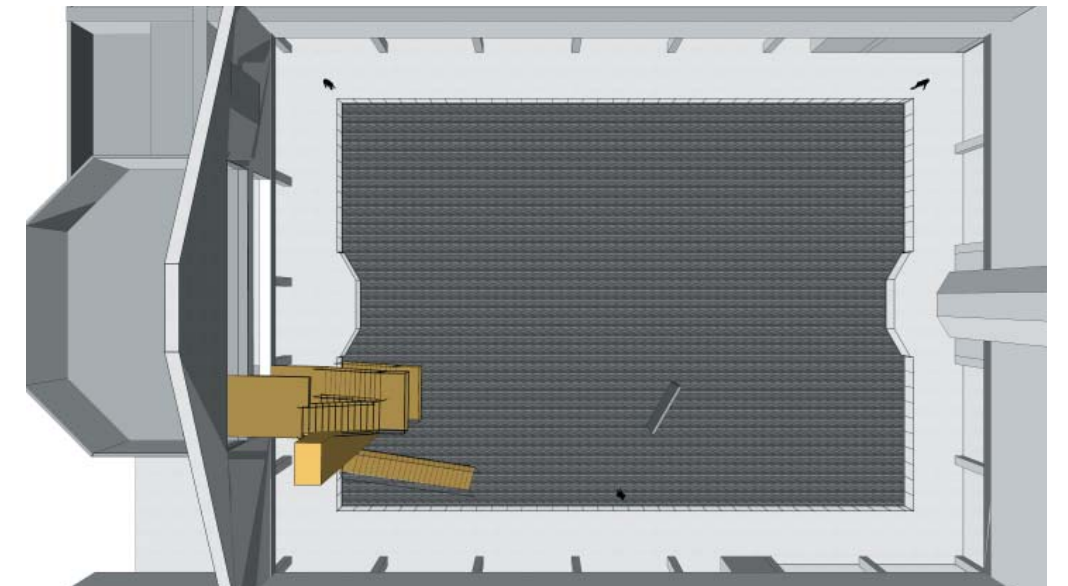
f) Connectivity for voice and data communication.



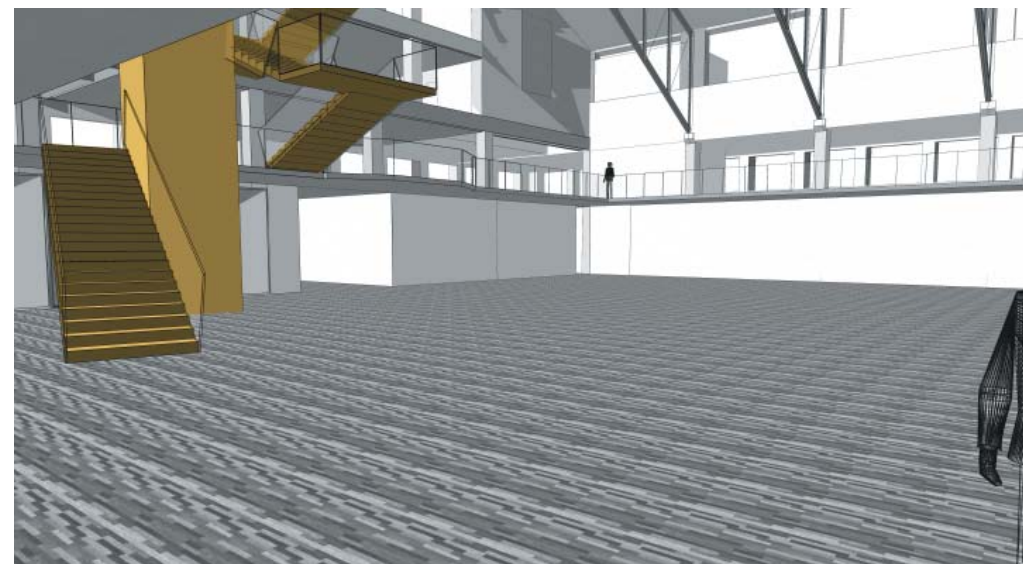
view from south end of first floor gallery



view from upper mezzanine to first floor gallery



view from above



view from entry

The stair will be located in the northwest corner of the main gallery space to optimize wayfinding, progression into the sequence of the second floor exhibits, and ability to vacating the overlook from the mezzanines to the main exhibit space. The stair layout

STAIR PERSPECTIVES