Knight Memorial Library
Existing Conditions Assessment

275 Elmwood Avenue
Providence, Rhode Island

March 22, 2018

DBVW Project No. 1724



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Acknowledgements

The activity that is the subject of this publication has been financed in part with Federal funds from the National Park Service, Department of the Interior. However, the contents and opinions do not necessarily reflect the views or policies of the Department of the Interior, nor does the mention of trade names or commercial products constitute endorsement or recommendation by the Department of the Interior.

I. Executive Summary

DBVW Architects, Inc. was hired by Providence Community Library in August 2017 to conduct an existing conditions assessment of the Knight Library in Providence, RI. This report consists of observations from on-site surveys performed in October and November 2017. They are the result of limited visual inspections of the existing building and site for architectural attributes only. Recommendations and prioritization for observed deficiencies are included at the end of this report to aid in planning future improvements. Existing, non-measured floor plans are also included in the appendices for reference.

The architectural team began by observing the conditions on the exterior of the building. A lift was provided and allowed us to closely observe the condition of the roof and exterior walls on the south and west sides of the building. Due to the grading and curbing, access was not possible on the north and west sides. Although the upper hip roof was recently replaced, the tile roof appears to need remedial work to ensure it remains watertight. The integral copper gutter system has failed and must be removed and replaced. The masonry walls are generally in good condition, except for a section over the staff entry on the west side. Complete repointing and flashing of the cornice, belt course, and water table are also required. The exterior walls will require selective repointing. Exterior windows are in fair condition but require complete restoration and new weather-stripping. The exterior protective panels should be removed, and windows should receive new laminated vandal resistant glazing. The exterior wood doors are in poor condition and should be replaced with new custom wood doors and code compliant hardware.

The building is not fully handicapped accessible. Improvements must be made to provide an accessible exterior entry, install a new elevator, and create code compliant public restrooms. Please refer to Appendix D1, attached at the end of this report, for our previous report and recommendations for accessibility.

The interior of the building requires wall and ceiling plaster repairs in numerous areas of water intrusion. This work should not be undertaken until the roof and gutter work are complete and the building has been allowed to thoroughly dry out. Interior resilient, carpet, and linoleum finish flooring is in poor condition and should be replaced as part of future interior renovation work. The decorative plaster ceilings in the reading rooms and over the mezzanines exhibits cracking throughout. Additional investigation is required to determine the cause of the cracking and develop a recommended plan of action. Interior doors are only 30-inches wide and have non-handicapped accessible knob-style hardware. Doors and hardware in public areas should be made handicapped accessible. Wall mounted handrails should be installed at all egress stairs.

A list of recommendations and order of magnitude budget costs was developed as part of a high-level exercise to assist in decision making for future improvement planning.

II. Project Team

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III. Building Background

The Knight Memorial Library was designed in 1922 by the prominent New York architect Edward Lippincott Tilton in the Renaissance Revival style. The cornerstone was laid in 1922, and construction occurred from 1922 to 1924. The building opened to the public in 1924. Tilton began his career working for the well-known New York architectural office of McKim, Mead and White. After studies at the Ecole des Beaux-Arts in Paris, he and partner William A. Boring, won a competition in 1897 to design the first phase of new buildings for the United States Immigration Station on Ellis Island in New York. Seven years later, their formal partnership was dissolved; and Tilton formed his own firm. He went on to specialize in the design of libraries and educational buildings.

The Knight Library features a large central hall with flanking reading rooms on a raised first floor, the piano nobile, located above three stories of a freestanding, cast iron/steel and stone slab floor book stack core. The building is approximately 25,435 gross square feet (gsf) in area. The stacks occupy approximately 6,966 gsf. The exterior is clad with Indiana limestone. The building is capped with a distinct green glazed Ludowici barrel tile roof which culminates in a hip ringed with decorative copper cresting. The detailing of the building is influenced by Italian and Greek precedents. Fortunately, from a historic preservation point of view; little has changed from the time of the original construction.

IV. Architectural Assessment

A. Roof

Main Roof:

The main portion of the roof consists primarily of steep slopes with a rise of approximately 7-inches for every 12-inches horizontally. (+/- 7:12 slope) The roof is covered with Ludowici clay barrel tile shingles with a distinctive green glaze, meant to mimic patinated copper. The hip ridges at each corner of the building are covered with matching barrel tile caps. (Photo #1) The tile appears to date from the original construction in 1922-1924. It is unknown if asphalt felt underlayment was included as part of the original construction.



1 - Hip Ridge (East Elevation/South Side)

The shingles terminate at the eaves with a continuous copper drip edge flashing, which interlocks with the integral copper gutter. The shingles terminate at the upper roof under the original decorative copper band. Clay stops were utilized in the original construction to prevent wind driven rain from getting behind these terminations. The stops appear to be loose and have dropped and are missing in numerous locations around the building. (Photo #4) Vent pipe penetrations are flashed with copper boots and counterflashing; and appear to be in good condition.



2 - Hip Ridge (West Elevation/South Side)

Numerous repairs are evident all around the building. Earlier repairs appear neat and reasonably well executed; and utilized matching clay tiles secured with copper clips. Later repairs appear sloppy; and utilized similar but non-matching clay tiles in bright green and red colors. They appear to be secured with roofing cement and standard fasteners. The roofing cement is both gray and red in color, and does not match the original construction. It is also spread over adjacent tiles; presumably to ensure a watertight seal at the repaired areas. (Photo #2) The later repairs compromise the visual integrity of the green roof.



3 – Damaged Clay Tile Shingle

Cracked and missing tiles were also observed all around the building. (Photo #3) The greatest damage appears to occur at the eaves where many shingles are broken, and at the hip ridge caps

where several cap tiles are missing. In places where caps are missing, the original wood grounds are visible and exposed to the elements. Some of this damage may be attributable to improper access and protection for previous repair work.

Although there are many deficiencies, generally the clay roof tile appears to be in good condition. Since the life expectancy of clay tile roofs is typically more than one-hundred years, we recommend corrective work be undertaken to holistically address the deficiencies and problem areas. This will ensure that the building remains watertight, and will prolong the life of the roof and building. It will also preserve an important character defining feature of this historic building.



4 - Missing Stops at Decorative Copper Band

Gutter System:

The steep slope roof drains to an integral perimeter gutter, fully concealed within the limestone cornice. (Photo #5) It is fully lined with copper and appears to have a flat bottom. The gutter measures approximately 9-inches deep by 11-inches wide; and appears to date from the original construction. The copper extends up under the clay tile and secures into a continuous copper drip edge. It also overlaps approximately 3-inches onto the top of limestone cornice cap where it terminates in a horizontal reglet. The joint was originally leaded to make this connection watertight.



5 – Typical Integral Gutter, Eave and Cornice

Concealed conductors and leaders are located at each corner of the building. The vertical rear wall of the gutter has a round indent to accept the strainer assembly. (Photo #6) Leaders consist of cast iron piping and are concealed within the exterior masonry walls; and connect to the internal plumbing drainage system.

On the date of inspection, approximately 1-inch of standing water was observed throughout the gutter system; most likely due to the flat bottom and debris around the conductors. The copper appears to have been repaired numerous times. Earlier repairs to the seams appear to utilize Lexonite. Later repairs to the reglet on the cornice cap stone appear to utilize sealant. (Photo #7) Large sections of copper appear to have been covered with a green elastomeric coating. No



6 – Typical Integral Gutter Conductor at Corner

visible pitting or pin holes were observed. It is important to note that expansion joints are not present in the copper gutter system to relieve stresses due to thermal movement. This may explain the widespread copper joint failure and previous repairs.

Evidence of water infiltration in the walls below the gutter was observed in several areas of the attic. Re-lining the gutter system will not adequately address the known deficiencies. We recommend complete removal and replacement in-kind, utilizing new copper. This will afford an opportunity to inspect and repair any concealed problems with the masonry back-up construction. The new copper gutter should include some provisions for sloping towards the conductors and expansion joints at the mid-point of each gutter run. It should also be extended to wrap over the top of the limestone cornice cap to better protect the horizontal reglet and the joints between the stone sections.



7 – Typical Integral Gutter

Limestone Cornice:

The limestone cornice around the building has numerous water stains, atmospheric deposits, and biological growth. (Photo #8) The biological growth is present on the east, west and south sides of the building. Sealant was also observed on all horizontal joints on top of the cornice. This appears to be part of an old repair campaign, done to correct deteriorated mortar joints. The sealant is no longer fully elastic, has cracked, and is pulling away from the adjacent stone. The sealant is generally in poor condition and must be replaced.



8 – Typical Limestone Cornice

Water continues to saturate the stone. It is infiltrating at the top in the failed sealant joints and seeping from behind due to the compromised integral gutter system. Given the extent of past repairs, it appears that the gutter and cornice have been problematic for a long time. The water is causing damage to the underside of the cornice and appears to be seeping into the wall behind and below. Evidence of previous stone patching and repairs, and masonry joint repointing were observed around the exterior of the building. (Photo #9) These previous repairs have subsequently deteriorated. Water infiltration is also evident inside

the attic. Efflorescence and water stains are evident on the knee-wall in the attic.

We recommend removing the sealant in its entirety, removing any loose mortar and installing pre-fabricated lead flashing strips bed in sealant to make the joints in the top of the cornice weathertight. The cornice face and underside should also be re-pointed in their entirety. When work is undertaken, the stone should be allowed to adequately dry out prior to repairing and covering with a new copper gutter system. The cornice should also be cleaned to remove the water stains, atmospheric deposits and biological growth with a restoration type masonry cleaner. Due to over saturation of the stone, careful consideration should be given to installing a breathable sealer to prevent future absorption of water. If installed, this should be included in the building maintenance program and scheduled for a re-application every 5 to 7 years.



9 – Old Limestone Cornice Repairs

Upper Roof:

The upper "flat" section of roof consists of a low slope roof covered with 0.60 mil thick EPDM. A large metal framed glass skylight is present at the center. (Photo #10) The entire roof was replaced back in 2012. The original drawings indicate this was a metal roof, which was most likely covered with flat seamed fully soldered copper. It is unknown if the copper is still present under the EPDM. Tapered rigid insulation is present to direct water to the perimeter; and onto the steep sloped roofs. The perimeter of the roof is edged with a new perimeter copper drip edge. The original decorative copper cresting was re-soldered to retain the visual integrity of the building. (Photo #11). An original copper ventilator is present near the center along the east side of the building. The base of the ventilator is approximately 4-inches above the finished roof covering. The unit should be removed and replaced on a new 12-inch high curb.



10 – Upper Roof and Central Skylight

In general, the upper roof appears to be in very good condition. The life expectancy of EPDM is approximately twenty years. However, the joints and sealant between the sheets and flashings are

typically problematic in this type of roof system. We suggest implementing a program to inspect the roof and repair seams, if necessary, every few years to ensure the roof remains watertight.

A new insulated metal roof hatch was also installed as part of the 2012 roofing work. We recommend installing walkway pads around the roof hatch to prevent undue wear on the membrane covering.



11 – Upper Roof Edge and Cresting

Roof Structure/Attic:

As indicated on the original drawings, the roof deck consists of a 6-inch thick reinforced concrete deck with a 2-inch thick nailable concrete topping on the steep sloped areas. Sections of the original formwork are still present in the attic. The condition of the underside of the concrete deck was reviewed from the attic; and although areas of previous patching and water stains were observed, the deck appears to be in good condition.

The roof construction is un-insulated. At some point, blown-in fiberglass insulation was added over the attic floor to increase energy efficiency for the interior spaces below. Since the insulation is easily displaced, we recommend consideration be given to removing it and replacing with rigid mineral wool insulation. This is not an immediate priority.

The attic also includes a steam heat loop around the central skylight and an insulated steam main at the perimeter to feed the mezzanine radiators below.



12 – General View of Attic toward Central Skylight

Central Skylight:

A large skylight is present in the center of the upper roof. (Photo #13 and #14) It appears to date from the original construction. Many panes of wired glass are cracked or broken. The glass is not fully tempered and most likely does not meet OSHA requirements for fall protection. Two copper ventilators are located at the ridge of the skylight. It is unknown if they still function. The copper flashings and battens appear damaged and compromised in numerous locations. The base of the skylight is approximately 8-inches above the finished roof surface. It consists of EPDM flashing

adhered over the original copper base; and tucked under the original copper counterflashing.

The original design included the skylight as a means of introducing natural light and ventilation into the central reading room. At some point during the 1950's or 1960's, the skylight was modified. The attic enclosure walls were opened to install a false ceiling between the inner glass screen and the outer sloped skylight. The work appears to have been done to introduce fluorescent lighting above the glass screen. The lights are no longer functional and have been abandoned in-place. Three piles of replacement glass are also present in the attic.

Overall, the skylight is in poor condition. We recommend replacing the skylight with a new metal framed unit glazed with insulated fully tempered frosted glass. The base should be set so it is a minimum of 12-inches above the finished roof surface to prevent water infiltration.



13 – Central Skylight Exterior



14 – Central Skylight Interior

Rear Skylight:

A skylight is also present in the steep sloped clay tile roof on the rear/west side. (Photo #15) It is located over the original elevator shaft, and appears to date from the original construction. Two panes of wired glass are cracked and broken at the bottom of the skylight. The glass is not fully tempered. The copper flashings appear to be covered with an elastomeric coating. Water staining on the interior plaster below is minimal. The head flashing has accumulated a small pile of debris in the middle which should be cleaned out. In general, the skylight appears to be in stable condition. We recommend replacing the glass and repairing the skylight as part of the roof repair campaign.



15 – Rear Skylight

Chimneys:

Two large chimneys are present on the rear/west side of the building, near each exterior corner. (Photo #16 and #18) They appear to be constructed of cast stone and limestone, with brick back-up construction. A large limestone cap, with unprotected flue openings, covers the top. A small copper louver is present on the west side of each chimney.

The chimney nearest to the south side has one brick flue extension with two open sides and a stone cap. The chimney nearest to the north side

serves the main boiler plant and is substantially taller in height. It has damage to the limestone profiled cap. There is a missing section of stone and dark staining is present on the limestone. (Photo #17)

The mortar joints have deteriorated in several areas and are in poor condition. Evidence of past repair and patching work was observed. The cast stone appears to be weathered; but in good condition. Base flashings consist of the original copper step-flashings. Copper clad crickets are present behind the up-slope side of the chimneys. The copper appears to have been repaired in several spots; and has been covered with a green elastomeric coating.

We recommend re-pointing the masonry, installing new metal caps with screening to prevent pest intrusion, repairing the damaged stone, and installing new copper flashings and crickets as part of the gutter and roof repair work.



16 – Chimney on West Side at South Corner



17 – Chimney on West Side at South Corner

B. Exterior Walls

Exterior walls consist of smooth faced, coursed, Indiana limestone blocks above a base of granite. The exterior walls are adorned with elements from Renaissance architecture. (Photos #19, #20 and #21) It is interesting to note that the original drawings depict a brick exterior on the building, set in a running bond, with limestone trim and accents; and a main entrance surround of glazed terracotta. The upgrade to limestone on the exterior walls certainly created a more impressive and stately public library.

Back-up wall construction consists of multi-wythe brick masonry. As indicated on the original drawings, the width of the brick back-up wall varies from approximately 20-inches thick at the foundation to 16-inches thick at the roof. Exterior walls appear to be solid and fully mortared, without weeps and insulation. Through-wall flashings were not observed.

A large, distinctive, profiled limestone cornice and frieze are present at the roof; and wrap around the building. A doric triglyph and metop frieze consists



18 – Chimney at West Side at North Corner

of dentil work directly under the cornice which sits upon a carved molding. The molding runs along the top of a wide band containing a carved repeating pattern of fluted pilasters and coffered panels. (Photo #22) The frieze also contains ornate carvings depicting acanthus leaves at each corner of the building. (Photo #8) The main entrance has a flat section with carved lettering bearing the name of the library. A carved cornerstone is located at the northeast corner of the building.

The exterior walls are adorned with several other notable features. A projecting horizontal accent band is present at the level of the main floor. Joints between the stone sections are mortared, without flashing. The base of the building consists of a profiled water table located below the lower level windows which steps out to engage the ground.

Large projecting flat quoins are present at each corner of the building, and visually tie the roof to the base. (Photo #23) Two pilasters are also located on the west side of the building which bound a service zone. The ornate embellishment and water table seen on the east, north and south sides of the building does not extend into this area.

Profiled limestone surrounds are present on the punched window and door openings. (Photo #24) They mimic Renaissance architecture and form elegant frames for the windows and doors. The main entrance also has a highly decorative and ornate arched top surround with a scrolled keystone at the top of the arch. (Photo #24)

The surrounds on the main level are arched, and the lower level are square. Flashings were not observed at any of the tops. Surrounds are not present on the west side of the building within the service zone. Windows in the service zone are punched directly into the main limestone façade. The personnel entrance is the only exception as it has a profiled surround which also includes a transom window. In general, the limestone surrounds appear to be in good condition. Only one damaged area was observed on a main level window located on the west side of the building. The right side of the window head has a large chunk of missing stone most likely from a past impact and must be repaired.



19 – Main Elevation



20 – Typical Exterior Wall



21 – Limestone Wall

Mortar is generally intact and appears to be in fair condition, except near the cornice as noted in the roof section of the report. Several other areas around the exterior of the building have missing or deteriorated mortar joints. This appears to be prevalent at places where water can sit on a horizontal surface, particularly at the window openings, the horizontal accent band and the water table.

Evidence of previous stone patching and repairs, and masonry joint repointing were also observed around the exterior of the building. In general, the previous repairs appear to be in fair condition. A non-original sloped mortar wash was observed between the windows on the front/east side of the building. The mortar wash is clearly not original and should be removed.

The limestone has numerous water stains and atmospheric deposits. However, no major cracks were observed on the exterior envelope. A large area of damaged stone with severe efflorescence is present on the west side of the building. (Photo #25) It is located above the staff door at the mezzanine level between the windows. It may be the result of a gutter failure, or a leaky steam or plumbing line buried within the exterior wall construction.

Large areas near the base of the building are covered with paint applied to conceal past vandalism from graffiti, particularly on the west and north sides of the building. Small areas of newer graffiti are also scattered around the building. It is important to note that applying paint to cover up graffiti is not a recommended practice since it can be absorbed into the historic masonry. Limestone is particularly porous in nature.

In general, the exterior masonry is in good condition. We recommend undertaking a selective repair and repointing campaign to ensure the exterior remains watertight. The damaged areas noted above should be repaired. Repointing may be assumed to be required for approximately 30% of the wall area.

Consideration should be given to raking out the mortar joints at the horizontal accent band and



22 - Frieze



23 – Quoins at Building Corners



24 – Main Entrance and Window Surround

water table, and installing pre-fabricated lead flashing strips bed in sealant to make the horizontal joints weathertight.

We also recommend removing the paint and graffiti areas in accordance with the U.S. Department of the Interior, National Park Service - NPS Technical Preservation Brief #38 "Removing Graffiti from Historic Masonry." The paint should first be removed utilizing a gentle paint remover. Then, underlying graffiti may be removed with a slurry of water and a poultice. A small test area, located in an inconspicuous spot, is recommended to ensure the process does not damage the stone. The test should be executed prior to making a final decision on the removal methods. Consideration should be given to applying an anti-graffiti coating.



25 – Damaged Stone on West Side

C. Windows

The existing windows throughout the building are true-divided-light, wood double-hung units. As stated in the masonry section above, the upper sash on main level have arched tops. (Photos #26 and #27) The windows on the lower level have flat tops. The windows are painted on the exterior, and stained on the interior. The windows all appear to date from the original construction.

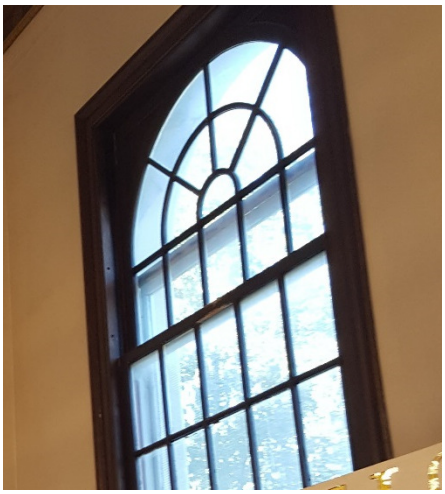
One of the windows in the main level reading room was recently restored as part of a local educational project. The window is in excellent condition.

Glazing throughout appears to consist of single-pane plate glass. This glass is not fully tempered and is therefore particularly un-safe when broken. Regular plate glass forms very sharp and dangerous shards.

The windows are covered on the exterior to prevent damage from vandalism. The main level windows are protected with hardware cloth secured to painted wood frames. (Photos #28 and 29) The lower level windows are protected with painted expanded metal screens secured to steel frames. Several windows have damage from BB gun shots. The protective devices are not original, but appear to be effective in preventing damage



26 – Exterior Window at Main Level



27 – Interior if Window at Main Level

from thrown objects. Since the protective devices are unsightly, we recommend removal.

Hardware consists of bronze sash chains and lead counter weights concealed in pockets within the wood window frames. A few windows appear to have broken or missing chains. Pole sockets are present on the upper sash, since the original intent was to operate only the upper sash. However, at some point the lower sash began to be normally operated. This has caused damage to the top rail of the bottom sashes in the main level reading rooms.

Interior decorative leaded glass panels are present in the meeting rooms on the main level. They operate as hinged units which swing into the room. They appear to date from the original construction. The windows are in good condition. (Photo #30)

The wood sash and frames appear to be in good condition. The exterior surfaces need to be re-painted. The existing sealant between the wood frames and the surrounding stone has failed in many locations and should be replaced. (Photo #29) It is unknown if the original systems utilized lead-based paint or PCB-containing sealants. This should be verified as part of any future work.

In general, the windows are in fair condition, but need attention. We recommend a comprehensive window restoration campaign be undertaken. The sash should be carefully removed and sent to an off-site workshop where they can be repaired and restored. Glass should be replaced with laminated vandal resistant glazing and re-set with new glazing points and glazing compound. The existing frames and sills should be repaired and re-painted, and bronze weather stripping installed. New parting beads may also be required. The sash should then be re-finished and re-installed in the original openings. Missing hardware should also be replaced.

D. Doors

Exterior doors are located at the main entrance, the two lower level entries flanking the monumental exterior stair, lower level auditorium, staff entry,



28 – Exterior Window



29 – Exterior Window Protective Screen and Sill



30 – Meeting Room Interior Leaded Glass Panels

loading dock, and mechanical room. The doors are not currently handicapped accessible.

The main entrance has a pair of decorative sliding bronze clad paneled outer doors. The doors are functional and are used to secure the building at night. Detailing incorporates heavy molding surrounds, panels, and recessed paneled stiles and rails. The doors are set into a large bronze clad frame topped with a decorative Greek key design, and ringed with a pattern of acanthus leaves, laurels, and egg and dart moldings. (Photo #31) The transom above the doors consists of a decorative bronze grille. The interior main entrance doors are double-leaf, clear finished wood, in-swing doors with raised wood panels in the lower sections and a glazed upper vision panel. Glazing is single-pane plate glass. Hardware consists of push/pulls and spring hinges. (Photo #32) Both sets of doors are only 30-inches wide. In general, both the outer and inner doors appear to be in good condition.

The remaining doors consist of double-leaf, wood doors with wood panels in the lower sections and a glazed upper vision panel. (Photo #33) Glazing is single-pane plate glass, and has a protective metal screen. The doors are set into wood frames, with a true-divided light, wood transom window above. The doors are only 30-inches wide. Similar doors are present on the north side of the building, except the doors have wood panels in the upper sections in lieu of glazing. The panels in the lower sections are also damaged and are covered with plywood. Hardware consists of older style exit devices with vertical rods. The exterior thresholds are bronze. The door closers are in poor condition. Weather-stripping is negligible or non-existent. Wood door frames exhibit damage from continued exposure to water. The doors are damaged from continued use. In general, these doors are in poor condition and should be replaced with new custom wood doors to match the existing, with fully tempered glass vision panels. The frames should be repaired and repainted, and new weather-stripping installed. Modifications for handicapped accessibility should be undertaken at one of the lower level entrances. The operable door leaf must have a minimum clear width of 34-inches.



31 – Main Entrance Outer Doors



32 – Main Entrance Interior Doors



33 – Lower Level Entry Doors

The staff entrance on the west side of the building, located in the service area, consists of a painted hollow metal door and frame. This was retrofit into the original wood frame. A newer style rim mounted exit device and closer are present. The door is in fair condition.

E. Exterior Stairs

The main entrance is accessed via a large monumental central granite stair. The stair has an elegant design that utilizes two side flights which join into a central landing and continue up to the main doors. (Photos #34 and #35) Cheek walls consist of carved limestone. The granite treads were recently repaired and re-set. It is important to note that the original drawings depict granite cheek walls; and two, bronze light fixtures at the upper landing. The bases of these fixtures are still evident. One bronze railing remains in the center of the upper stair run. The stair lacks any handrails or guardrails on the remainder of the runs. The current stair is not code compliant. The limestone cheek walls appear eroded from weathering, skate boards, and exposure to de-icing salt. Areas of staining, efflorescence, paint applied to conceal past vandalism, and graffiti were also observed. The granite treads/risers are in good condition. We recommend restoring the limestone cheek walls and installing new code complaint railings.

A cast-in-place concrete stair connects the basement mechanical room up to grade. A painted steel guardrail protects the top of the retaining wall. The railing is in poor condition due to corrosion, and does not meet current code requirements. The guardrail should be replaced.

A small loading dock is also located on the west side of the building. (Photo #36) It consists of a concrete structure wrapped with limestone slabs and granite stair treads. The dock exhibits severe damage from water infiltration. A non-code complaint rail is present on the open side. The dock should be repaired; and the railing replaced.

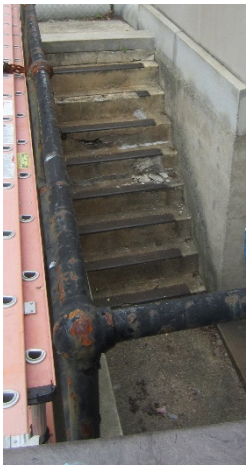


34 – Central Monumental Stair



35 – Central Monumental Stair Side Flight





36 – Loading Dock and Mechanical Room Stair

F. Interior Walls, Columns and Floors

Walls:

The interior walls throughout the building generally consist of flat, smooth plaster applied as a three-coat system directly over terracotta back-up construction. The original drawings call for a 2-inch terracotta furring over the brick exterior walls, and 4-inch thick terracotta for the interior walls. Ornamentation and embellishment appears to be concentrated on the main level and entrances since these constitute the primary public zones. In general, the plaster and painted finishes are in fair condition, except as noted below.

Plaster damage appears to be prevalent at the high section of wall, up near the decorative frieze band at the ceiling. This is most likely due to continued water infiltration from the failed perimeter gutter system. Recent repair work is evident as "white" unpainted plaster. (Photo #37) Extensive plaster damage is present on the exterior walls and ceilings on each of the mezzanines. A large stepped crack is present at the office wall adjacent to the stair on the east mezzanine. However, more damage was observed on the west mezzanine. (Photo #38) Water damage was also observed at a few of the piers between the exterior windows. Repair of the damaged plaster is not recommended until the new roof work has been completed; and the building has been allowed to dry out. Repairs made prior to this will undoubtedly fail and result in unnecessary added cost.

Walls enclosing the rooms under the mezzanines consist of custom stained oak, with built-in wood book shelves, approximately 60-inches high; and leaded glass transom windows above. (Photo #39) The wall into the staff support room behind the circulation desk has a built-in, double-sided card catalog drawer system. Wall base consists of 6-inch high wood base under the bookcases in the reading rooms, and green marble approximately 4-inches high in the atrium. A few damaged panes of leaded glass were observed in the transom windows. This treatment is also consistent around the stairs, main entry vestibule, library support spaces, office, and conference room. A similar



37 – General View of Reading Room



38 – Plaster Damage at Mezzanine



39 – Walls under Mezzanine

treatment is also present on the room on the east mezzanine.

The main conference room has wood paneling and trim, approximately 60-inches high; with plaster walls above. The plaster is separated into panels with wood verticals trim, chair rail cap, and a small crown molding at the ceiling. Wall base consists of green marble approximately 4-inches high. Damage was observed adjacent to the electrical outlet and door. (Photo #40)



40 – Conference Room

The main entrance walls are covered with full height marble, and have an ornate plaster molding at the ceiling. Gray marble slabs are set into a panelized frame of green marble. (Photo #41) The exterior doors have an ornate frame of green marble. The original bronze dedication plaque is also present.



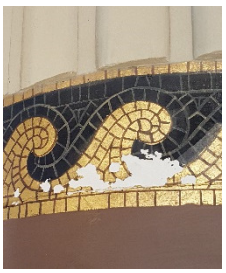
41 – Main Entry Vestibule

Main Level Columns:

Large columns with decorative plaster enclosures surround the central atrium, and visually support the decorative frieze and ceiling under the central skylight. (Photo #42) The enclosures conceal the building's cast-in-place concrete structural columns. The plaster column enclosures are round, except for the ones located at the corners of the atrium which are square. The columns engage the edge of the mezzanines.

The column capitals are in the Ionic style, with scrolled ends, and are gilded to highlight the details. The round columns have fluted shafts which rise from smooth bottom sections, approximately 66-inches in height. The square columns are similar except with smooth shafts. The columns have a two-tone paint scheme. The bottom section has a faux painted band with a mosaic wave design at the top; and a decorative molding and Greek key band near the base, approximately 2-inches high. The column bases are octagonal-shaped, green marble, approximately 4-inches high.







42 – Main Level Columns

The column capitals appear to have been recently repaired and repainted. However, the faux painting and plaster bottom sections exhibit signs of wear and tear and damage from impact. Vertical cracks

are present on several columns. The column enclosures should be restored and repainted.

Floors:

Finish flooring varies by location within the building. Since the main level and entrances are the primary public zones, they have a higher level of finish. Support spaces and utility areas typically have either resilient flooring or exposed concrete floors with resilient wall base.

Tile: The central atrium flooring consists of tile, in varying sizes, approximately 24-inches square and 24-inches wide by 36-inches long. A formal gray marble border wraps the area, it is approximately 30-inches wide, and corresponds to the columns. The underlying floor structure in this area is the top of the multi-level self-supporting library stack system.

VAT: The reading rooms, lower level children's room, auditorium, and lower level corridor flooring consists of 9-inch square resilient tiles; which appear to be VAT (asbestos containing material). This should be confirmed by a hazardous material specialist and licensed testing agency. The tiles in the reading rooms and children's room are set in a repeating block pattern; and utilize separate field and accent colors. Except for a few cracked tiles, the flooring is in fair condition. Future renovation work should include abatement and replacement with new resilient and/or carpet tile flooring.

Carpet: Broadloom sheet carpeting is present in the west section of the main level reading room. The carpet is in poor condition and should be removed.

Linoleum: The mezzanine flooring consists of linoleum sheet goods over the original concrete deck. The linoleum is in poor condition and should be removed and replaced.

Stone: The finish flooring in the main entry vestibule and lower level entrances consist of gray marble slabs. The main entrance also has green marble accents. The marble is in good condition, except for the lower level vestibule on the east side of the building, to the south of the main central entry stair. The marble slab at the exterior door has cracked and



43 – Main Level Flooring



44 – Library Stack System

heaved, and presents an unsafe condition. This should be removed and temporarily replaced with lightweight cementitious fill, since this entry is slated to be renovated to serve as the handicapped accessible building entrance.

The finish flooring in the stairs consists of gray marble slabs, set onto the steel stair structure. A few sections of marble flooring have cracked in the stairs, one loose slab is present near the door to the main level. This should be repaired and re-set. The flooring in the library stacks consists of gray marble slabs set into the metal frame of the self-supporting library stack system. The marble flooring should be cleaned and sealed.

G. Interior Ceilings

The interior ceilings throughout the building consist of flat, smooth plaster applied as a three-coat system directly over expanded metal lath and a black iron support structure. Iron strap anchors were observed penetrating the attic floor slab, at the mid-span of the ceiling panel. A larger cavity space is present above the ceilings over the mezzanines.

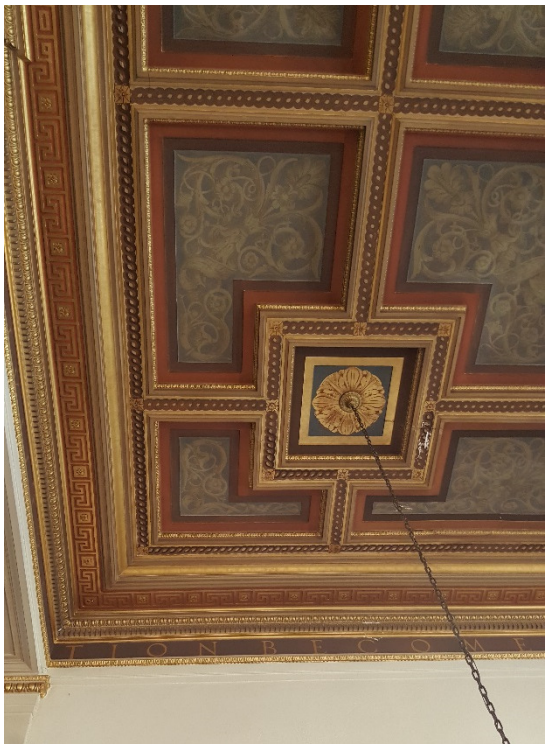
Damage from water intrusion is evident, and appears to be prevalent on the main level, at the perimeter of the building. Significant plaster damage is present on the west mezzanine. This is most likely due to continued water infiltration from the failed perimeter gutter system. It is unknown if the black iron supports and attachments are compromised from rust due to prolonged water exposure.

Ornamentation and embellishment appears to be concentrated on the main level and entrances since these constitute the primary public zones.

In general, the plaster and painted finishes are in fair condition; except as noted below. Repair of the damaged plaster is not recommended until the new roof work has been completed, and the building has been allowed to dry out.



45 – Reading Room Ceiling

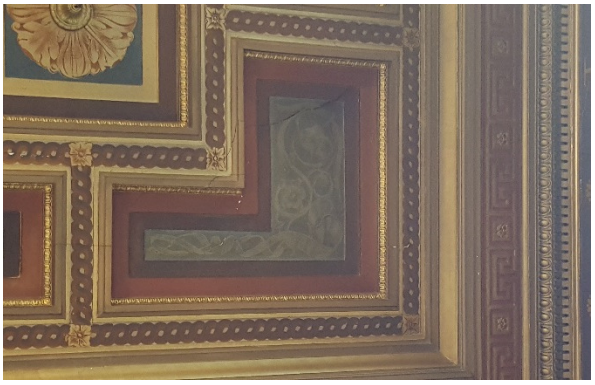


Reading Room:

The ceiling is embellished with a decorative cornice, border and frieze. A pattern of ribs and flat panels with roped putty moldings and rebates is employed. (Photo #45) Light fixtures are centered on panels which "interrupt" the regular pattern. (Photo #46-A) Faux painting and polychrome colors are utilized to create a sense of richness and elegance. The ceilings located over these areas are higher above the finish floor below than the ceilings located over the mezzanines.

The ceilings are riddled with cracks in both the ribs and flat panels. (Photo #46-B) The cause of the cracking is not apparent. Evidence of past campaigns of repair work was also observed. Signs of patching and over painting are clearly visible throughout.

Additional investigation is required to confirm stability of plaster ceilings to develop an appropriate plan of action.



46-B – Reading Room Ceiling Cracks

Central Atrium Skylight:

The area directly under the skylight is covered with a flat inner glass screen consisting of frosted glass panes set into a metal frame. (Photo #47) The glass exhibits water staining from the skylight above. The glass is not fully tempered.

The ceiling area surrounding the inner glass screen consists of a system of plaster ribs and flat panels with ornate moldings, rosettes, trim, and cornice. (Photo #48) Original ventilation louvers are present in each panel, on all sides of the inner glass screen.



47 – Central Atrium Ceiling

A decorative frieze with plaster casts of classical Greek architecture surrounds the atrium. The original drawings indicate "Stock frieze. See catalog of P.P. Caproni & Bro. Boston, Mass. No. 7000." A little research yielded the following information. P.P. Caproni and Brother was the main supplier of high quality plaster casts to universities and museums throughout the United States from 1892 to 1927. The casts were faithfully cast from molds taken from the original carvings. Missing sections and imperfections on the originals can be found on the casts. The casts were typically used as a teaching tool, which explains why they were



48 – Central Atrium Ceiling Detail

most often seen in schools, museums, and libraries. The scene depicted around the Knight Library atrium is the eastern frieze of the Parthenon. (Photo #49)

This area of the ceiling and wall above the frieze appears to have been extensively repaired and repainted. A few minor cracks and water stains were observed. In general, this area is in good condition.



49 – Central Atrium Frieze

Lower Level:

The ceilings in the lower level consist of flat, smooth plaster applied as a three-coat system directly over expanded metal lath and a black iron support structure. Ornamentation is much simpler and consists of a small plaster cornice and moldings. The ceilings are interrupted by dropped structural beams. The auditorium also has direct-glue applied acoustic ceiling tiles. These were installed to improve acoustics and may have been installed in the 1950's. It is unknow if the tiles or the glue dabs contain asbestos, this should be confirmed by a hazardous material specialist and licensed testing agency. In general, the ceilings are in good condition.

H. Interior Doors

Interior doors throughout the building consist primarily of oak, stile and rail, two-panel doors; set into wood frames. Doors into public areas have transom windows above. Metal clad wood doors in metal frames are located on utility/mechanical rooms, and into the central book stacks. Doors located in support and back-of-house areas have solid panels. Most of the doors appear to date from the original construction. Doors we would expect to be fire rated in modern construction, such as at the mechanical room, elevator machine room, and book stacks, do not bear UL labels and should be replaced. In general, the interior doors are in good condition.



50 – Main Entry Vestibule Doors

The main entry vestibule doors are full light, with a muntin pattern similar to that of a French door. Doors located in public areas have a glass vision

panel. The doors on the main level and the office on the east mezzanine have stained glass panels. The remainder of the doors have clear glass panels, which are not fully tempered nor code compliant.

Door widths are typically only 30-inches. Pairs of doors are located at the main entrance and lower level entrance vestibules. In general, the interior doors are not handicapped accessible since they do not provide 32-inches of clear width required for wheelchair passage. Also, many doors do not have the required push-pull clearances required for wheelchair passage due to location of adjacent built-in bookcases, millwork, and walls. We recommend seeking a variance for door width and clearances in staff areas. Doors in public areas must be made accessible. Installation of automatic door openers may also be an option.

The existing door hardware throughout the entire building consists primarily of brass, knob style locksets. Kick plates are located on most wood doors. Panic hardware typically consists of older style exit devices with exposed vertical rods. Entry doors are equipped with door closers. The hardware generally appears to date from the original construction. Knob style hardware is not handicapped accessible compliant. We recommend replacing the hardware in the public areas with lever-style hardware. The hardware may be ordered in a finish to match the existing.




51 – Lower Level Doors




52 – Main Level Doors

I. Interior Stairs and Elevator

Egress Stairs:

The lower level, first floor and mezzanine levels are connected by two interior egress stairs. One stair is located at the rear of the building, on the west side; and serves the service/staff zone. The other stair is located at the front of the building on the east side, adjacent to the main public entrance; and serves the public. (Photo #53) The stairs consist of stone treads, painted steel risers and stone landings; set on metal stair construction. Railing

systems consist of decorative metal balusters with scroll work and a wood handrail cap. The landings and mezzanines also have similar railings. The railings are approximately 32-inches high as measured from the finished riser and/or flooring to the top of the wood handrail cap. The building code requires new stair construction to have 42-inch high guardrails and handrails mounted at 34-inches above the walking surface. Only the stair run to the lower level has a wall mounted handrail. (Photo #54)

The main entrance vestibule, and lower level entrances also have marble clad stairs which lead from the exterior into the building. (Photo #55) The main entry vestibule has a center mounted, painted steel, bronze capped handrail. No handrails are present at the lower level entrances.

The lower level auditorium has direct access to the exterior on the Princeton Street side via a wooden stair. The stair consists of wood framing, three vertical risers, and a large platform in front of the doors. The entry and stair are not original to the building and appear to date from the 1940's. A painted wrought iron guardrail with a wood cap is present on the room side of the stair.

We recommend adding wall mounted handrails to enhance safety. Variances may be sought for the guardrail and handrail heights at the egress stairs.



53 – Egress Stairs at Main Level



54 – Egress Stairs at Lower Level

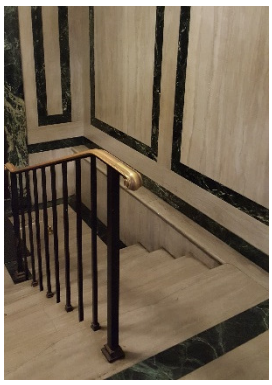
Library Stack Stairs:

The library stack system also has several integral stairs. The stairs consist of stone treads and painted steel risers; set on metal stair construction. Metal handrails are present on each side of the stair, connected via posts to the stair construction. The main access stair is located on the main level, behind the circulation desk. A 32-inch high guardrail system with gate surrounds the opening in the floor.

Elevator:

Only one elevator serves the building. It is located on the rear or west side of the building; and serves the service/staff zone. It is a Payne elevator which appears to date from the original construction. The





55 – Egress Stairs at Lower Level and Main Entry

elevator does not have code compliant controls, safety features or the required dimensions and clear width at the elevator entrance required for handicapped accessibility. It is restricted to staff use, and predominantly utilized to move books and supplies between levels. The elevator does not stop at the middle book stack level. The machinery is antiquated and located in an adjacent machine room. (Photo #56) We recommend replacing the elevator in conjunction with future interior renovations.

Book Lift:

A non-operational book lift is present within the book stacks. It connects all book stack levels and rises to the main level, at the rear of the circulation desk. The original fiber rope is cut and unconnected. It is unknown if the motor and controls still function. We recommend rehabilitating the lift and installing a braided steel cable.



56 – Elevator and Machine Room

J. Restrooms

The building is currently served by five, original, single-user restrooms. (Photo #57) Each restroom is equipped with a floor-mounted toilet and either a wall-mounted lavatory or a vanity mounted lavatory. Limited improvements have been made over the years. Plumbing fixtures and finishes have been replaced in some of the rooms. The room layouts are narrow and located in areas that cannot easily be modified to be made handicapped accessible. The rooms do not currently comply with the minimum code required fixture clearances, door widths, and room dimensions. Therefore, the toilet rooms are not compliant with the accessibility code. We recommend constructing new, fully code complaint public men's and women's rooms on the lower level. As part of future interior renovation work, the staff restroom off the break room could also be renovated and expanded.



57 – Restrooms

K. Site

The building is set back from Elmwood Avenue and fronts a large formal lawn. (Photo #58) The main entrance to the building is approached from public city sidewalks along Elmwood and Princeton Avenues, and Moore Street. Site stairs connect the city sidewalks onto the property. These transitions are not handicapped accessible. Sidewalks on the library grounds converge into a main walk, located on the central axis of the building; which leads to the central monumental stair, main entrance, and lower level entrances. Exterior pavement is in fair condition.



58 – Site at Main Entrance

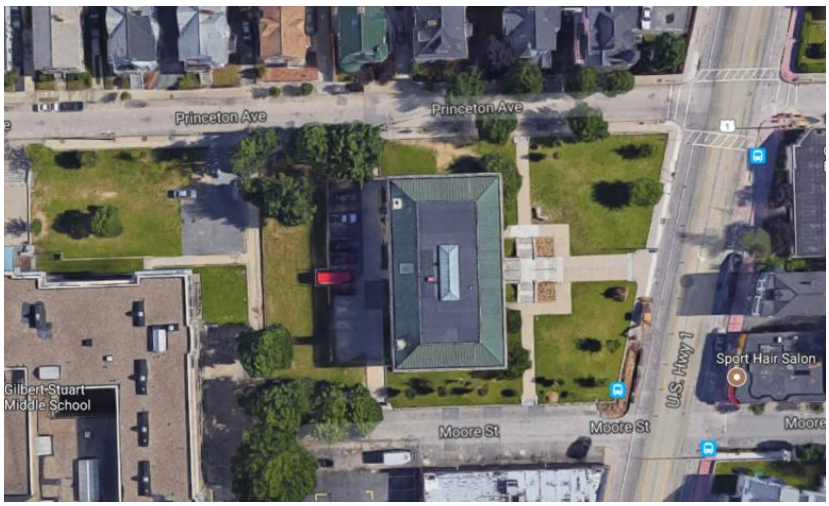
Please refer to Appendix D1, attached at the end of this report, for recommendations for site improvements to make the site and entry handicapped accessible.

A paved parking area with a tall, chain link security fence and motorized sliding gate is located on the west side of the building. (Photo #59) The motor on the gate does not appear to function. A rear yard is present behind this area; towards the school to the west. This area is enclosed with the original wrought iron fence. Tall masonry piers with decorative caps and ball finials form the openings for the gates. Only the gates at the opening onto Princeton Avenue remain.



59 – Rear/West Yard Gate

Consideration should be given to restoring the landscaping to something that more closely approximates the original setting, including large elm trees along Elmwood Avenue.



Appendix A1 – Additional Interior Plaster Ceiling Investigation

Based upon our observations of excessive cracking and water damage during our initial existing conditions assessment, additional investigation of plaster ceilings was undertaken on November 17, 2017 and again on January 26, 2018. Staff provided an opening in the west mezzanine ceiling for review since this area exhibits significant water damage. (Photo #A1). Reading Room ceilings were inspected by eye from the mezzanine level only.

The mezzanine ceiling consists of a traditional, three-coat plaster system applied to expanded metal lath, attached to a suspended black iron support structure. (Photo #A2) The structure consists of a grid of secondary members and primary members. The plaster cornice at the perimeter appears to have been field-run, and is attached to a rough wire lath corner block. (Photo #A3)

The secondary members are 1-inch high iron bars spaced at approximately 10-inches on center. The bars have a slight I-shaped sectional profile. The secondary bars run perpendicular to the primary members, which are 1 ½-inch by 1 ½-inch iron angles. The angles are spaced approximately 72-inches on center and run perpendicular to the exterior wall. They span approximately 15-feet in length. (Photo #E4) All connections and attachments utilize tied wire. The wire on the angle iron appears heavier than the wire lath. Although some surface rust was observed, the heavier wire ties appear to be in good condition.

The primary angle members are hung from the concrete attic deck slab with rigid, two-piece, 1-inch wide iron straps. The straps are spaced approximately 48-inches on center. The upper strap section appears to have been cast into the slab at the time of original construction. The lower strap sections are connected to the upper sections with machine screws and nuts. (Photo #E4) The straps appear to be in good condition.

The west mezzanine ceiling has a cavity space of approximately 16-inches between the underside of



A1 – West Mezzanine Ceiling Opening



A2 –Suspended Mezzanine Ceiling Structure



A3 – Typical Mezzanine Cornice

the attic floor ribs and the plaster. The air inside the cavity felt warm and slightly moist. This could be attributed to water infiltration at the perimeter gutter system.

A higher, finished ceiling appears to have been installed directly against the underside of the attic slab. (Photo #A5) The attic slab was constructed utilizing metal forms which joined to form ribs at approximately 24-inches on center. Metal lath and a brown coat of plaster were observed above the lower ceiling, just below the ribs. (Arch Details #1)

Finished ceilings on the mezzanine measure approximately 10-feet six-inches above finish floor. The adjacent stair and closet plaster ceilings measure approximately 12-feet above finish floor. This correlates with the dimension of the cavity space between the upper and lower ceilings.

The west mezzanine ceiling appears to have bowed, and has a low point or belly in the center. It is unknown if this occurred soon after the original plaster was installed, or is more recent.

The ribs and moldings of the Reading Room are most likely formed with metal lath, below the upper ceiling construction. In general, the ceiling structure observed tends to create a rigid system. This may contribute to some of the cracking, and the campaigns of previous repair work. It appears that cracks may have developed soon after the completion of the building.

Unlike mezzanine ceilings, plaster ceilings above the Reading Rooms appear to be directly applied with lath to the under-side of structure, but additional inspection from a ladder or lift will be required for confirmation.

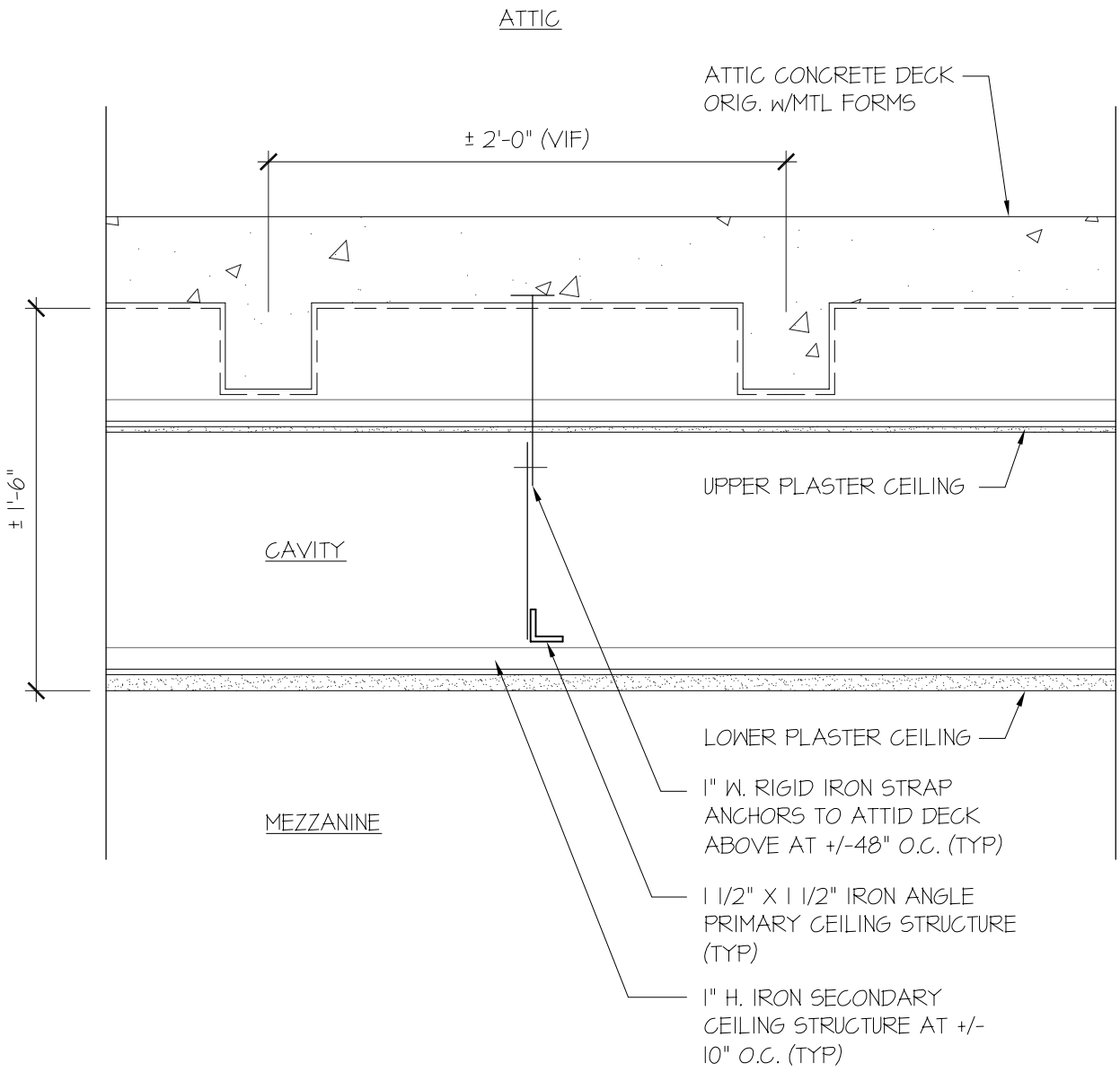
We recommend engaging an experienced, ornamental plaster specialist to sound out all ceilings, beams and cornices to determine if plaster has delaminated or disengaged from the metal lath, and to develop recommendations for overall restoration.



A4 – Typical Mezzanine Ceiling Construction



A5 – Typical Mezzanine Ceiling Construction



1 TYPICAL CEILING SECTION

SCALE: 1 1/2"= 1'-0"

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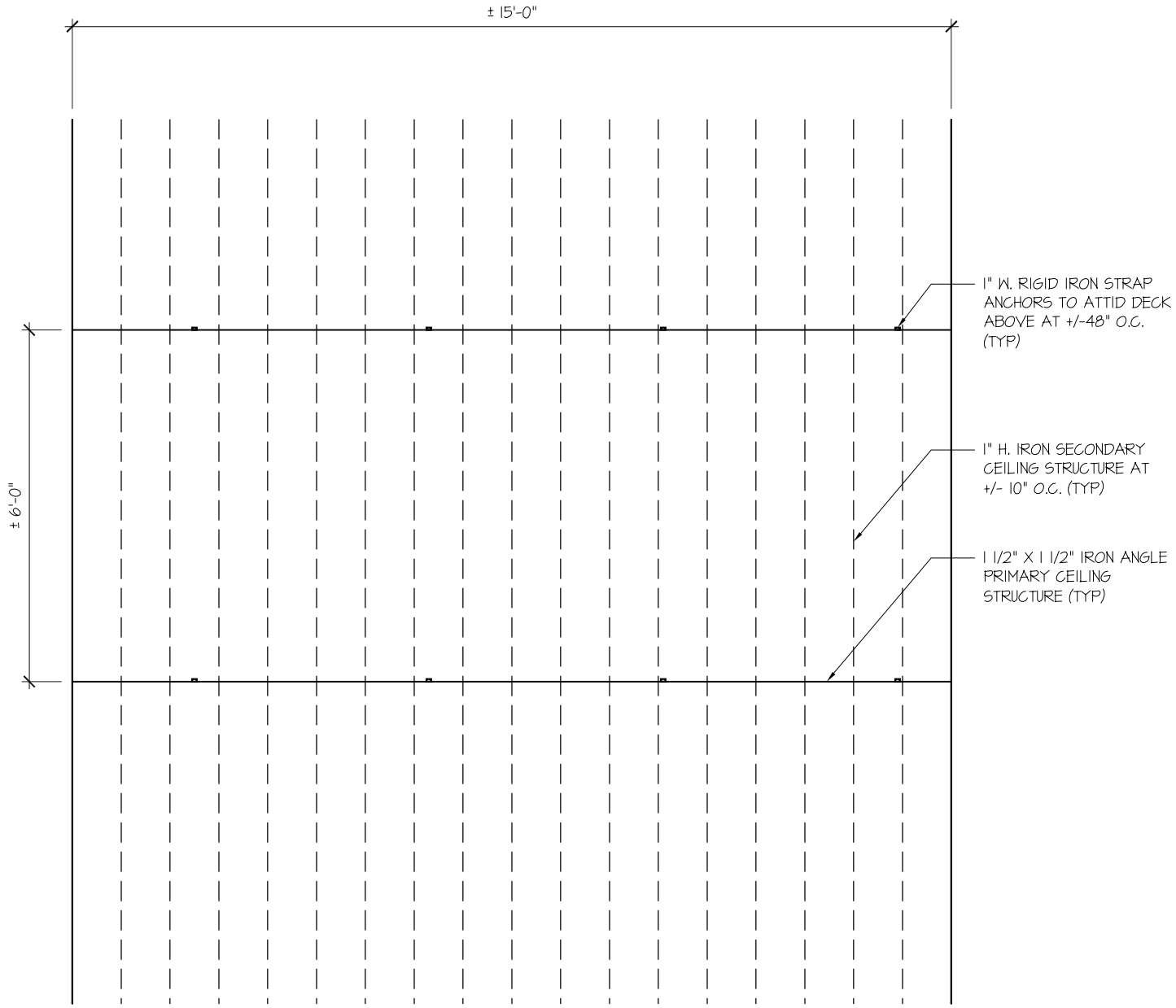
SCALE: 1 1/2" = 1'-0"
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DRAWN: EC
JOB NO.: 1724

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Knight Memorial Library
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CEILING DETAILS

ISSUED FOR: Study
DATE ISSUED: Nov. 17, 2017
REVISION DATE: -

A1



2 TYPICAL CEILING PLAN

SCALE: 3/8"= 1'-0"

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A2

B1. Recommendations & Budget

The following list of recommended improvements have been identified in the existing conditions assessment. For convenience, the items are listed below, with a recommended level of priority assigned based upon professional judgement. The priority scale ranges from 1-3, with "1" being the highest and "3" the lowest priority.

The following Order of Magnitude Budget Costs were provided by Pezzuco Construction and are intended for planning purposes only. They do not include costs for improvements or upgrades that are not specifically described. Hazardous material abatement, design and construction contingencies, escalation, fees, and other soft costs must be added to properly budget for future work.

Item:	Priority Level:	Order of Magnitude Budget Cost:
Roof - Much of this category is included in the funding allocation from the Champlin Foundation. Our understanding is that this work will be competitively bid, so cost estimates were not included.		
a. Replace missing or damaged clay tile shingles.	1	
b. Replace missing clay tile rain stops along upper roof and eaves.	1	
c. Remove and replace integral copper gutter system.	1	
d. New copper flashings on roof and at chimneys.	1	
e. New horizontal lead flashing and sealant at cornice.	1	
f. New breathable sealer at limestone cornice.	1	
g. New ventilator and 12-inch high curb at upper roof.	2	
h. New walkway pads at roof hatch on upper roof.	2	
i. Replace large central skylight with new.	2	
j. Repair rear skylight.	1	
k. Repair and repoint chimneys.	1	
l. New chimney caps.	1	
Attic		
a. Remove existing blow-in fiberglass insulation and provide new rigid mineral wool insulation.	3	$ 100,000
Exterior Masonry - Much of this category is included in the funding allocation from the Champlin Foundation. Our understanding is that this work will be competitively bid, so cost estimates were not included.		
a. 100% repointing of cornice, accent band, and water table.	2 (1)	
b. Repair damaged window surround on west side.	2	
c. Selective repointing of masonry walls. (Assume 30%)	2 (1)	
d. Repair damaged masonry at west side.	2 (1)	
e. Coating and graffiti removal.	2	
f. New breathable anti-graffiti coating.	3	
g. Repair cheek walls at exterior front stair	3	
h. Repair loading dock masonry.	3	

Windows – Direct from Heritage Restoration (GC OHP NIC)

a. Remove protective exterior screens; restore all wood windows; replace missing hardware, and add new weather-stripping and vandal-resistant glazing.	2	$ 350,000
b. Install new exterior sealant and paint exterior trim and sills.	2	$ 125,000

Exterior Doors

a. New custom exterior wood doors at lower level auditorium.	1	$ 25,000
b. New custom exterior wood doors at front lower level entrances.	1	$ 50,000
c. Replace hardware at main entrance inner doors.	1	$ 5,000

Exterior Stairs

a. New guardrails and handrails at main entry stairs.	2	$ 20,000
b. New guardrail at basement mechanical room areaway stair.	2	$ 5,000
c. New railing at loading dock.	3	$ 7,000

Interior Walls, Columns and Floors

a. Repair water damaged walls.	2	$ 50,000
b. Repair and restore main level column enclosures.	3	$ 20,000
c. Clean interior stone walls in main entry vestibule.	3	$ 5,000
d. Replace VAT, carpet and linoleum finish flooring. (14,000sf)	3	$165,500
e. Clean and seal interior stone flooring throughout.	3	$ 7,500
f. Repair damaged leaded glass on main level.	2	$ 20,000
g. Construct new storage closets in lower level auditorium.	3	$ 10,000
h. Paint interior walls and clean wood trim.	3	$ 70,000

Interior Ceilings

a. Repair damaged, ornate plaster ceilings at Reading Rooms and mezzanines.	2	$150,000
b. Replace glass at central atrium skylight screen.	3	$ 20,000
c. Remove applied acoustic tile in lower level auditorium; and repair and repaint plaster ceiling.	3	$ 10,000
d. Repaint all non-ornamental ceilings.	3	$ 20,500
e. Touch-up paint at Atrium	3	$ 12,000

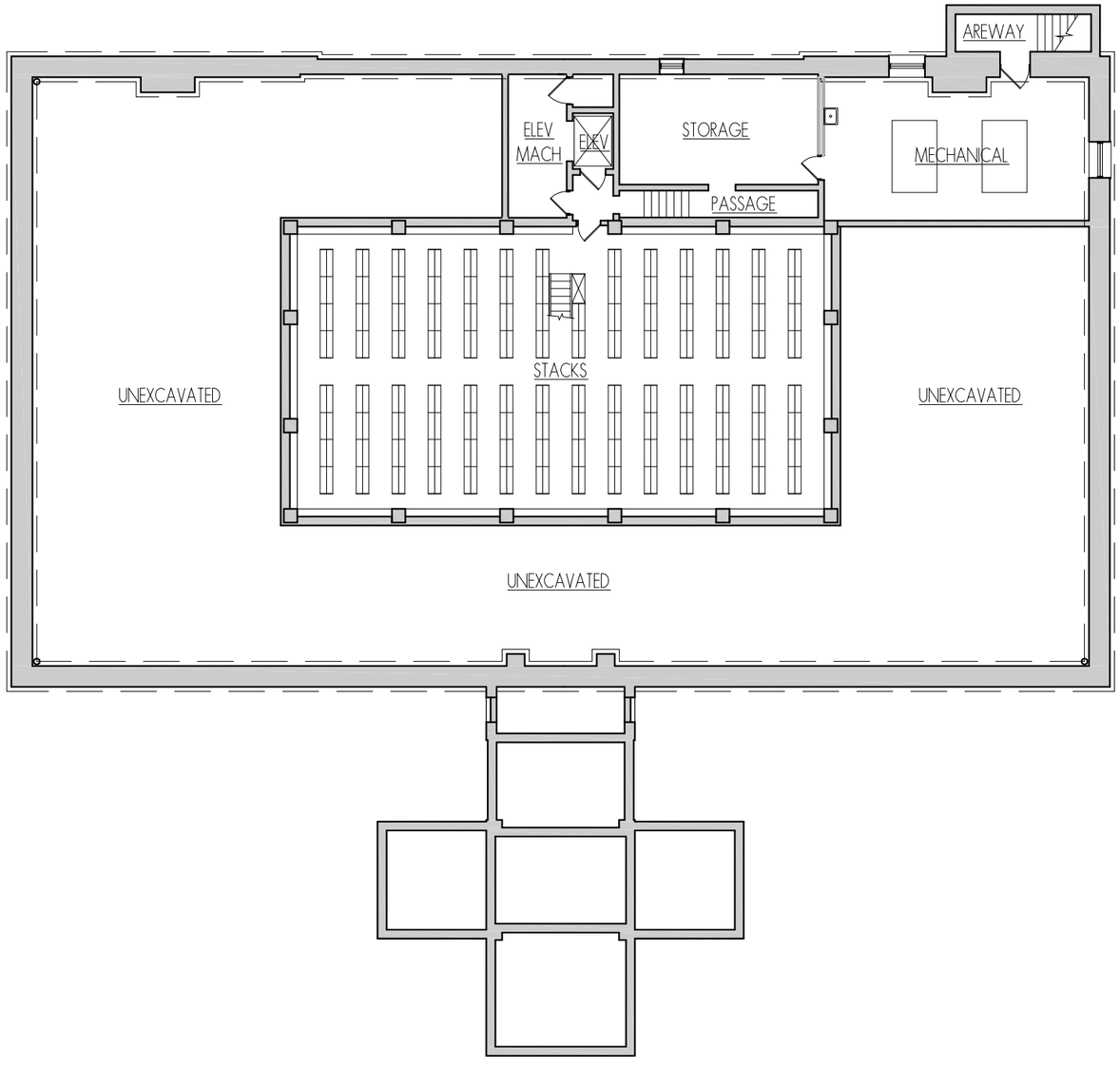
Interior Doors

a. Replace door at mechanical room with new fire-rated door and frame.	3	$ 2,500
b. Replace door vision panels with fully tempered glass.	2	$ 8,000
c. Re-work public area doors to provide 32-inches clear.	2	$ 25,000
d. Provide new lever-style hardware on public area doors.	2	$ 32,000

Interior Millwork, Cabinets and Furniture

Work not included in estimate.

Interior Stairs and Elevator		
a. New wall mounted handrails.	2	$ 20,000
b. New 42-inch high glass guardrail behind existing guardrail on each mezzanine.	2	$ 25,000
c. New handrails at lower level entry stairs.	2	$ 4,000
d. Repair library stack book lift.	3	$ 15,000
e. New 3-stop electric elevator, concrete pit, CMU shaft, interior modification at lower landing, main level and mezzanine, and ventilation to roof.	2	$ 420,000
Restrooms		
a. New accessible toilet rooms on lower level.	2	$ 140,000
b. Renovate existing single-user toilet rooms.	3	$ 25,000
c. Renovate and expand staff break room toilet room.	3	$ 25,000
Site Work		
a. Re-work south exterior entry into lower level into accessible entry.	2	$ 75,000
b. Re-work sidewalk and add new handicapped accessible walks to south exterior entry.	2	$ 15,000
c. New custom storage/maintenance shed at west side.	3	$ 15,000
d. Repair gate motor at staff parking area.	3	$ 2,500
Mechanical		
a. Install new heating, cooling and ventilation system.	3 (2)	$ 750,000
Electrical – Phase 1		
a. New transformer pad and underground electrical service.	1	$ 70,000
b. New electric room and distribution to existing electrical panels	1	$ 55,000
c. New fire alarm per Jensen Hughes specifications.	1	$ 135,000
d. New battery powered emergency lights.	1	$ 35,000
Electrical – Phase 2		
a. New tel/data cable wiring.	3	$ 55,000
b. New electrical outlet layout and wiring.	3	$ 155,000
c. New general lighting layout, wiring and controls includes restoring existing (28) chandeliers and tulip wall sconces with new wiring and controls.	3	$ 250,000



N

0 Existing Sub Basement Plan

SCALE: 1/16" = 1'-0"

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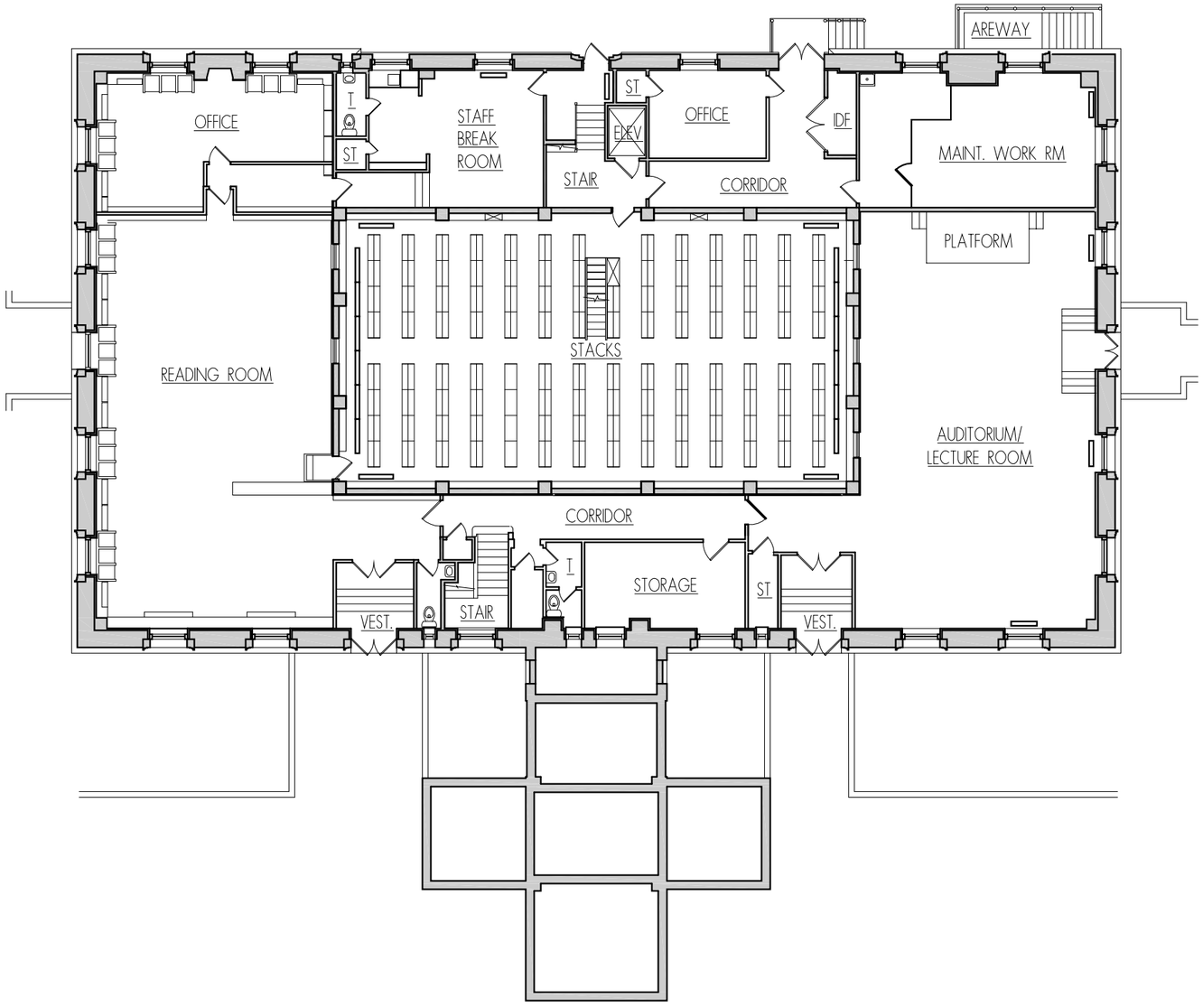
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EXISTING SUB BASEMENT PLAN

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REVISION DATE:

EX00



N

1 Existing Basement Plan

SCALE: 1/16" = 1'-0"

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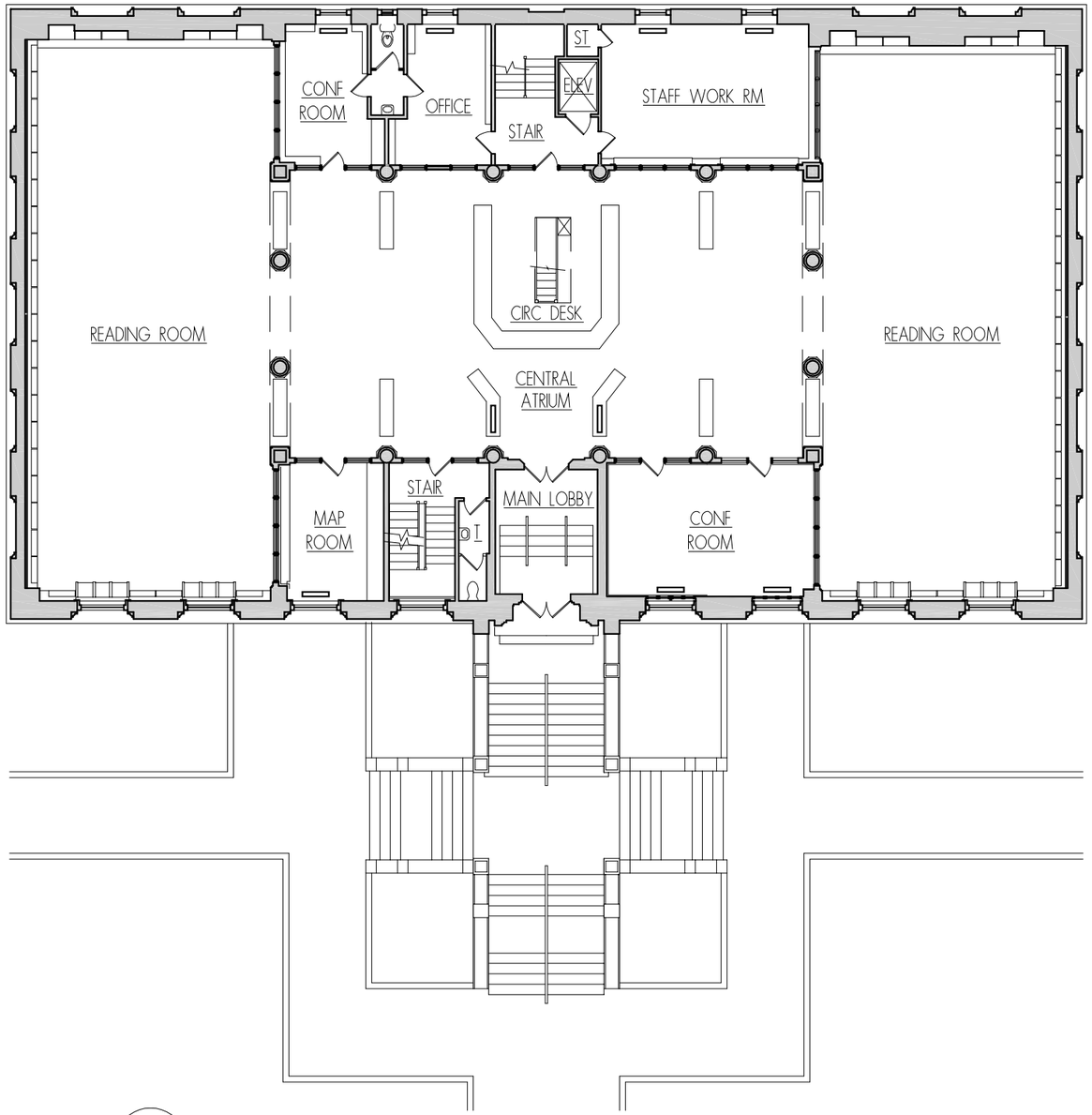
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EXISTING BASEMENT PLAN

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EX01



N

2 Existing Main Level Plan

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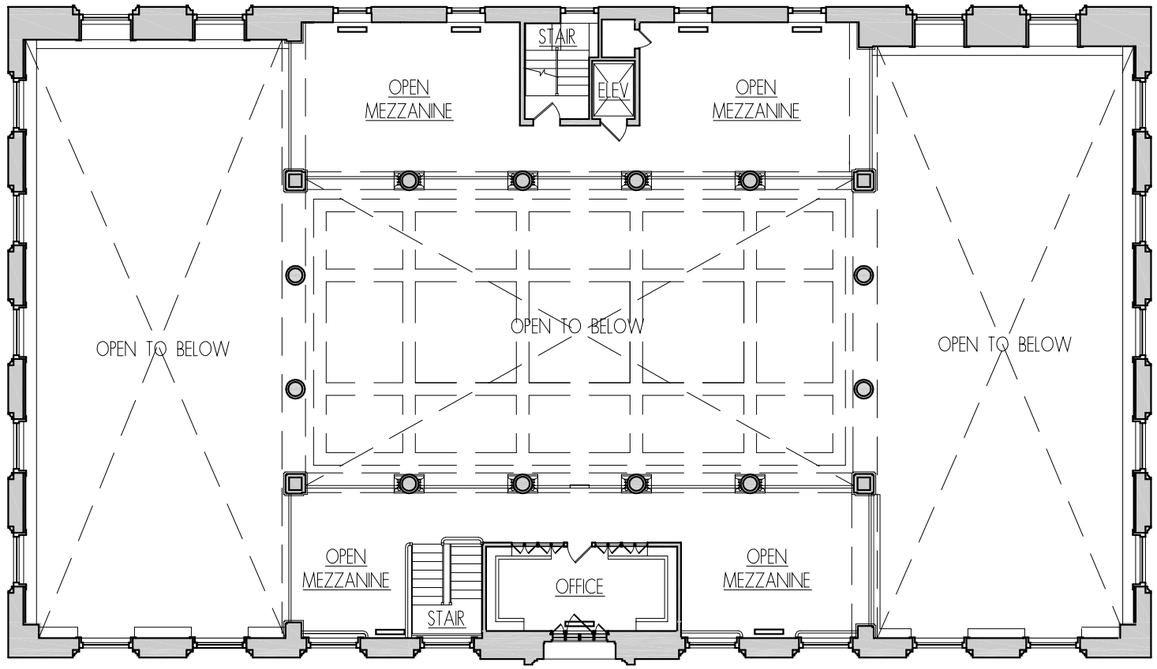
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EX02

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3 Existing Mezzanine Plan

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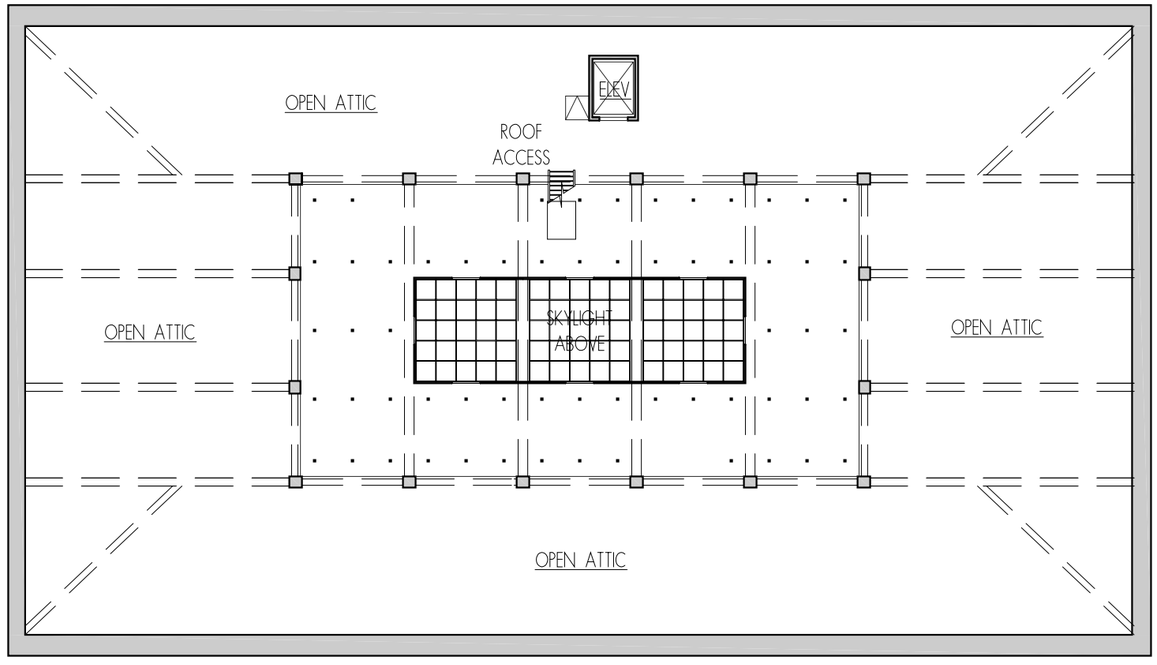
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EXISTING MEZZANINE PLAN

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EX03

N



4 Existing Attic Plan

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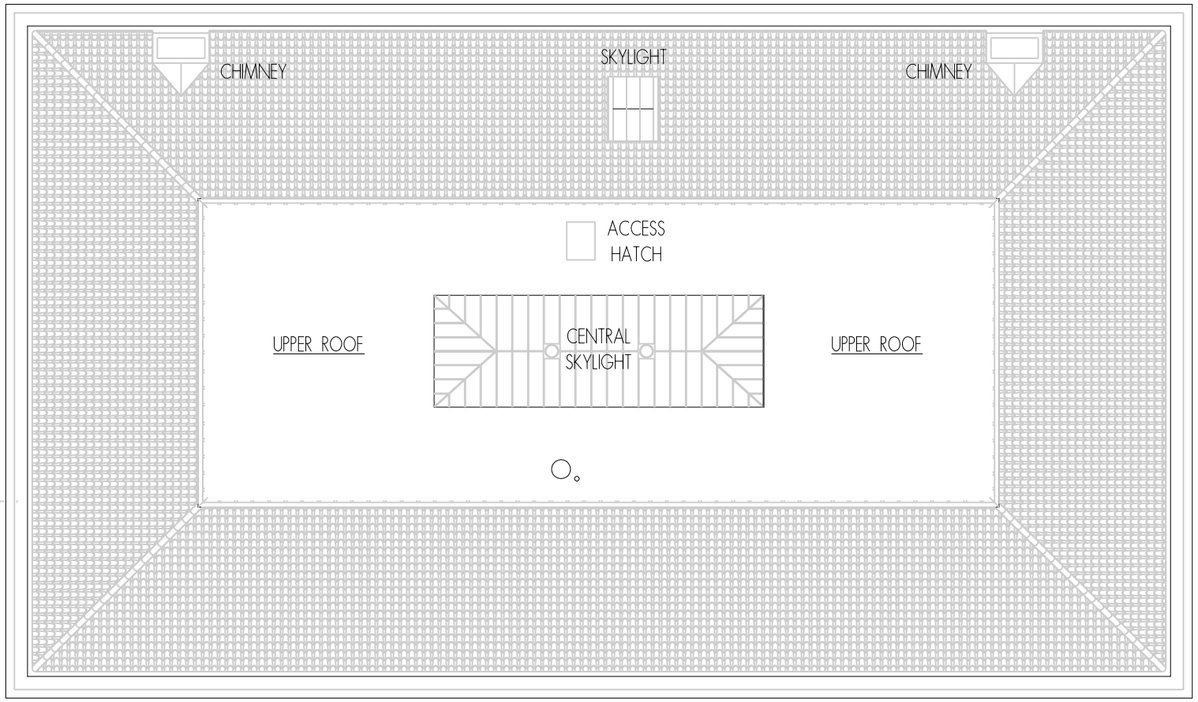
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EX04

N



5 Existing Roof Plan

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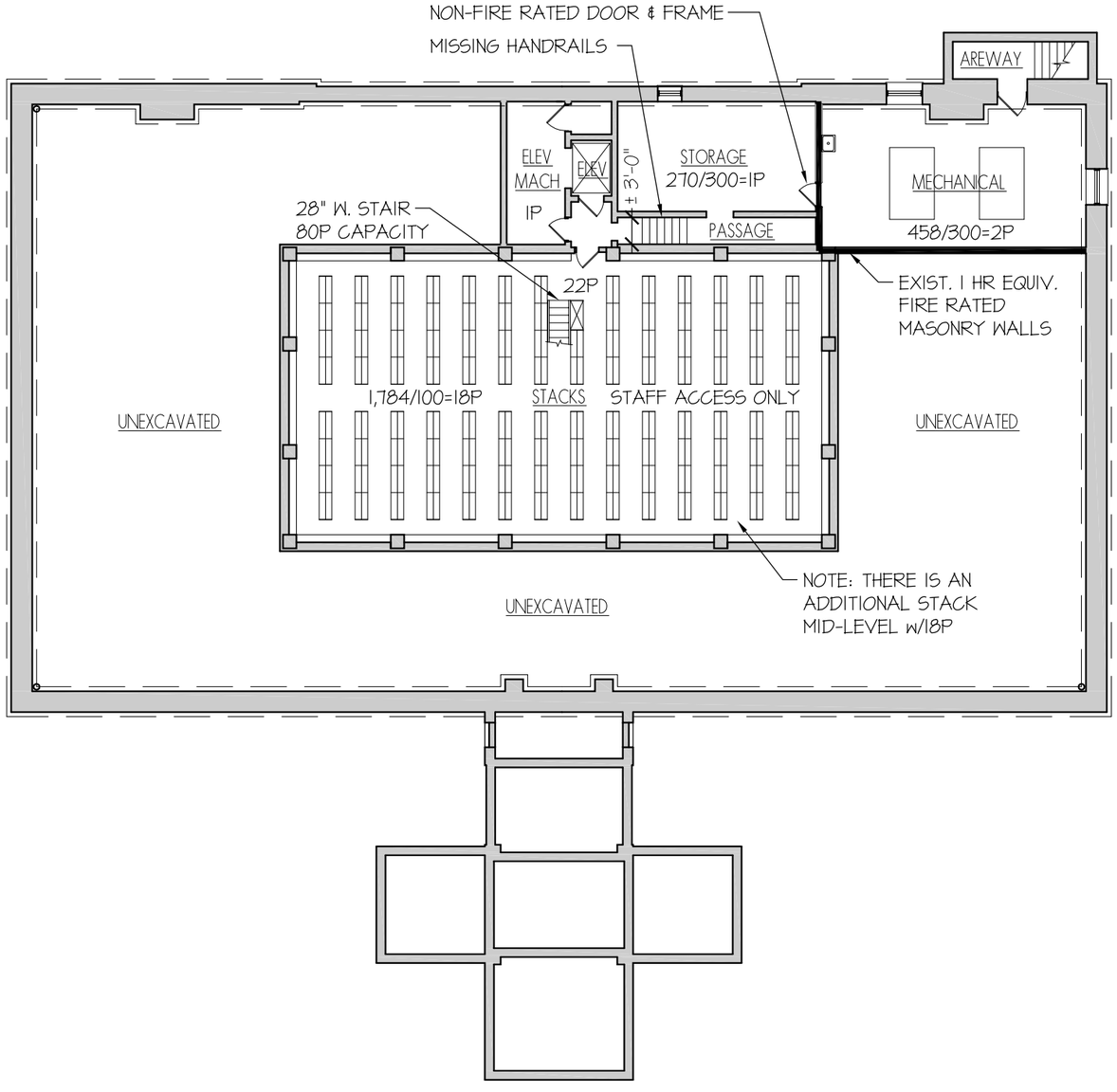
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EX05



N

0 Existing Sub-Basement Code Plan

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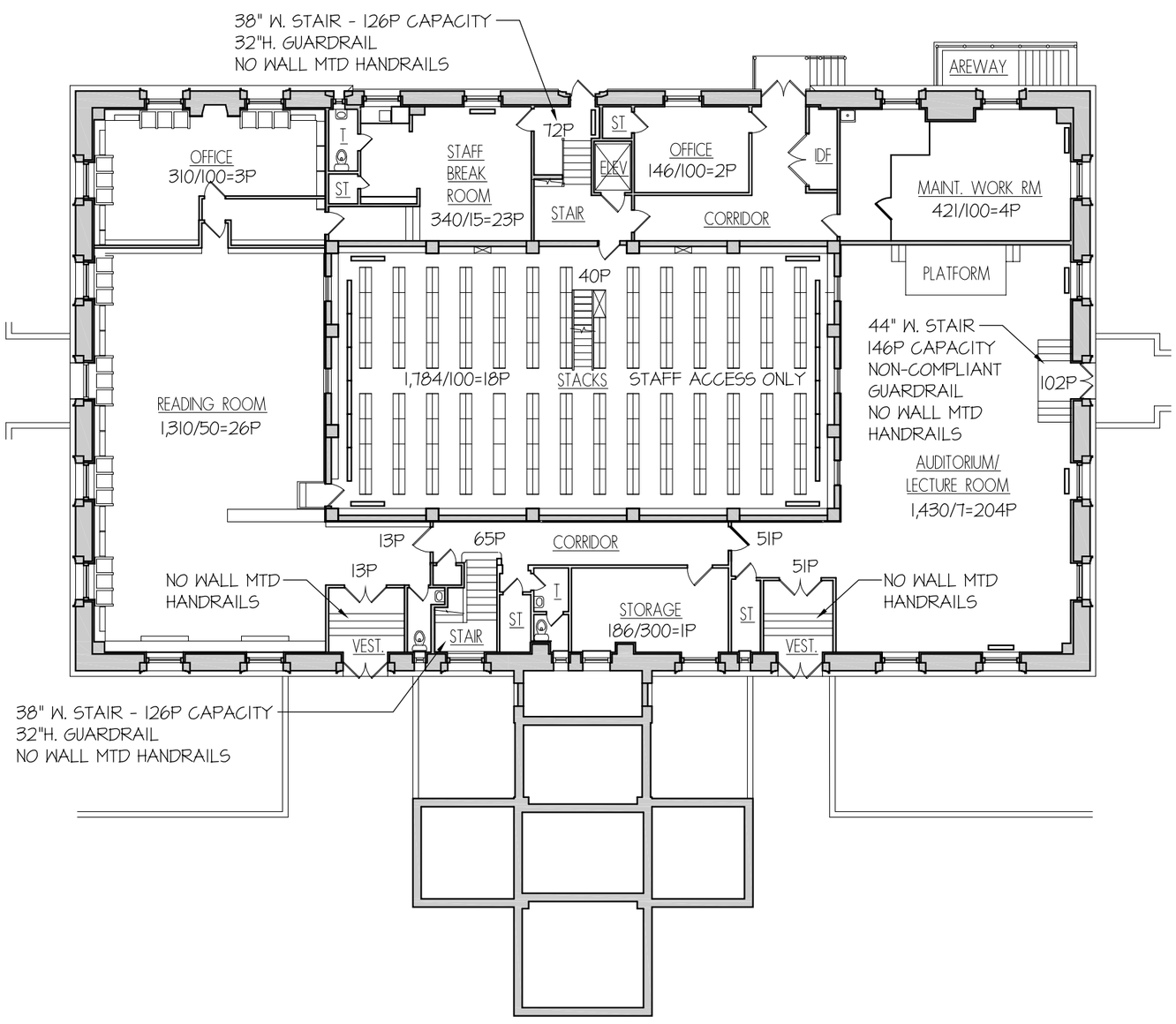
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EXIST. SUB-BASEMENT CODE PLAN

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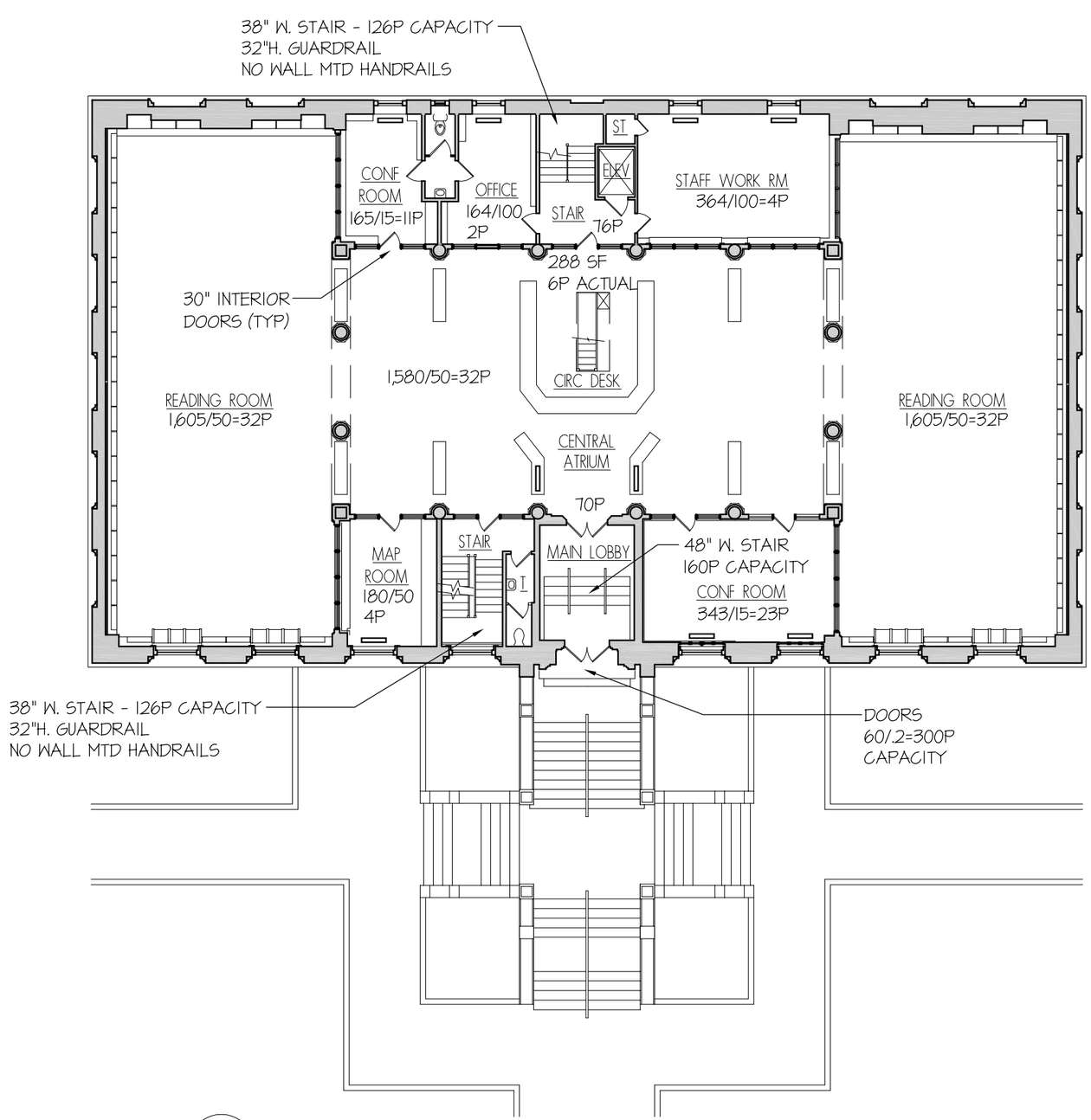
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N

2 Existing Main Level Code Plan

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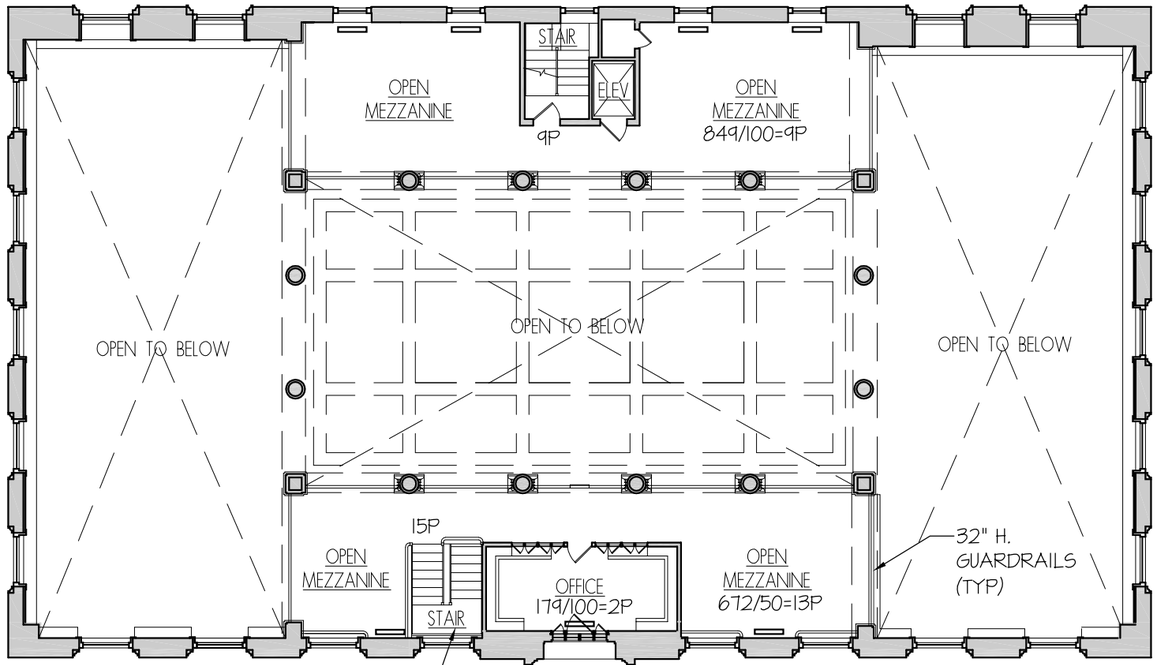
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EXISTING MAIN LEVEL CODE PLAN

ISSUED FOR: Study
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C02

N



3 Existing Mezzanine Code Plan

SCALE: 1/16" = 1'-0"

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EXISTING MEZZANINE CODE PLAN

ISSUED FOR: Study
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REVISION DATE:

C03

BUILDING CODE SUMMARY

APPLICABLE CODE(S)

THE BUILDING WAS EVALUATED FOR COMPLIANCE AND/OR CONFORMANCE WITH THE FOLLOWING CONSTRUCTION CODES, STANDARDS & GUIDELINES:

- RHODE ISLAND STATE BUILDING CODE, SBC-1-2013 (IBC 2012)
- RHODE ISLAND STATE REHAB CODE
- RHODE ISLAND STATE LIFE SAFETY CODE (NFPA 101, 2012)
- RHODE ISLAND STATE FIRE CODE-2013 (NFPA-1, 2012)
- RHODE ISLAND STATE FIRE ALARM CODE - CHAPTER 13 (NFPA-1, 2012)
- RHODE ISLAND STATE ACCESSIBILITY CODE, CHAPTER 11 (ICC/ANSI A117.1, 2012)
- RHODE ISLAND PLUMBING CODE, SBC-3-2013 (IPC 2012)
- RHODE ISLAND STATE MECHANICAL CODE, SBC-4-2013 (IBC 2012)
- RHODE ISLAND FUEL GAS CODE, SBC-19-2013 (IFGC 2012)
- RHODE ISLAND ELECTRICAL CODE, SBC-5-2014 (NEC 2014 & NFPA 70)
- RHODE ISLAND ELEVATOR CODE, CHAPTER 30
- NFPA 10, STANDARD FOR PORTABLE FIRE EXTINGUISHERS

CODE NOTES

1. EGRESS STAIRS ARE UNENCLOSED. TECHNICALLY THESE ARE CODE COMPLIANT BUT MAY REQUIRE UPGRADE IN THE FUTURE. THIS IS DEPENDANT UPON THE SCOPE OF FUTURE WORK AND MUST BE RE-EVALUATED AT THE TIME OF DESIGNING THE IMPROVEMENTS.
2. THE EXISTING STAIR WIDTH IS NOT TECHNICALLY CODE COMPLIANT. (44 INCHES IS REQ'D) A VARIANCE IS RECOMMENDED.
3. THE EXISTING INTERIOR DOORS ARE ONLY 30 INCHES WIDE AND NOT TECHNICALLY CODE COMPLIANT. MODIFICATIONS AND VARIANCES ARE REQUIRED.
4. THE EXISTING BUILDING IS NOT CURRENTLY HANDICAPPED ACCESSIBLE.
5. THE EXISTING FIRE ALARM SYSTEM IS NOT CODE COMPLIANT.
6. THE EXISTING GUARDRAILS ARE NOT CODE COMPLIANT.
7. THE EXISTING PLUMBING FIXTURE ARRANGEMENT AND COUNT IS NOT ADEQUATE OR CODE COMPLIANT.

USE AND OCCUPANCY CLASSIFICATION

	CODE REFERENCE
USE CLASSIFICATION: LIBRARY/ASSEMBLY "A-3" W/ACCESSORY MECHANICAL AND STORAGE "S-1"	IBC SECTION 304
EXISTING ASSEMBLY OCCUPANCY	NFPA 101 - CHAPTERS. 18 & 19

CONSTRUCTION TYPE

EXIST. CONSTRUCTION CLASSIFICATION: TYPE 2A (IBC) 11 (222) NFPA	IBC SECTION 602 NFPA 101 TABLE 13.1.6
CAST IN PLACE CONC ROOF DECK, CONC. ENCASED STEEL FRAME, CONCRETE FLOOR SLABS, LOAD-BEARING EXT. MASONRY WALLS.	

BUILDING HEIGHT AND AREA

ALLOWABLE BUILDING HEIGHT (STORIES/FEET): 3 STORIES/65' (A-3) ACTUAL BUILDING HEIGHT (STORIES/FEET): 2 STORIES + BASEMENT AND MEZZANINE/49' (A-3)	IBC TABLE 503
ALLOWABLE AREA: 15,500 GSF (LARGEST FLOOR) ACTUAL AREAS: EXIST. SUB-BASEMENT: 3,378 GSF EXIST. BASEMENT: 8,412 GSF EXIST. FIRST FLOOR: 8,275 GSF EXIST. MEZZANINES: 2,134 GSF (TOTAL) THE EXIST. BUILDING MEETS NEW CONST. HEIGHT AND AREA LIMITATIONS W/OUT SPRINKLERS AND OPEN PERIMETER INCREASES.	

FIRE RESISTANCE RATED CONSTRUCTION

		CODE REFERENCE
STRUCTURAL FRAME		
INCLUDING COLUMNS, GIRDERS, TRUSSES	1 HR	IBC TABLE 601 (TYP, UON)
BEARING WALLS		
EXTERIOR AND INTERIOR	1 HR	
NON-BEARING WALLS AND PARTITIONS		
EXTERIOR AND INTERIOR	0 HR	
FLOOR CONSTRUCTION		
INCLUDING SUPPORTING BEAMS AND JOISTS	0 HR	
ROOF CONSTRUCTION		
INCLUDING SUPPORTING BEAMS AND JOISTS	1 HR/CLASS B	IBC TABLE (TBL) 601 & 1505.1
FIRE BARRIERS		
CORRIDORS:	1 HR	IBC TBL 1018.1
	0 HR	NFPA 101 - CH. 7
EXIT ENCLOSURES:	1 HR	IBC SECTION 1022 & NFPA CH. 7
SHAFTS	1 HR	IBC SECTION 708.4 & NFPA CH. 7

INTERIOR FINISHES

		CODE REFERENCE
MINIMUM FINISH CLASS (W/OUT SPRINKLERS)		IBC TBL 803.5 & NFPA 101 - 13.3.3
EXITS:	CLASS A	
CORRIDORS:	CLASS A	
ROOMS:	CLASS C	

MEANS OF EGRESS

		CODE REFERENCE
MAXIMUM ALLOWABLE TRAVEL DISTANCE	200'-0"	NFPA 13.2.6.2
MAXIMUM COMMON PATH OF TRAVEL	75'-0"/50 OCCUPANTS	NFPA 13.2.5.1.2
DEAD END CORRIDOR	20'-0"	IBC 1018.4 & NFPA 101 - 13.2.5.1.2
EGRESS WIDTHS		IBC 1005.3 & NFPA 101 - TABLE 7.3.3.1
DOORS	0.2 INCHES/OCCUPANT	
STAIRS	0.3 INCHES/OCCUPANT	
CORRIDORS	0.2 INCHES PER OCCUPANT	
OTHER COMPONENTS	0.2 INCHES/OCCUPANT	
MINIMUM NUMBER OF EXITS PER FLOOR		IBC 1021.2 & NFPA 13.2.4
2 PER FLOOR	(1-600 OCCUPANTS)	
		IBC TABLE 1004.1.2 &
OCCUPANT LOAD FACTORS:		NFPA 101 - TABLE 7.3.1.2
READING ROOM	50 SF	
STACKS	100 SF	
ASSEMBLY	15 SF NET (TABLES AND CHAIRS) 7 SF NET (CHAIRS)	
MECH & STORAGE	300 SF	
OFFICES	100 SF	

NOTE: THE EXIST. BLDG. EGRESS COMPONENTS (STAIRS, CORRIDORS & DOORS) WERE EVALUATED TO DETERMINE ADEQUACY OF ARRANGEMENT AND CAPACITY. THE COMPONENTS APPEAR SUFFICIENT TO SERVE THE EXISTING USE AND REQUIRE MODIFICATIONS FOR FULL CODE COMPLIANCE.

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Knight Memorial Library
275 Elmwood Avenue - Providence, RI
CODE REVIEW INFORMATION

ISSUED FOR: Study
DATE ISSUED: 11-17-17
REVISION DATE:

C04

Knight Memorial Library

275 Elmwood Avenue, Providence, Rhode Island



Accessibility, Mechanical and Electrical Assessment

August 8, 2014

Project No. 1410

DURKEE BROWN VIVEIROS WERENFELS ARCHITECTS

111 CHESTNUT STREET
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www.durkeebrown.com

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III.	**Building Background**		3
IV.	**Accessibility Review**		
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VI.	**Recommendations**		8
VII.	**Mechanical, Electrical and Plumbing Review and Recommendations**		

APPENDIX

Existing Floor Plans - (Scans of the Original 1922 Drawings w/Drafted Corrections)

Existing Exterior Elevations - (Scans of the Original 1922 Drawings w/Drafted Corrections)

Proposed Concept Sketches - Site, Vertical Circulation and New Restrooms

I. Executive Summary

In March 2014, Durkee, Brown, Viveiros, & Werenfels Architects (DBVW) was engaged by the Providence Community Library to review options for making the building accessible and to assess the existing mechanical, electrical, and plumbing (M/E/P) systems to determine if there are ways to upgrade these systems in a sustainable way.

Based upon limited on-site investigations, and following a review of previously prepared reports, we have concluded that the library is in need of several accessibility and M/E/P system upgrades so that it can continue to successfully serve the community. In this report, we have outlined several recommendations for improvements to the building.

We have prepared a conceptual design which addresses handicap accessibility. A new entrance is established at the basement level on the front of the building. The map room on the first floor will be altered to accommodate a new elevator. It is our opinion that this design strategy results in the least compromises the historic character of this wonderful building. The drawings in this report also provide for new accessible restrooms on the basement level.

The mechanical and electrical upgrades that are recommended in this report are designed to upgrade existing systems and add air conditioning in a way that utilizes a sustainable approach to energy consumption. In addition to upgrading and adding HVAC systems, we recommend that the original skylight be restored to take advantage of natural daylighting and reduce energy consumption from light fixtures.

The recommendations in this report are designed to respect the historic character of the building while bringing it into closer compliance with the Americans with Disabilities Act (ADA) and improving the climate control within the building. The recommended work may be broken up into phases, as funding becomes available.

It is important to note that our review of the building did not include the exterior envelope, complete analysis for compliance with current building and fire codes, or any assessment to determine the presence of hazardous materials. We recommend that the library consider performing these tasks in an expanded future study; prior to the implementation of any improvements.



Aerial View of Knight Library

II. Project Team

Architect:

Durkee, Brown, Viveiros, & Werenfels Archtiects
111 Chestnut Street
Providence, RI 02903
Martha Werenfels, AIA - Principal
Edward S. Cifune, AIA - Sr. Project Manager
Matthew Jesi, Intern Architect

Mechanical & Plumbing Engineer:

Wilkinson Associates, Inc.
615 Jefferson Boulevard
Warwick, RI 02886
Steven Wilkinson, P.E. - President
Carissa Charles, P.E. - Project Manager

Electrical Engineer:

Building Engineering Resources, Inc.
333 Westminster Street
Providence, RI 02903
Marc Plante, P.E. - Principal

III. Building Background

The Knight Memorial Library was designed in 1922 by the prominent New York architect Edward Lippincott Tilton in the Renaissance Revival style. The cornerstone was laid in 1922, and construction occurred from 1922 to 1924. The building opened to the public in 1924. Tilton began his career working for the well known New York architectural office of McKim, Mead and White. After studies at the Ecole des Beaux-Arts in Paris, he and partner William A. Boring, won a competition in 1897 to design the first phase of new buildings for the United States Immigration Station on Ellis Island in New York. Seven years later, their formal partnership was dissolved. Tilton formed his own firm in New York and went on to specialize in the design of libraries and educational buildings.

The Knight Library features a large central hall with flanking reading rooms on a raised first floor, the piano nobile, located above three stories of a freestanding cast iron/steel and stone slab floor book stack core. The building is approximately 25,435 gross square feet in area. The stacks occupy approximately 6,966 gsf. The exterior is clad with Indiana limestone. The building is capped with a distinct green glazed Ludowici barrel tile roof which culminates in a hip ringed with decorative copper cresting. The detailing of the building is influenced by Italian and Greek precedents. Fortunately, from a historic preservation point of view, little has changed from the time of the original construction.

IV. Accessibility Review

A. Accessible Entrance and Route

Main Public Entrance: The main public entrance is approached from public city sidewalks along Elmwood and Princeton Avenues. It is also accessed from Moore Street, which is now fully paved. Site stairs are present at each transition from the public sidewalks onto the property. These transitions are not handicap accessible. Sidewalks on the grounds of the Library connect to a main walk which is located on the central axis of the building. This walk leads to a formal Beaux-Arts exterior central stair. The stair has an elegant design that utilizes two side flights which join into a central landing and then continue up one flight to the main door.

The main entry has outer sliding copper clad doors which protect inner double-leaf, swinging aluminum and glass doors. This entrance leads to an interior stair with four vertical risers up to the first floor. (Photo #1) The main entrance is not handicap accessible. Any attempt to make the stair and entry doors accessible would significantly compromise the historic integrity of these elements and result in a less than desirable solution.

Site Walks: The exterior concrete sidewalks appear to comply with the slope requirements of the accessibility code; however, we recommend engaging a surveyor to verify actual grades. This survey work can be done in conjunction with future design work.

Basement Entrances: Secondary walkways flank the center stair. These walkways lead to basement entrances, symmetrically located on each side of the main entrance stair. The basement entrances retain their original double-leaf wood doors and glazed transoms. The door leafs measure approximately 30 inches wide and do not have accessible hardware. The walks terminate in front of the doors at a 4 inch high granite step. (Photo #2) The basement entrances lead to interior stairs with four vertical risers leading down to the basement level. (Photo #4)

The entrances are not currently handicap accessible; however, we recommend that one of these entrances be re-worked to provide an accessible entrance. The existing on-site sidewalk can be removed and the area can be re-graded to raise the elevation at the doors to eliminate the existing step. New sidewalks would also need to be installed and the transition to the public sidewalk re-worked with a sloped walkway. Refer to concept sketches located in the Appendix. (A000) Also, refer to the "Vertical Accessibility Options" paragraph below for recommendations with respect to the interior vertical route.

Staff Entrances: The main staff entrances are located on the rear of the building through a secure parking area. Exterior cast-in-place concrete stairs provide access to a service areaway down to the mechanical/boiler room. A second concrete stair leads up to a first floor service zone. The main staff entrance is located in the center of



1. Main Stair



2. Basement Entrance at Front of Building



3. Staff Entrance at Rear of Building

the rear of the building at grade. The entry then leads to an interior stair that connects the basement, first floor, and mezzanine level. (Photo #3) Entrances in this area are not accessible. There does not appear to be a practical way to create accessible entrances at the rear of the building.

Lecture Room Entrance: The basement level lecture room has a direct entrance from Princeton Avenue. The entry is not original to the building and appears to date from the 1940's. Double exterior wood doors lead to an interior wood framed platform stair with three vertical risers leading down to the basement level. (Photo #7) The exterior sill condition is similar to the other basement doors. There is no exterior walkway. This entrance is also not handicap accessible. If our other recommendations are implemented, this entry will not need modifications to bring it into compliance.

Stairs: The basement, first floor and mezzanine levels are connected by two interior stairs. One stair is present at the rear of the building on the service side. The other is located at the front of the building on the public side adjacent to the main entry vestibule. (Photo #6) The stairs have stone treads and painted closed steel risers. Railing systems consist of decorative balusters with scroll work and wood handrails. The railings are approximately thirty-two (32) inches high as measured from the riser to the top of the wood handrail. (Photo #5) No handrails are present along the wall side of the stairs. The stairs do not constitute a compliant accessible route.

Elevator: The only elevator in the building is located at the rear of the building on the service side. It appears to be the original Payne elevator from the 1920's. The elevator does not have compliant controls, safety features or the required clear width at the elevator entrance. (Photo #8) It is restricted for library personnel use only and predominantly used to move books and supplies between the floors. It is important to note that the elevator does not stop in the middle book stack level.

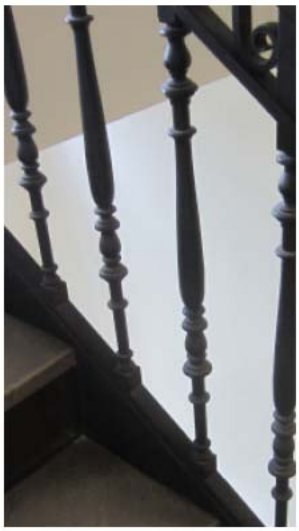
There does not appear to be a practical way to achieve full accessibility compliance with the existing elevator; therefore, we recommend that a new vertical accessible route be developed.

We first looked at the possibility of locating a new elevator at the rear of the building; however, since this area is fenced in to create a secure parking area, it cannot be readily reached by the public. Also, this area is predominantly service and staff oriented. We came to the conclusion that it would be more appropriate to develop a new accessible entrance and vertical circulation on the front side of the building.

We also looked into the possibility of utilizing a vertical platform lift in lieu of an elevator. Ultimately, this was not included in the report since it is not fully code compliant.



4. Interior Basement Stair



5. Typical Railing



6. Interior Connecting Stair



7. Lecture Room Entrance at Basement

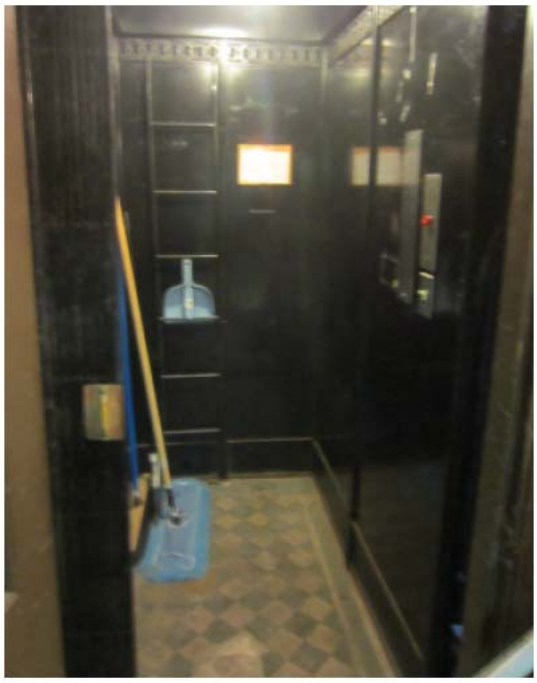
Vertical Accessibility Options: We have developed a conceptual design option for the library's consideration. A new accessible entry lobby will be created at the existing basement entrance on the south side of the building. Refer to concept sketches located in the Appendix. (A000, A01A, A02A & A03A)

The option includes an ADA compliant hydraulic elevator in a self-supporting, fire-rated, concrete block hoistway. The elevator that is drawn is based upon an Otis Gen2 elevator, which does not require a machine room. Installing this elevator will require excavation in the basement for construction of a concrete pit and foundation. The floor construction will also need to be modified to accommodate the shaft.

The map room on the first floor would have to be modified to accommodate the new elevator by removing the built-in bookcases and the door. (Photo #9) The new elevator could connect the new entrance, basement, first floor and the mezzanine level. The ceiling over the mezzanine consists of smooth plaster with a decorative frieze and a painted Greek-key border, which will remain exposed and visible around the new elevator shaft. (Photo #10)

The existing railings at the mezzanine are approximately thirty-two (32) inches high as measured from the floor to the top of the wood handrail. The handrails need to be modified to provide a 42 inch high code compliant guard. This may be accomplished by adding an upper section, similar in nature to the design of the existing rail; or by intrducing a 42 inch high, tempered glass guardrail behind the existing historic railing.

We recommend that the rear mezzanine remain as-is; and remain non-handicapped accessible. This is due to the significant expense of adding another elevator at the rear of the building; and the loss of valuable space on the service side of the building. The area could be utilized by staff only; as long as equal accommodations for staff are provided on the first floor.



8. Elevator



9. First Floor Map Room



10. Front Mezzanine with Map Room at Right

B. Restroom Facilities

The building is currently served by five, original, single-occupant restrooms. Each restroom is equipped with a floor-mounted toilet and either a wall-mounted lavatory or a vanity. Some improvements have been made over the years. Plumbing fixtures and finishes have been replaced, however, the rooms are extremely narrow and located in areas that can not be easily modified to make them accessible. (Photos #11 and #12) Because the rooms do not currently comply with the minimum required fixture clearances, door widths and room dimensions, they are not handicapped accessible.

Given the desire to retain the historic integrity and fabric of the building, we recommend that new, fully accessible, centrally located men's and women's restroom facilities are created at the basement level. The basement is only one floor away from the main reading rooms and just down the hall from the lecture room and original children's room. The existing toilet rooms may be retained when new accessible restrooms are added. Refer to concept sketch A01A, located in the Appendix.

It is important to note that a full code review of the building to determine the number of plumbing fixtures that is required by code is not within the scope of this report. It is likely that the code requires more fixtures than what we are proposing to add; however, a variance may be sought and the proposals in this report represent a significant improvement over current conditions.



11. 1st Floor Restroom



12. Staff Restroom

C. Miscellaneous Items

During our walk-through of the building, we observed floor tiles and piping insulation which, given visual characteristics and age, may contain hazardous materials. Our review of the building did not include an assessment by an environmental services specialist to identify hazardous materials. We recommend that the library consider hiring a specialist to complete a comprehensive analysis and generate a report stating the presence of any hazardous materials. If hazardous materials are found, an abatement plan should be generated as part of any future improvements or work.

V. Energy Commentary

During our inspection of the building, we reviewed the attic and roof for the possibility of accommodating future mechanical equipment. Although there appears to be adequate space in the attic for new mechanical equipment, we are concerned that introducing new equipment and ductwork could potentially introduce problems to the building. One primary reason for concern is related to the air distribution ductwork itself. The main room and flanking reading rooms have richly decorated coffered and painted plaster ceilings. New diffusers and grilles would be no-

ticeable and would require losing historic fabric for their installation. These modifications could also potentially undermine the structural integrity of the suspended ceilings. Please refer to the "Plumbing, Mechanical & Electrical Review" section of the report for the existing systems review and recommendations for upgrade and replacement.

We also observed that the original large central skylight is still present on the roof. Many panes of glass are cracked or broken, and the copper flashings and battens appear compromised in many locations. Overall, the skylight is in poor condition. (Photo #13) The original design included the skylight as a means of introducing natural light into the central reading room. At some point during the 1950's or 1960's, the skylight was modified. (Photo #15) The attic enclosure walls were opened up to install a false ceiling between the inner glass screen and the outer sloped skylight. (Photo #14) The work appears to have been done to introduce fluorescent lighting above the glass screen. The lights are no longer functional and have been abandoned in place.

As part of a sustainable strategy, and in the interest of energy conservation, we recommend that the skylight be replaced in-kind and the false ceiling be removed. The inner glass screen should be cleaned and restored. This would provide the main room with abundant natural daylight. The electric light fixtures could be retrofitted with daylight sensors and tied to a light control system that would dim or turn off the lights when sufficient natural light is present, thus reducing overall energy consumption.

VI. Recommendations:

Based upon our findings in this report, we recommend the following course of action for addressing the issues that we have identified under a phased plan. It should be noted that this is a general outline of phases.

Phase I - Electrical Service, Elevator & Toilet Core:

a) Install new electrical service.
b) Install new fire alarm system.
c) Construct new elevator and modify basement entrance.
d) Construct new site walks.
e) Construct new toilet core in basement.
f) Modify railings on mezzanine levels.

Phase II - Mechanical System:

a) Install new heating and cooling system throughout the building.

Phase III - Lighting & Skylight:

a) Replace main skylight and restore glass screen.
b) Re-wire and re-lamp original fixtures.
c) Provide daylight and occupancy sensors.



13. Skylight at Roof



14. Glass Screen from Above



15. Main Reading Room with Glass Screen at Center

June 27, 2014

PLUMBING, FIRE PROTECTION, MECHANICAL & ELECTRICAL SYSTEMS

EXISTING CONDITIONS REPORT AND PROPOSED BASIS OF DESIGN

Project: #14042

THE KNIGHT LIBRARY

275 Elmwood Avenue
Providence, Rhode Island

Prepared For:

Durkee Brown Viveiros Werenfels Architects
111 Chestnut Street
Providence, Rhode Island

INTRODUCTION:

Under the scope of this Engineering Study, a focused analysis of the Plumbing, Fire Protection, HVAC and Electrical Power, Lighting and Fire Alarm Systems serving Knight Library (c. 1922) has been performed. The building systems have been reviewed relative to Code compliance, condition and for adaptability given the proposed renovations and reuse as an assembly occupancy.

Included as a part of this analysis are recommendations for system upgrade and/or replacement.

Estimates of related construction costs for proposed system improvements have also been provided.

APPLICABLE CODES AND STANDARDS:

The following Codes and Standards have been considered in the preparation of this analysis and report and must be applied in the preparation of design documents for the proposed boiler plant conversion:

International Building Code, 2012 Edition, with State of Rhode Island Amendments
International Mechanical Code, 2012 Edition, with State of Rhode Island Amendments
International Fuel Gas Code, 2012 Edition, with State of Rhode Island Amendments
International Energy Conservation Code, 2012 Edition, with State of Rhode Island Amendments

Rhode Island Fire Laws and Rules, Annotated, 2013 Edition

RI Department of Labor and Training, Boiler Inspection Unit, Rules and Regulations for Boiler and Pressure Vessel Inspection

NFPA 13; Standard for the Installation of Sprinkler Systems, 2010 Edition
NFPA 25; Standard for the Inspection, Testing and Maintenance of Water Based Fire Protection Systems, 2011 Edition
NFPA 54; ANSI Z223.1-2012 National Fuel Gas Code, 2012 Edition
NFPA 70; National Electric Code, 2010 Edition
NFPA 101; Life Safety Code; 2012 Edition

PROJECT AREA BREAK DOWN:

The following area break down of spaces is provided for general reference only. These areas have been based upon existing documents and are noted to be approximate only.

Sub Basement:	=	3,664 gsf
Basement:	=	9,072 gsf
First Floor:	=	8,318 gsf
Mid-Stack	=	2,322 gsf
Mezzanine:	=	2,059 gsf
Total:	=	+/-25,435 gsf

SUMMARY OF EXISTING CONDITIONS and SUGGESTED UPGRADES:

PLUMBING SYSTEMS:

Domestic Water Piping Systems:



Presently, the facility is provided with a 5/8" domestic water meter (#0323049896) that increases to a 2-inch water service that enters the boiler rooms via the north exterior wall and is equipped with a Watts model 909 backflow preventer along with a potable water expansion tank. It is not anticipated that the water service will need to be increased in size.

The domestic water piping material is brass as it enters the building and changes to Type "L" copper with soldered joints and fittings. The existing piping systems were noted to be in good condition.



Boiler make-up is equipped with a Watts 909 backflow preventer and pressure reducing valve.

A reduced pressure zone (RPZ) type backflow preventer should be provided in order to be code compliant.

Domestic Water Piping Systems Insulation:

There is no insulation on existing domestic hot or cold water piping.

Sanitary Waste and Vent Piping Systems:

The building is provided with one sewer outlet leaving the building at the north wall of the Auditorium at the basement level toward Princeton Avenue. The building is equipped with a quantity of four internal storm drains that connect to the sewer system.

The existing sanitary waste and vent piping systems along with the storm drainage system are cast iron. Where visible, the piping systems were noted to be in good condition. Their condition within the wall construction could not be observed.

Natural Gas Piping Systems:

The building is provided with a 2-inch natural gas service via a connection to the municipal main beneath Princeton Avenue, with a 3M rotary-type gas meter located outside of the building.

All internal piping has been installed as Schedule 40 black steel with screwed fittings and joints. Presently, this piping is arranged to serve the demands of the boilers only. It is expected that some reconfiguration and expansion of the gas piping will be required to support the expanded demand posed by the proposed building improvements. As a part of the heating system expansion, it may be required that National Grid make some adjustments at the gas meter.

Domestic Hot Water Generation:



Water Heater In Boiler Room

Hot water is provided to the Kitchen and toilet rooms on the east side of the building by a 6-gallon electric water heater located in the Boiler Room. The water heater was installed in 2007 and appears to be in good condition.

Hot water is provided to the toilet rooms on the west side of the building by a 2.5-gallon Sinkerator (model W152), 1.5 KW electric water heater which is located in the basement level Closet. The water heater appears to be in good condition.

When considering proposed additional fixtures as a part of the building improvements, domestic water heaters may need to be upsized in capacity to support the increased hot water demands of the facility.

FIRE PROTECTION SYSTEM:

Fire Protection:

The building is equipped with one sprinkler head located between the boilers which is connected downstream of a check valve tapped off of the domestic cold water system.

HVAC SYSTEMS:

Boiler:



Existing Boilers

The building is equipped with two natural gas fired low pressure steam boilers which were installed in 1994. Boiler #B-1 was rebuilt in 2013. They are connected to the existing steam distribution and condensate return piping systems via a Hartford loop.

Emergency shut off switches exist at each boiler.

Boiler #B-1 is in excellent condition and boiler #B-2 is in good condition. The duplex feed unit is in good condition.

Specific information relative to the boiler #B-1 is as follows:

Manufacturer:	Weil McLain 78
Model:	778
Input Rating:	937.0 mbh
Net Steam Output Rating:	573.0 mbh
Pressure Rating:	15 psi

Specific information relative to the boiler #B-2 is as follows:

Manufacturer:	Weil McLain 80
Model:	780
Input Rating:	935.0 mbh
Net Steam Output Rating:	565.0 mbh
Pressure Rating:	15 psi

Specific information relative to the boiler feed system is as follows:

Manufacturer:	Hoffman
Model:	100 VBF(2)
Pumping Capacity:	6.9 gpm @ 20#
Pump Configuration:	Duplex
Pump Motor:	1/3 HP ea.

Combustion Air Ventilation Intake and Venting Systems:

Combustion air is provided to boilers with two 24” x 24" louvers located in the west wall of the boiler room, 6-inches below the ceiling. Each louver is equipped with automatic dampers interlocked with each boiler. The installed system meets the requirements of the NFPA 54 Code Standard, for combustion air via One -permanent-opening method IMC 304.6.2.

Each boiler is equipped with a 10-inch diameter single wall vent pipe which is connected to the masonry chimney.

Fresh Air Ventilation:

Currently fresh air ventilation is provided to the building from operable windows.

Mechanical Ventilation System:



Electrical Conduit Installed Within Ductwork

The supply fan and steam coil heating system serving the basement level stacks has been removed. The associated galvanized sheetmetal ductwork with stamped grilles still remains.

Electrical conduit has been installed within this ductwork in numerous locations which is a violation of the National Electric Code

Terminal Space Heating Systems, Existing:

The library is equipped with a 2-pipe, low-pressure steam system. Terminal cast iron radiators at installed at exterior walls in the basement, first floor and mezzanine levels with steam and condensate piping installed within the wall construction.



Steam Radiator with Self Contained Control Valve

Radiators are installed behind benches at the east exterior wall on the first floor. Radiators are located behind stacks located in the basement reading room and first floor stacks. There are 4-inch high openings located at the bottom of the stacks to allow for the convection process to occur behind the shelves. There are stamped louvers located at the perimeter of the former skylight at the mezzanine level.

The first floor entry is not equipped with heat. The basement entries are equipped with radiators.

A 2-inch steam main runs up into the attic for perimeter radiation at the floors below. The attic is also equipped with a 1-inch steam main that follows the perimeter of the former skylight.

All steam and condensate distribution piping is Schedule 40 black steel with screwed joints. Where visible, the piping was noted to be in poor condition.



Grille for Vento-Stack

Gravity Heating System:

The each corner of the building is equipped with a vento-stack system which includes a galvanized duct riser equipped with a cast-iron steam panel at the base. There are 36x6 stamped aluminum grilles installed in each stack at each floor level.



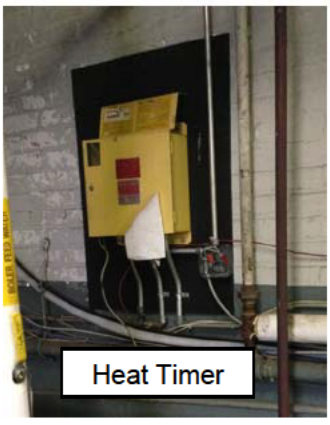
Sidewall Exhaust Fan

Toilet Exhaust Systems:

Existing toilet room is equipped with ceiling mounted or wall mounted exhaust fan that is interlocked with the light switch.

Tele-Data Closet Temperature Control:

The tele-data closet is equipped with a thermostat operated transfer fan that transfers air from the closet to the adjacent hallway.



Heat Timer

Temperature Control Systems:

Presently the heating systems within the building are controlled by simple heat timer. Some radiators are equipped with self-contained control valves. The majority of radiators presently have no form of control.

Systems Maintenance, General:

The heating system is currently maintained by the building's facility staff.

Existing HVAC Systems To Remain:

Existing steam boilers and associated duplex condensate receiver system are in good condition and will remain along with associated steam and condensate piping. Steam radiation located within the stacks and within casing throughout the Library will remain as well.

Existing HVAC Systems Demolition:

Existing systems demolition will be limited to the removal of existing steam coils and associated ductwork for the vento-stack systems which exist within the sub-basement and extend up at each of the four corners of the Library. Associated steam and condensate piping serving vento-stacks will be disconnected and capped.

New HVAC Systems for Proposed Building Improvements:

General:

Two proposed HVAC systems will be provided in this report. A heat loss and heat gain analysis was calculated to determine the capacities required for the Library. Below are design parameters used.

Design Parameters:

Systems will be designed and specified to perform to the standards as defined by the Rhode Island State Building Code and the International Energy Code, (with Rhode Island amendments).

Based upon this information, the following target ranges for system design and operation will be applied:

Design Indoor Space Temperatures:

Winter Design:	70 deg F dry bulb
Summer Design:	76 deg F dry bulb, 50% Relative Humidity

Design Outdoor Air Temperatures:

Winter Design:	5 deg F dry bulb, 3.1 deg F wet bulb
Summer Design:	89 deg F dry bulb, 73 deg F wet bulb

Leaving Air Temperature:

Winter Design:	87 deg F dry bulb, 73 deg F wet bulb

Summer Design: 56 deg F dry bulb, 55 deg F wet bulb

Electrical Power:

HVAC systems are to be selected for operation at 480/277 volt, 3 phase. HVAC temperature control components will require a 120 volt, single phase power source.

Computed Heating and Cooling Demand:

The expected heating and cooling demand of the building has been computed based upon existing floor plans and designated occupancies.

These expected heating and cooling demands have been computed as follows:

Building Cooling Demand, Simultaneous:

Sensible Gain, Room Side:	356,700 btuh
Latent Gain, Room Side:	76,400 btuh
Total Heat Gain, Room Side:	433,100 btuh

Building Heating Demand, Simultaneous:

Heating Demand, Total:	527,500 btuh

Proposed HVAC System #1: (Conventional System)

The first proposed HVAC system combines the use of the existing steam boilers and associated condensate system with two new, modular indoor air handling units. Indoor air handling units will be configured with DX coils with two remote, air cooled condensing units to be located at grade. A new steam-to-hot water heat exchanger will be provided for the generation of heating hot water from the existing steam boiler system. The heat exchanger will be installed in the sub-basement Boiler Room for the hot water coils in the new air handling units. Hot water will be distributed with a new circulating pump via a type-L copper piping system.

The two indoor air handling units (with double wall construction) will be equipped with an air-side economizer, high efficiency filter section, hot water heating coil, access section, dx type cooling coil and supply fan equipped with a variable frequency drive. Units will be installed in the attic on two newly constructed platforms (to be designed by a structural engineer). The air handling units will be equipped with supplemental drain pans along with secondary condensate drain overflow along with an emergency unit shut-down and alarm system. Condensate drain piping shall be type-L copper and extended down to the Boiler Room to discharge at the existing floor drain. A new permanent stair case will also be required for access up into the attic for equipment maintenance.

Two newly constructed dog-houses will be provided at the west roof exposure for ventilation air and exhaust air to each air handling unit. There will be two intake louvers (27.7 square feet total area each) and two exhaust louvers (21.2 square feet total area each). Ductwork will be extended to and from the louvers. One in-line return/exhaust fan will also provided for each air handling system within the attic.

Two 20-ton outdoor air cooled condensing units will be provided and installed on a concrete pad to be located 10 feet off of the west exterior wall (adjacent to the Boiler Room). Condensing units will occupy two parking spaces and be surrounded by fencing to deter vandalism. Refrigerant piping will extend from the condensing units to the Boiler Room within an above grade trench system. Once within the Boiler Room, refrigerant piping will extend up to the air handling units in the attic.

As not to disturb the decorative, coffered ceiling in the Library; new ductwork will be installed within the four corners of the building with sidewall supply grilles (where vento-stacks currently reside). Existing vento-stacks will be removed and vertical chases reconstructed to conceal new vertical ductwork from the attic. New ductwork chases will also be installed within the east and west mezzanines for air distribution down from the attic to the basement and stacks.

The expansion of the toilet room exhaust systems is also proposed for support of the proposed accessible toilet rooms at the Basement level. Existing sidewall exhaust fan at the east basement toilet room will be removed and a new ceiling mounted exhaust fan shall be provided. The routing of toilet exhaust ductwork and location of a new exhaust air louver will be coordinated with the Architect.

Below are equipment schedules for proposed HVAC System #1. Refer to attachments for associated equipment cuts.

Air Handling Unit Schedule:

Zone	Exposure	HVAC Unit	Total Airflow (CFM)	Min. Ventilation Airflow (cfm)	Cooling Total/Sens (mbh)	Total (mbh)	Model
1	North	HVAC -1	9000	1050	211.5/180.0	263.7	Carrier Aero Size 21
2	South	HVAC-2	9000	1050	211.5/180.0	263.7	Carrier Aero Size 21

- R-13 double wall galvanized sealed panels.
- MERV-13 filters.
- Airside economizer.
- Hot water coil with 1-row 8-FPI AL fins galvanized casing and 304 stainless steel drain pan.
- DX coil (R410A) with AL fins galvanized casing and 304 stainless steel drain pan.
- Draw-thru plenum fan with premium efficiency motor and variable speed drive.
- Direct digital controls.

Condensing Unit Schedule:

Zone	Exposure	HVAC Unit	Cooling Total (mbh)	Cooling Total (tons)	Model
1	North	CCU -1	252.1	20	Carrier 38AUD-025
2	South	CCU-2	252.1	20	Carrier 38AUD-025

- Hermetic scroll compressors.
- Dual circuit.
- E-coated aluminum fin evaporator and condenser coils.
- Anti-short cycle protection.

Return/Exhaust Fan Schedule:

Zone	Exposure	HVAC Unit	Airflow (cfm)	External Static Pressure (in. w.c)	HP	Model
1	North	EF -1	9000	0.75	3	Greenheck BSQ-300-30
2	South	EF-2	9000	0.75	3	Greenheck BSQ-300-30

- Belt driven centrifugal in-line.
- Galvanized steel housing.
- Backward included aluminum wheel.
- NEMA Premium Efficiency Motor.

Shell and Tube Hot Water Converter Schedule:

Service	Dia. (in.)	Number of Passes	Tube-Side Flow (gpm)	Hot Water Temp In / Out (°F)	Capacity (lbs per hour)	Steam Pressure (psi)	Model
HVAC-1 & 2	8	4	40	150 /180	615.1	10	Taco G08406-S

- Shell 316 stainless steel.
- Head Fabricated Steel.
- Tubes ¾ x 20 BWG Copper
- Working pressure 150 PSIG (ASME).

Hot Water Pump Schedule:

Service	Flow (gpm)	Pressure Drop (ft. head)	Motor HP	Type	Model
HWP-1 & 2	40	25	1.0	Vert. In Line	Taco KV1506

- Single stage end suction, rear pull-out design.
- Pump casing shall be constructed of ASTM A48 class 30 cast iron.
- Impeller shall be ASTM B584-836/875 bronze and hydraulically balanced.
- Close coupled pump to a NEMA standard JM frame motor.

<u>Proposed HVAC System #2: (Enhanced System)</u>

Proposed system #2 is a ground-source heat pump system coupled with two 35-ton nominal capacity combination chiller-boilers. A plate and frame heat exchanger will be required for an open-loop type ground source system but not required for a closed-loop system. This will be determined by the well designer. The chiller-boilers (and heat exchanger if applicable) will be located in the Boiler Room.

The chiller-boiler system will provide chilled water and heating hot water to two-pipe fan coil units. Summer-winter change over valves will be provided for isolation of heating-only equipment during the summer months. A blend tank will also be provided to account for diversity in system flow as compared to chiller-boiler flow requirements.

Fan coil units will be located in concealed locations where steam radiation is currently located; such as behind bookshelves and benches. Demolition of existing steam radiations would require the temporary removal and replacement of portions of the bookshelves. Steam piping located within exterior walls can be abandoned in place and capped flush with interior partitions.

The existing steam boilers will be converted to supply hot water to the system as a source of back-up when the geothermal system cannot provide sufficient heating output. Two condenser water pumps equipped with variable speed drives will be provided (N+1 arrangement) and two dual temperature pumps also equipped with variable speed drives will also be provided (N+1 arrangement).

Ventilation air will be provided to the Library by a ducted energy recovery ventilator which will be located in the Boiler Room. The energy recovery ventilator will be equipped with a supply fan, exhaust fan and energy recovery wheel and hot water heating coil downstream. Toilet exhaust from the new toilet rooms will be ducted back to the energy recovery ventilator.

Below are equipment schedules for the proposed geothermal chiller-boiler and associated fan coil units.

Geothermal Chiller-Boiler Schedule:

Chiller -Boiler Unit	Cooling Cap (BTUH)	Cooling Condenser Water Temp (°F) / GPM	Cooling Chilled Water Temp (°F) / GPM	Heating Capacity (BTUH)	Heating Condenser Water Temp (°F) / GPM	Heating Hot Water Temp (°F) / GPM	Model
CB-1	325,622	86.0-96.8 /80.0	53.6-43.4 /64.0	341,147	40.0-33.8 /80.0	104-114.7 /64.0	Florida Heat Pump model WW420
CB-2	325,622	86.0-96.8 /80.0	53.6-43.4 /64.0	341,147	40.0-33.8 /80.0	104-114.7 /64.0	Florida Heat Pump model WW420

- Heavy-gauge steel cabinet and casing.
- Refrigerant R-410A.

Millwork-Type Fan Coil Unit Schedule:

Fan Coil Unit Type	Arrangement	Airflow Range (cfm)	Height (in.)	Model
1	2-Pipe	200-1200	24-15/16	Airtherm model FCTF
2	2-Pipe	200-1200	18-3/8	Airtherm model LCTF

- ECM or PSC motor.
- Galvanized steel housing.
- NEMA Premium Efficiency Motor.

Energy Recovery Ventilator Schedule:

ERV Unit	Supply Airflow (cfm)	Supply Fan Motor (HP)	Exhaust Airflow (cfm)	Exhaust Fan Motor (HP)	Unit MCA/ MOCP	Model
1	2100	1.5	2100	1.5	7.5 / 15	Greenheck ERVe-20-15H

- Galvanized steel housing.
- Internally lined galvanized sheet metal, double wall construction with 3 lb insulation.
- Single point control.
- Frost control for energy wheel.
- Low leak dampers.
- 2" MERV 8 filters.

Condenser Water Pump Schedule:

Service	Flow (gpm)	Pressure Drop (ft. head)	Motor HP	Propylene Glycol	Type	Model
CWP-1 & 2	80	40	2.0	40%	Vert. In Line	Taco KV1507

- End suction, rear pull-out design.
- Pump casing shall be constructed of ASTM A48 class 30 cast iron.
- Impeller shall be ASTM B584-836/875 bronze and hydraulically balanced.
- Close coupled pump to a NEMA standard JM frame motor.

Dual Temperature Water Pump Schedule:

Service	Flow (gpm)	Pressure Drop (ft. head)	Motor HP	Propylene Glycol	Type	Model
DTP-1 & 2	85	25	2.0	0%	Vert. In Line	Taco KV1507

- End suction, rear pull-out design.
- Pump casing shall be constructed of ASTM A48 class 30 cast iron.
- Impeller shall be ASTM B584-836/875 bronze and hydraulically balanced.
- Close coupled pump to a NEMA standard JM frame motor.
- Provide VFD control.

<u>Alterations to Existing Air Distribution Systems:</u>

General:

As noted previously, the proposed modifications to the building's existing air distribution systems will be required to provide conditioned air to the stacks as well as the Basement, First Floor and Mezzanines.

New ductwork can be installed where the four vento-stacks resided. New sidewall air distribution can be provided off of the chases to supply air to the Library without disturbing the coffered ceiling. New chases will be provided at the back of the Mezzanines and will extend down to existing-to-remain distribution ductwork at the stacks.

June 27, 2014

PLUMBING, FIRE PROTECTION, MECHANICAL & ELECTRICAL SYSTEMS

MECHANICAL EQUIPMENT CUTS PROPOSED SYSTEM #1

Project: #14042

THE KNIGHT LIBRARY

275 Elmwood Avenue
Providence, Rhode Island

Prepared For:

Durkee Brown Viveiros Werenfels Architects
111 Chestnut Street
Providence, Rhode Island

Certified Drawing for AHU-1

Project: 14042 Knight Library AHU
Prepared By:

06/18/2014
09:04AM

UNIT	ELECTRICAL CHARACTERISTICS	STD. UNIT WT.		CORNER A		CORNER B		CORNER C		CORNER D		CENTER OF GRAVITY			UNIT HEIGHT
		LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	LBS.	KG.	X	Y	Z	H
38AUZ25 (RTPF)	208/230-3-60,460-3-60,575-3-60	978	444	340	163	188	85	147	67	283	128	38 [965.2]	23 [584.2]	17 [431.8]	50-3/8 [1270.2]
38AUD25 (RTPF)	208/230-3-60,460-3-60,575-3-60	978	444	340	163	188	85	147	67	283	128	38 [965.2]	23 [584.2]	17 [431.8]	50-3/8 [1270.2]
38AUQ25	208/230-3-60,460-3-60,575-3-60	1015	460	354	161	224	102	170	77	268	122	37 [939.8]	26 [660.4]	23 [584.2]	50-3/8 [1270.2]

UNITED TECHNOLOGIES CARRIER P.O. BOX 4808 SYRACUSE, NY 13221

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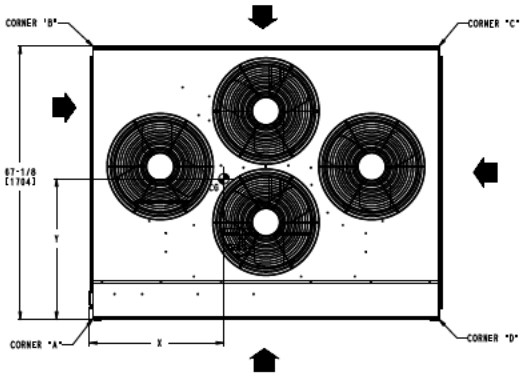
NOTES:
1. MINIMUM CLEARANCE (LOCAL CODES OR JURISDICTION MAY PREVAIL):
   A. BOTTOM TO COMBUSTIBLE SURFACES: 0 INCHES.
   B. OUTDOOR COIL, FOR PROPER AIR FLOW: 36 INCHES ONE SIDE, 12 INCHES THE OTHER. THE SIDE GETTING THE GREATER CLEARANCE IS OPTIONAL.
   C. OVERHEAD: 60 INCHES, TO ASSURE PROPER OUTDOOR FAN OPERATION.
   D. BETWEEN UNITS: CONTROL BOX SIDE, 42 INCHES PER NEC.
   E. BETWEEN UNIT AND UNGROUNDED SURFACES: CONTROL BOX SIDE, 36 INCHES PER NEC.
   F. BETWEEN UNIT AND BLOCK OR CONCRETE WALLS AND OTHER GROUNDED SURFACES: CONTROL BOX SIDE, 42 INCHES PER NEC.
2. WITH EXCEPTION OF THE CLEARANCE FOR THE OUTDOOR COIL AS STATED IN NOTE 1B, A REMOVABLE FENCE OR BARRICADE REQUIRES NO CLEARANCE.
3. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM WOOD OR CLASS A, B OR C ROOF COVERING MATERIAL.

SERVICE VALVE CONNECTIONS		
UNIT	SUCTION	LIQUID
38AUZ25	1-5/8 [41.3]	5/8 [15.9]
38AUD25	1-3/8 [34.9]	1/2 [12.7]
38AUQ25	1-3/8 [34.9]	1/2 [12.7]

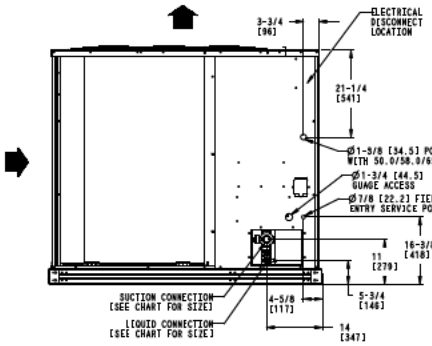
CG CENTER OF GRAVITY

DIRECTION OF AIR FLOW

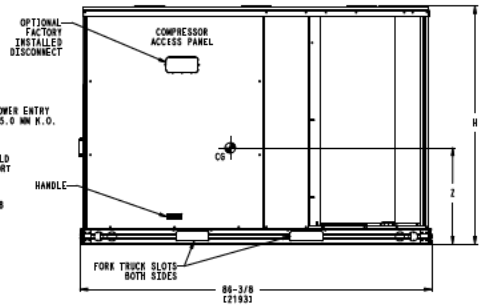
DIMENSIONS IN [ ] ARE IN MM



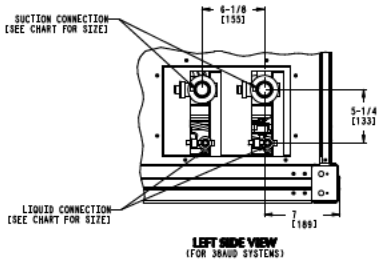
TOP VIEW



LEFT SIDE VIEW



FRONT VIEW



LEFT SIDE VIEW (FOR 38AUD SYSTEMS)

DATE	SUPERCEDES			REV
08/04/10	04/14/10	38AUZ , 38AUD AND 38AUQ 25 CONDENSING UNIT	38AU500370	D

Certified Drawing for AHU-1

Project: 14042 Knight Library AHU
Prepared By:

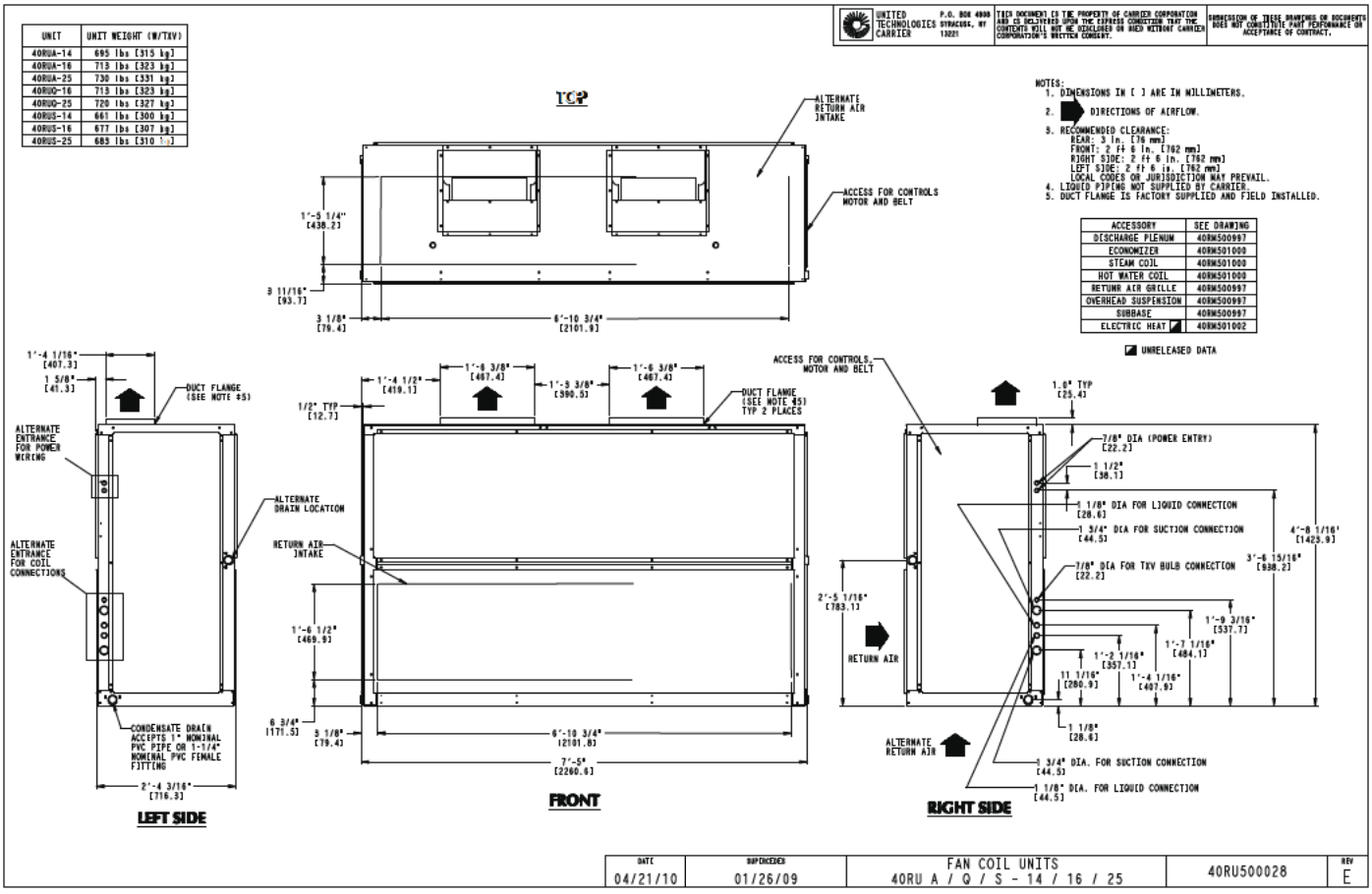
06/18/2014
09:04AM

UNIT	UNIT WEIGHT (W/TXV)
40RUA-14	695 lbs [315 kg]
40RUA-16	713 lbs [323 kg]
40RUA-25	730 lbs [331 kg]
40RUQ-16	713 lbs [323 kg]
40RUQ-25	720 lbs [327 kg]
40RUS-14	661 lbs [300 kg]
40RUS-16	677 lbs [307 kg]
40RUS-25	683 lbs [310 kg]

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DATE	SUPERCEDES			REV
04/21/10	01/26/09	FAN COIL UNITS 40RU A / Q / S - 14 / 16 / 25	40RU500028	E

Certified Drawing for AHU-1

Project: 14042 Knight Library AHU
Prepared By:

06/18/2014
09:04AM

HOT WATER AND STEAM COIL ACCESSORIES

UNIT SIZES 07 - 12

DIMENSION	HOT WATER COIL	STEAM COIL
A	1⅛" MPT	[38.1] 1⅛" MPT	[38.1]
B	1½" MPT	[38.1] 2½" MPT	[63.5]
C	2⅜"	[60.3] 3⅛"	[79.4]
D	4⅞"	[123.8] 3⅛"	[79.4]
E	2⅛"	[54.0] 4⅝"	[115.8]
F	1'-11¼"	[590.6] 1'-9"	[584.2]
G	3'-4"	[1016.0] 3'-4"	[1016.0]

UNIT SIZE 14 - 25

DIMENSION	HOT WATER COIL	STEAM COIL
A	2" MPT	[50.8] 1½" MPT	[38.1]
B	2" MPT	[50.8] 2½" MPT	[63.5]
C	2⅜"	[60.3] 3⅛"	[79.4]
D	4⅞"	[123.8] 3⅛"	[79.4]
E	2⅛"	[54.0] 4⅝"	[115.8]
F	1'-11¼"	[590.6] 1'-9"	[584.2]
G	6'-8"	[2032.0] 6'-8"	[2032.0]

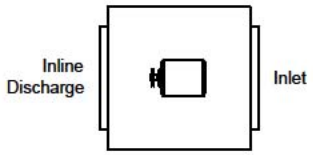
NOTE: Dimensions in [ ] are millimeters.

GREENHECK
Building Value in Air.

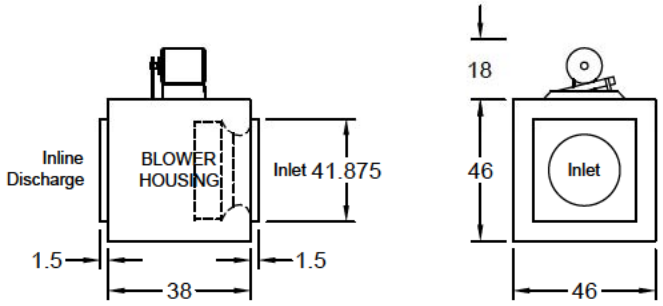
Printed Date: 6/27/2014
Job: 14042 Knight Library
Mark: REF-1&2

Model: BSQ-300-30

Belt Drive Centrifugal Inline Fan



PLAN VIEW

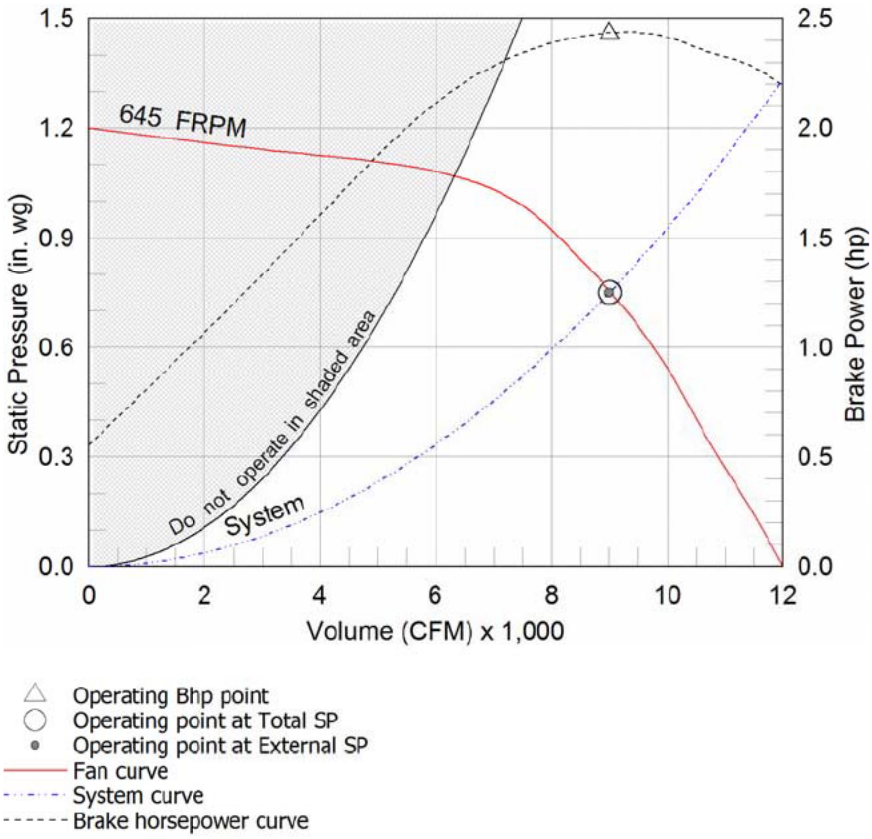


ELEVATION VIEW END VIEW

Dimensional	
Quantity	1
Weight w/o Acc's (lb)	501
Weight w/ Acc's (lb)	505
Max T Motor Frame Size	215

Performance	
Requested Volume (CFM)	9,000
Actual Volume (CFM)	9,000
External SP (in. wg)	0.75
Total SP (in. wg)	0.75
Fan RPM	645
Operating Power (hp)	2.43
Elevation (ft)	62
Airstream Temp.(F)	70
Air Density (ft3)	0.075
Drive Loss (%)	4.6
Tip Speed (ft/min)	5,150
Static Eff. (%)	46

Motor	
Motor Mounted	Yes
Size (hp)	3
V/C/P	460/60/3
Enclosure	ODP
Motor RPM	1725
Windings	1
NEC FLA* (Amps)	4.8



Sound Power by Octave Band

Sound Data	62.5	125	250	500	1000	2000	4000	8000	LwA	dBA	Sones
Inlet	84	87	82	75	73	69	64	59	79	68	17.5
Radiated	87	88	78	69	65	54	46	43	76	64	14.2

Notes:

All dimensions shown are in units of in..
*FLA - based on tables 150 or 148 of National Electrical Code 2002. Actual motor FLA may vary, for sizing thermal overload, consult factory.
LwA - A weighted sound power level, based on ANSI S1.4
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per Octave band at 5 ft - dBA levels are not licensed by AMCA International
Sones - calculated using AMCA 301 at 5 ft

Submittal Data Information

U Tube Heat Exchangers

201-009T

Model G8406S 8" Diameter Steam, 4 Pass, 3' Length

JOB: Knight Library

CONTRACTOR:

ENGINEER: WAI

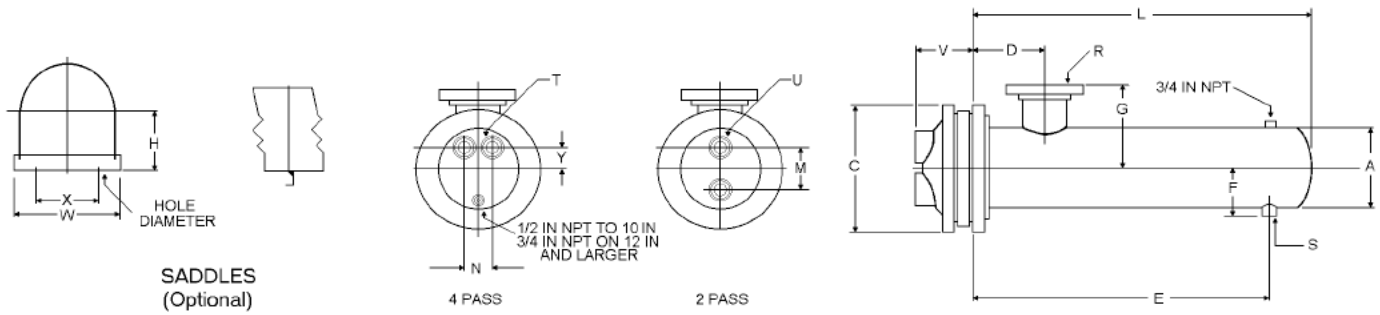
REP:

COMMENTS:

ITEM NO.	MODEL NO.	PASSES
Hx	G08406-S	4

	FLUID	FLOW (gpm)	TEMP. IN (F)	TEMP. OUT (F)	PRESS. DROP (ft)	VELOCITY (fps)
TUBESIDE	Water	40	150	180	0.74	3.21

	STEAM	LBS. PER HOUR	SAT. STEAM TEMP.	STEAM PRESSURE		
SHELLSIDE		615.1	239.4	10		



* Dimensions in inches, heating surface in sq.ft., weight in lbs.

N	T	Y	V	A	C	D	E	F	G	L	R	S	Heating Surface	Shipping Weight
4	2T	2	3-3/8	8-5/8	13-1/2	8	30	6	6-7/8	36	2-1/2T	1T	25.1	234

SADDLE DIMENSIONS: H-7-5/16; W-11-1/4; X-9; Hole Diameter.-5/8

MATERIALS OF CONSTRUCTION

	Standard	Optional
Shell	Steel	304ss, 316ss
Head	Cast Iron 4-10"	Fabricated Steel, Cast Bronze, Fabricated 304ss/316ss
	Fabricated Steel 12-30"	Cast Bronze, Fabricated 304ss/316ss
Tubes	3/4 x 20 BWG Copper	3/4 18 BWG Copper, Steel, 304ss, 316ss, 90/10 Cu Ni, Admiralty
Tube Sheet	Steel	Bronze, Brass, 304ss, 316ss, 90/10 Cu Ni
Separators	Steel	Bronze, Brass, 304ss, 316ss, 90/10 Cu Ni
Working Pressure	150 PSIG (ASME)	Consult Factory
Max. Temperature	375 deg. F	Consult Factory

COMPARE. YOU'LL TAKE TACO.

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TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone:905/564-9422. FAX: 905/564-9436

Submittal Data Information

KV Series Vertical Close Coupled Pumps

301-1094T

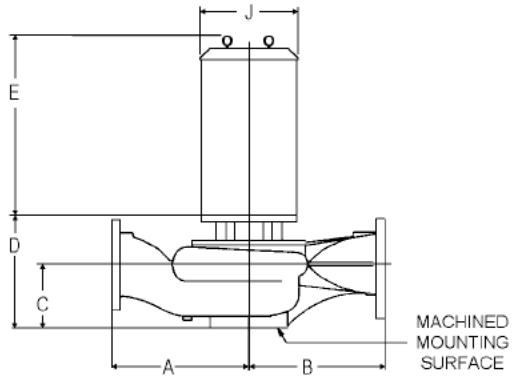
MODEL 1506 **1760 RPM**

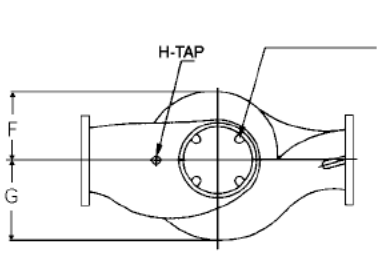
JOB: Knight Library CONTRACTOR:

ENGINEER: WAI REP:

COMMENTS:

ITEM NO.	MODEL NO.	IMP. DIAM. / IN.	FLOW / GPM	HEAD / FT	POWER / HP	ELEC. CHARS
	KV1506	5.2	40	25	1	

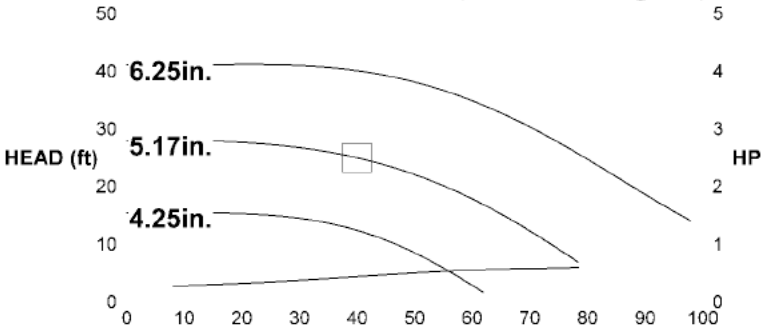




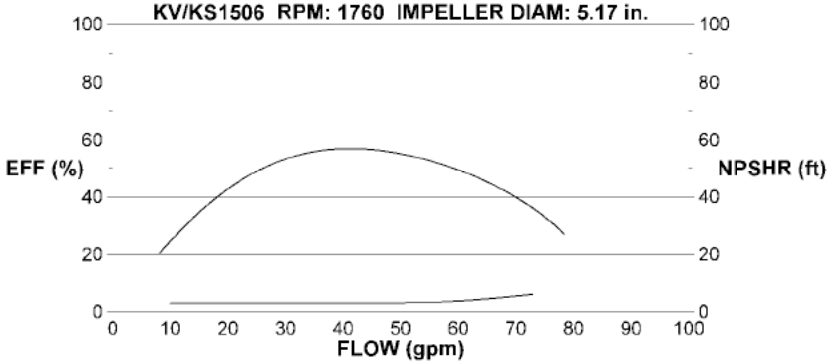
* Dimensions in inches. Do not use for construction purposes unless certified.

CONN.	HP	FRAME	Flange Size ASA	860 kpa Flange A	860 kpa Flange B	C	D	E	F	G	H	J
1.5x1.5	1	143JM	1.50	7.50	7.50	4.49	8.65	12.06	4.13	4.63	.25	6.62

PUMP PERFORMANCE CURVES (based on Water @ 60 F)



KV/KS1506 RPM: 1760 IMPELLER DIAM: 5.17 in.



Item	BRONZE FITTED Standard	Optional
Casing	Cast Iron ASTM A48 Class 30A	
Impeller	Bronze ASTM B584-836	CF
Wear Ring	None	
Shaft	Carbon Steel	
Shaft Sleeve	Bronze ASTM B584-932 SAE660	
Mech. Seal	Ceramic EPT	
Seal Flush Line	Copper	CF

OPERATING SPECIFICATIONS

	Standard		Optional
Flange Pressure	125# 860K	250# 1720	
	175 PSIG	300 PSIG	CF
	1210 KPA	2070 KPA	CF
Temperature	250F 120C	250F 120C	CF

CF - Consult Factory

Do it once. Do it right.

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June 27, 2014

PLUMBING, FIRE PROTECTION, MECHANICAL & ELECTRICAL SYSTEMS

MECHANICAL EQUIPMENT CUTS PROPOSED SYSTEM #2

Project: #14042

THE KNIGHT LIBRARY

275 Elmwood Avenue
Providence, Rhode Island

Prepared For:

Durkee Brown Viveiros Werenfels Architects
111 Chestnut Street
Providence, Rhode Island

WATER COOLED CHILLERS AND LOW TEMP BOILERS

UNIT PERFORMANCE DATA

FHP MANUFATURING HIGH-EFFECIENCY WATER SOURCE HEAT PUMPS

WW420

WW SERIES

Refrigerant R-410A

Unit Tag	Qty	Configuration	Remarks
WWHP-1	2	Remote Control	

Electrical Specifications

Voltage	Stages	Compressor		Unit	
		RLA	LRA	MCA	MFS
460/3/60	2	26.9	173.0	60.5	80.0

Cooling Performance / **Heating Performance**

Condenser	Condenser Entering Fluid Temp (F)	86.0	Source	Source Entering Fluid Temp (F)	40.0
	Leaving Fluid Temp (F)	96.8		Leaving Fluid Temp (F)	33.8
	Flow Rate (GPM)	80.0		Flow Rate (GPM)	80.0
	Pressure Drop (FOH)	15.1		Pressure Drop (FOH)	21.0
	% Propylene Glycol	30.0		% Propylene Glycol	30.0
	Freeze Point	8.0		Freeze Point	8.0

Evaporator	Evaporator Entering Fluid Temp (F)	53.6	Load	Load Entering Fluid Temp (F)	104.0
	Leaving Fluid Temp (F)	43.4		Leaving Fluid Temp (F)	114.7
	Flow Rate (GPM)	64.0		Flow Rate (GPM)	64.0
	Pressure Drop (FOH)	9.1		Pressure Drop (FOH)	7.5
	% Propylene Glycol	0.0		% Propylene Glycol	0.0
	Freeze Point	32.0		Freeze Point	32.0

Chiller Capacity (BtuH)	325,622	Heating Capacity (BtuH)	341,127
Input Watts (W)	24,937	Input Watts (W)	30,476
EER (BtuH/W)	13.1	COP (W/W)	3.3
Heat Rejection (BtuH)	410,706	Heat Absorbtion (BtuH)	237,142

Warnings:

Units are complete packages featuring 2 stage operation and containing refrigeration compressors, reversing valves, expansion valve metering devices and coaxial style water to refrigerant heat exchangers. Also included are safety controls: overload protection for compressors, high and low refrigerant pressure switches and lock-out control circuit (CAP 4.05).

The results reported herein are based on testing by FHP. Variations in the installation and operational environment may alter performance. FHP disclaims all warranties, express and implied, that the performance will be as reported, including the warranty of merchantability and fitness for purpose. Continuous research and development may result in a change to an appliances design and specifications, which FHP may change without notice

Submittal Data Information

KV Series Vertical Close Coupled Pumps

301-1097T

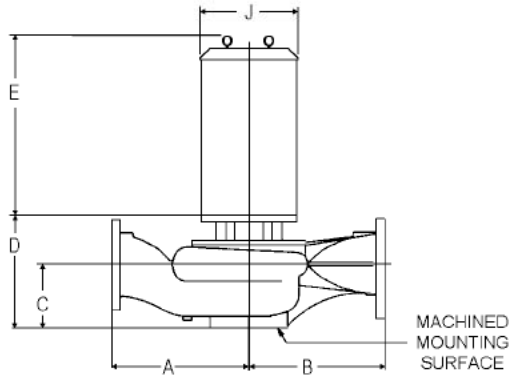
MODEL 1507 **1760 RPM**

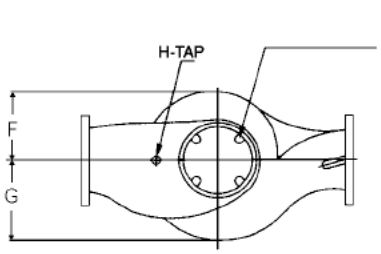
JOB: Knight Library CONTRACTOR:

ENGINEER: WAI REP:

COMMENTS: Geothermal Condenser Water Pump (N+1) with 40% PG

ITEM NO.	MODEL NO.	IMP. DIAM. / IN.	FLOW / GPM	HEAD / FT	POWER / HP	ELEC. CHARS
	KV1507	7.3	80	40	2	

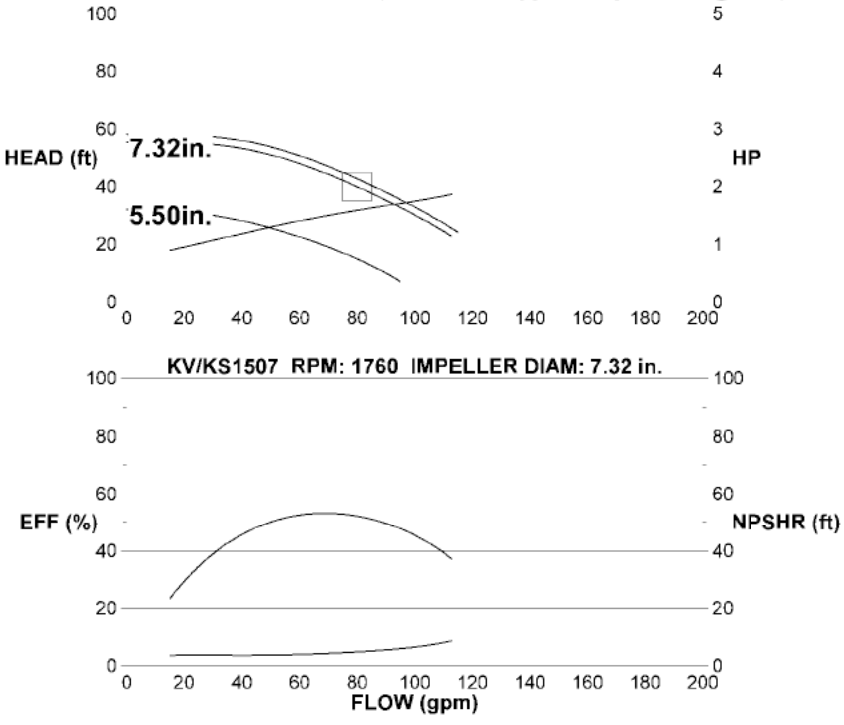




* Dimensions in inches. Do not use for construction purposes unless certified.

CONN.	HP	FRAME	Flange Size ASA	860 kpa Flange A	860 kpa Flange B	C	D	E	F	G	H	J
1.5x1.5	2	145JM	1.50	8	8	4.13	8.42	13.43	4.88	5.16	.25	6.62

PUMP PERFORMANCE CURVES (based on Propylene Glycol 40% @ 50 F)



Item	BRONZE FITTED Standard	Optional
Casing	Cast Iron ASTM A48 Class 30A	
Impeller	Bronze ASTM B584-836	CF
Wear Ring	None	
Shaft	Carbon Steel	
Shaft Sleeve	Bronze ASTM B584-932 SAE660	
Mech. Seal	Ceramic EPT	
Seal Flush Line	Copper	CF

OPERATING SPECIFICATIONS

	Standard		Optional
Flange	125# 860K	250# 1720	
Pressure	175 PSIG	300 PSIG	CF
	1210 KPA	2070 KPA	CF
Temperature	250F 120C	250F 120C	CF

CF - Consult Factory

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ERVe-20-15H

CONSTRUCTION FEATURES AND ACCESSORIES

Unit Overview

Model	Outside Air (CFM)	Exhaust (CFM)	Electrical V/C/P
ERVe-20-15H	2,100	2,100	460/60/3

Features

- Exterior housing constructed of galvanized steel
- Energy recovery cassette with a desiccant wheel
- Two blower and motor assemblies mounted with neoprene isolators
- Forward curved steel wheels
- Ball bearing motors
- Fan shafts in permanently lubricated bearings
- Corrosion resistant fasteners
- Internally lined with galvanized sheet metal creating a double wall
- Insulated with 1 in. 3# density insulation
- Door interlocking disconnect switch
- Internally mounted control center with motor starters, 24 VAC control transformers, control circuit fusing
- Single Point Wiring
- Motor mounted on adjustable plate
- Adjustable Motor Pulleys under 10 hp
- Static Free Belts
- Exhaust Discharge Gravity Backdraft Damper

Options and Accessories

- Listed to UL-1995
- Frost Control: Modulating Wheel
- Outdoor Air Filter - 2" MERV 8, 2-20x20
- Exhaust Air Filter(s) - 2" MERV 8, 2-20x20
- Supply Dampers - Motorized Low Leakage
- Exhaust Dampers - Motorized Low Leakage
- Weatherhood: Downturned Hood
- Hinged Access Doors

Note: Weight does NOT include skid/crating and may vary by 15% based on selected options.

-

ERVe-20-15H

PERFORMANCE AND SPECIFICATIONS

Description/Arrangement

Model	Qty	Unit Weight (lb)	Outdoor Air Discharge	Outdoor Air Intake	Exhaust Air Discharge	Return Air Intake
ERVe-20-15H	1	884	Bottom	End	Side	Bottom

Design Conditions

Elevation (ft)	Summer DB (F)	Summer WB (F)	Winter DB (F)
62	89	73	0

Air Performance

Type	Volume (CFM)	External SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor Size (hp)
Supply	2,100	0.5	1.057	1560	1.27	1-1/2
Exhaust Normal	2,100	0.5	0.921	1505	1.21	1-1/2

Electrical/Motor Specifications

V/C/P	Unit MCA (amps)	Unit MOP (amps)	Enclosure	Supply Motor RPM	Supply Efficiency	Exhaust Motor RPM	Exhaust Efficiency
460/60/3	7.5	15	ODP	1725	PE	1725	PE

Unit Pressure Drop (in. wg)

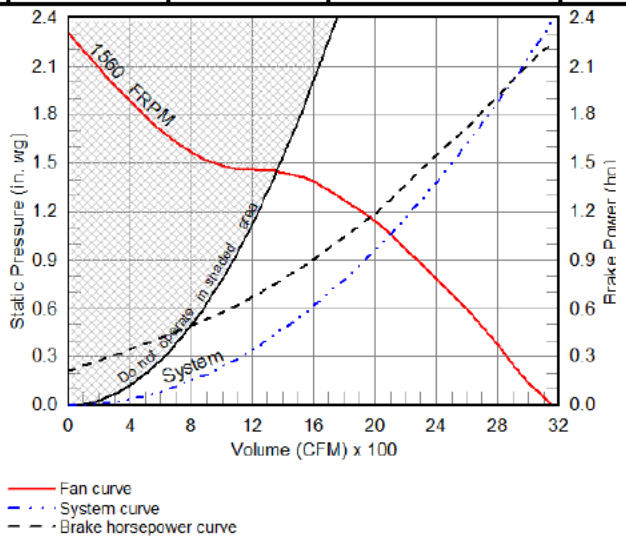
Air Stream	Weatherhood	Damper Section	Filter Section	Cooling Section	Heating Section
Supply	0.306	0.042	0.209	N/A	N/A
Exhaust	0.094	0.118	0.209	N/A	N/A

ERVe-20-15H

FAN CURVES

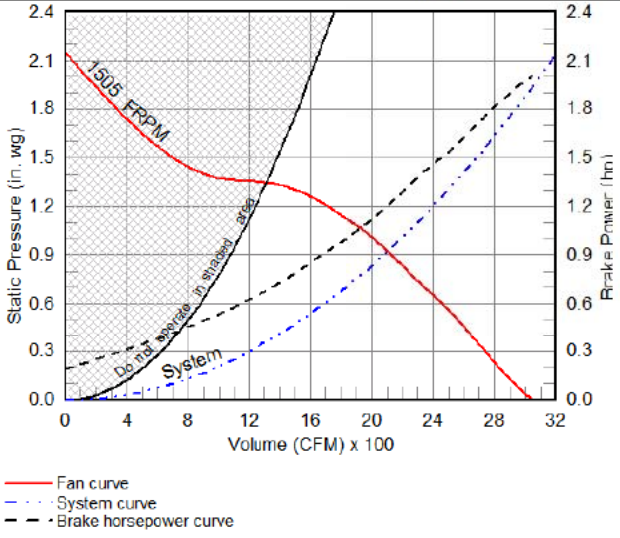
Supply Fan Performance

Volume (CFM)	Supply SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor Size (hp)	Fan Size	Fan Quantity
2,100	0.5	1.057	1560	1.27	1-1/2	A9-9	1



Exhaust Fan Performance - Normal Operation

Volume (CFM)	Exhaust SP (in. wg)	Total SP (in. wg)	RPM	Operating Power (hp)	Motor Size (hp)	Fan Size	Fan Quantity
2,100	0.5	0.921	1,505	1.21	1-1/2	A9-9	1



ERVe-20-15H

FAN SOUND PERFOMRANCE

EXHAUST FAN SOUND PERFORMANCE

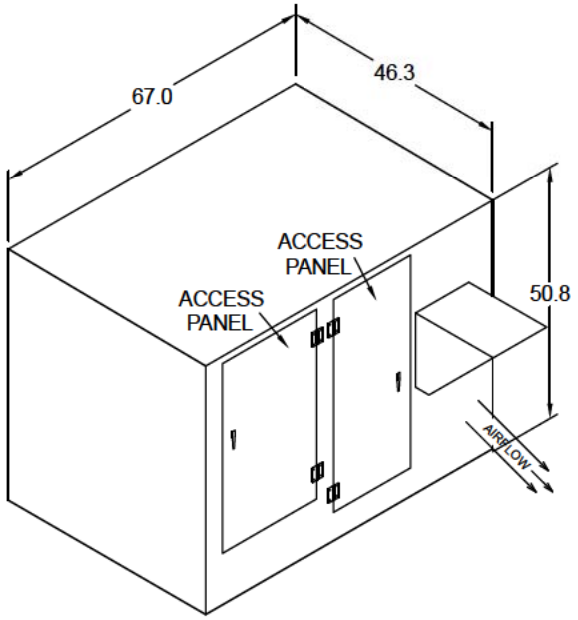
Exhaust Inlet Sound Power by Octave Band								Lwa	dBA
62.5	125	250	500	1000	2000	4000	8000		
73	69.3	62.5	58.3	62.3	62.3	60.8	56.2	68.2	56.7

SUPPLY FAN SOUND PERFORMANCE

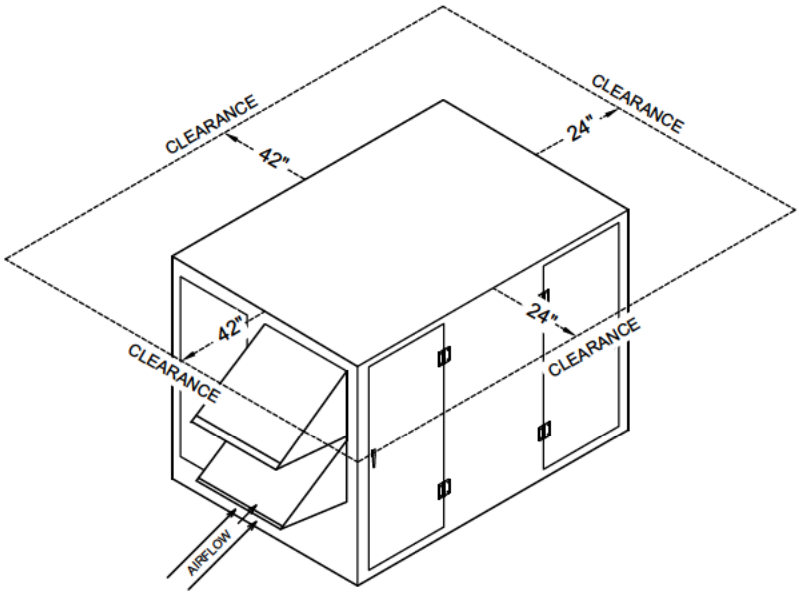
Supply Outlet Sound Power by Octave Band								Lwa	dBA
62.5	125	250	500	1000	2000	4000	8000		
74.1	70.5	63.8	58.8	63.1	63.2	61.9	57.3	69.1	57.6

ERVe-20-15H

ISOMETRIC DRAWINGS



Back Right Isometric



Front Left Isometric

Submittal Data Information

KV Series Vertical Close Coupled Pumps

301-1097T

MODEL 1507 **1760 RPM**

JOB: Knight Library DT-Pump

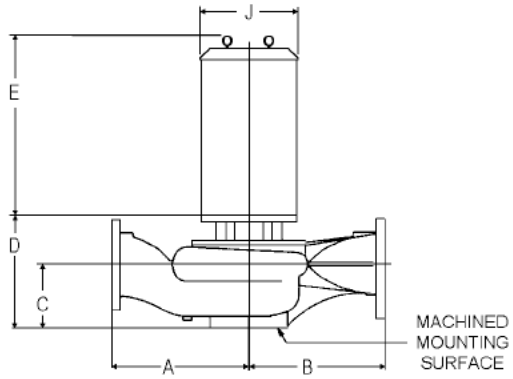
CONTRACTOR:

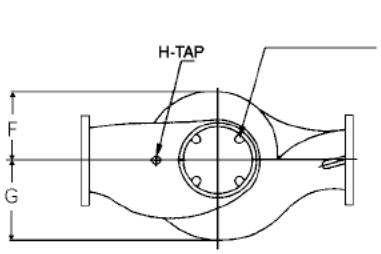
ENGINEER: WAI

REP:

COMMENTS:

ITEM NO.	MODEL NO.	IMP. DIAM. / IN.	FLOW / GPM	HEAD / FT	POWER / HP	ELEC. CHARS
	KV1507	7.3	80	40	2	

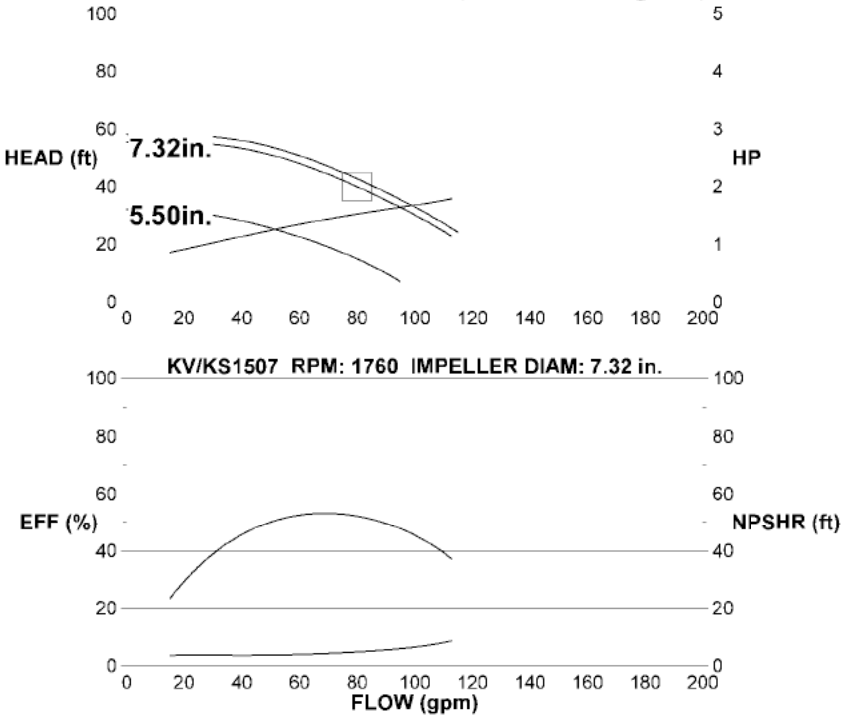




* Dimensions in inches. Do not use for construction purposes unless certified.

CONN.	HP	FRAME	Flange Size ASA	860 kpa Flange A	860 kpa Flange B	C	D	E	F	G	H	J
1.5x1.5	2	145JM	1.50	8	8	4.13	8.42	13.43	4.88	5.16	.25	6.62

PUMP PERFORMANCE CURVES (based on Water @ 60 F)



KV/KS1507 RPM: 1760 IMPELLER DIAM: 7.32 in.

Item	BRONZE FITTED Standard	Optional
Casing	Cast Iron ASTM A48 Class 30A	
Impeller	Bronze ASTM B584-836	CF
Wear Ring	None	
Shaft	Carbon Steel	
Shaft Sleeve	Bronze ASTM B584-932 SAE660	
Mech. Seal	Ceramic EPT	
Seal Flush Line	Copper	CF

OPERATING SPECIFICATIONS

	Standard		Optional
Flange	125# 860K	250# 1720	
Pressure	175 PSIG	300 PSIG	CF
	1210 KPA	2070 KPA	CF
Temperature	250F 120C	250F 120C	CF

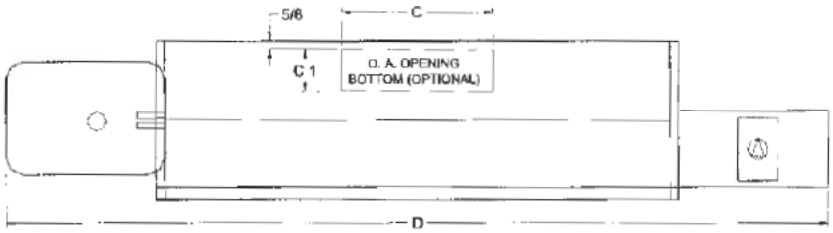
CF - Consult Factory

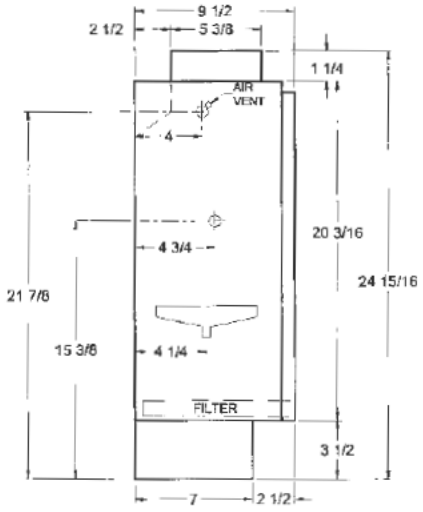
Do it once. Do it right.

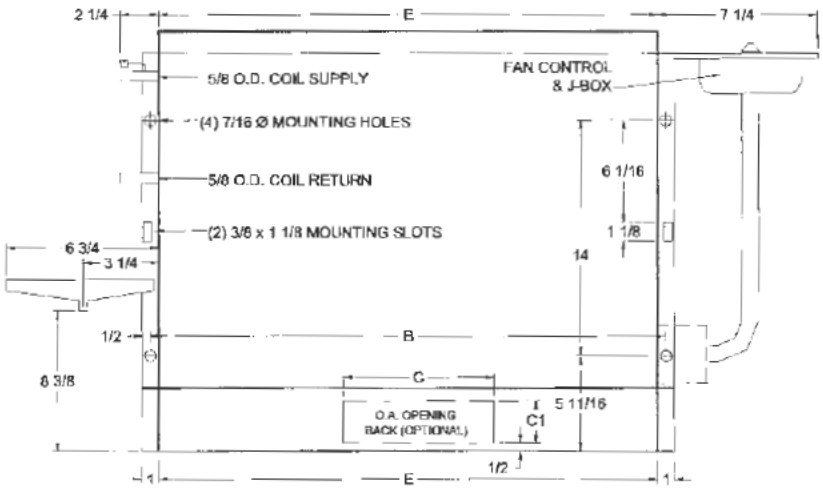
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TACO (Canada), Ltd., 6180 Ordan Drive, Mississauga, Ontario L5T 2B3. Telephone:905/564-9422. FAX: 905/564-9436

UNITAIRE IV FAN COIL UNITS

FCTF



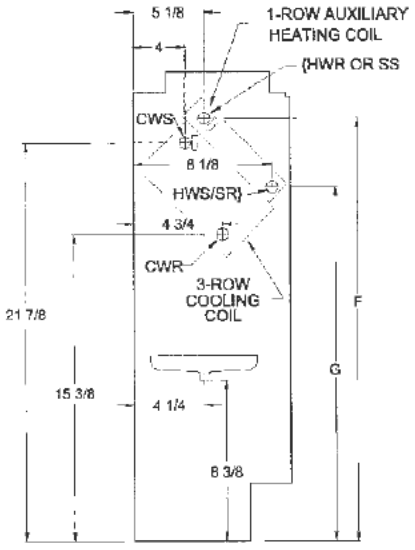




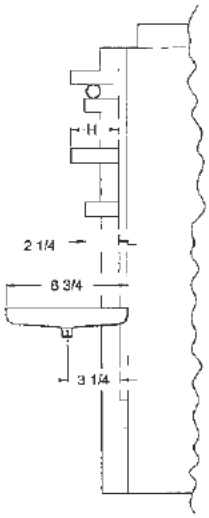
LEFT HAND PIPING CONNECTIONS SHOWN. RIGHT HAND OPPOSITE. PIPING HAND DETERMINED WHEN FACING AIR OUTLET ELECTRIC JUNCTION BOX LOCATION MAY VARY DEPENDING UPON CONTROL REQUIRMENTS. CONTACT FACTORY.

DIMENSIONS					
UNIT SIZE	B	25 % O.A. INTAKE		D	E
		C	C1		
02	22	9	2 1/2	35	21
03	28	9	2 1/2	41	27
04	32	15	2 1/2	45	31
06	46	15	2 1/2	59	45
08	58	27	2 1/2	71	57
01/12	78	27	2 1/2	91	77

OPTIONAL 1-ROW AUXILIARY HEATING COIL



LEFT END VIEW



FRONT VIEW

LEGEND

CWS-CWR: Chilled Water Supply – Return
HWS-HWR: Hot Water Supply - Return
SS-SR: Steam Supply – Return

SPECIAL NOTES

1-Row Auxiliary Steam or Water Coil Connections may be "Same As" or "Opposite" Cooling Coil Piping. If "Opposite" is selected, the fan speed control must be located on the chilled water side or located remote from the unit.

CONTROL PACKAGES

Control Packages require Engineering Investigation for confirmation of adequate space allowance.

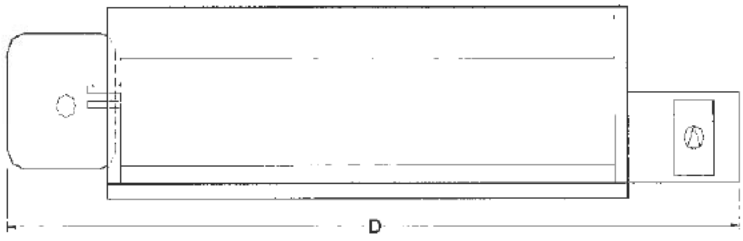
DIMENSIONS

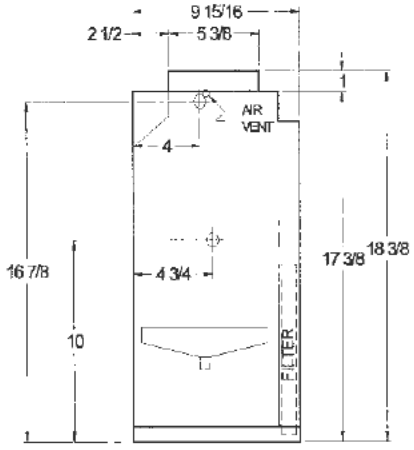
UNIT SIZE	DIMENSIONS (In.)		
	F	G	H
02 03 04	23	17 13/16	2
06 08 01 12	22 7/8	17 15/16	3

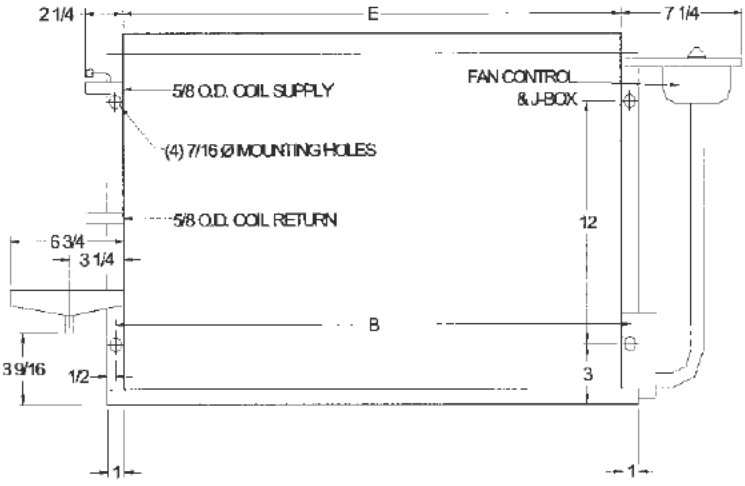
Coil connections are 5/8" O.D. sweat

UNITAIRE IV FAN COIL UNITS

LCTF







LEFT HAND PIPING CONNECTIONS SHOWN. RIGHT HAND OPPOSITE. PIPING HAND DETERMINED WHEN FACING AIR OUTLET ELECTRIC JUNCTION BOX LOCATION MAY VARY DEPENDING UPON CONTROL REQUIRMENTS. CONTACT FACTORY.

1-ROW AUXILLIARY HEATING COIL IS NOT AVAILABLE WITH THIS UNIT

DIMENSIONS			
UNIT SIZE	B	D	E
02	22	35	21
03	28	41	27
04	32	45	31
06	46	59	45
08	58	71	57
01/12	78	91	77

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B | E | R

BUILDING ENGINEERING RESOURCES, INC.

Building Electrical System Assessment

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PREPARED FOR:
Wilkinson Associates
615 Jefferson Boulevard #7
Warwick, Rhode Island 02886

PREPARED BY:
Building Engineering Resources, Inc.
Marc R. Plante, PE – Electrical

June 27, 2014

66 Main Street | North Easton, Massachusetts 02356 | T 508.230.0260 | F 508.230.0265 | BER@BER-engineering.com

ELECTRICAL SYSTEM

Incoming Services

There are two (2) electrical services supplying power to electrical loads. Service #1 is rated 200 amps at 120/240 volt, 1 phase, 3 wire. Service #2 is rated 60 amps at 600 volts, 3 phase, 3 wire. Both services enter the basement level, below grade from Princeton Street.

Service #1 originates at the last utility pole on Princeton Street. This pole is almost parallel with the building. I was unable to confirm the origin of Service #2. National Grid will need to provide additional information on how the 600 volt system is distributed in the area.

Service #1 is metered in the basement and terminated at a Square "D", 200 amp load center. This panel serves alarms, boiler room loads, computers, etc. and two (2) upper level branch circuit panels.

Service #2 is metered in the basement and terminates at a 60 amp, 3 pole fused disconnect switch. There are two (2) feeders from the CT box. One (1) feed supplies the 30 kVA 600 volt – 120/208 volt, 3 phase, 4 wire dry type transformer located in the basement. The second feeder supplies the 10 HP 600 volt traction elevator system.

Some disconnect switches appear original to the building. All panelboards have been upgraded and are in fair condition at best.

The 30 kVA transformer supports panel "A" on the first floor and in turn a 50 amp sub-panel in the Maintenance Office. The transformer has a primary side fused disconnect only. No secondary side overcurrent protection. The feeder is routed through the basement, enters the elevator shaft and rises up to panel "A". Panel "A" is recessed in the elevator shaft wall, back box is exposed in the shaft, and feeder connects to backside of panel. This entire installation violates Building and Elevator Codes.

Panel "A" is a Square "D" NQOD panelboard in fair condition. This is a main lug only panel. Panel supports lighting circuits and sub-panel. Unable to verify location and condition of sub-panel.

Panel "B" is located on first level adjacent to main entrance vestibule, toilet room side. Panel is 120/240 volt, 1 phase and supports lighting loads and small power receptacle circuits. Panel is in fair condition.

Recommendations:

- Existing systems are insufficient to support a modern, fully air-conditioned facility. Both systems shall be disconnected and removed entirely. The facility shall be provided with a new 800 amp 120/208 volt, 3 phase, 4 wire service. A new Utility Company pad mounted transformer shall be located on lawn adjacent to building; Princeton Street side of building. Utility Company will need to extend pole line to this

location and create a new riser pole. A new 800 amp main distribution panel will be located in the basement.

- New 200 amp panels will be located on each level to support lighting and receptacle loads. Dedicated feeders to new large HVAC equipment and the new elevator will originate at the new "MDP".

Lighting Systems

Most fluorescent light fixtures have been retrofitted with electronic ballasts and T-8 lamps through the Utility Company energy programs. Fluorescent screw shell, self-ballasted lamps are being utilized for the pendant light fixtures in the main Reading Rooms. Stack Room, Offices, Restrooms, Support Rooms all have local wall switches. Types of switches vary from original pushbutton type to conventional toggle switches. Appears the large rooms are switched at the panel. There are no automatic lighting controls for the interior lights as required by the present Energy Code. Some corridors and portions of stairwells seem to be lacking in coverage.

The building perimeter is illuminated with wall mounted floodlights. These are directional fixtures and appear to be 250 watt metal halide lamps. There are no pole fixtures on the site. The floodlights are wired to the nearest panel on the first floor. There are time clocks for the circuits. All fixtures have a built in photocell for photo "on" operation. There is a total of six (6) floodlights around the building.

Recommendations:

- All interior lighting should be replaced with either LED products or high efficiency fluorescent lamp and ballast combinations. All new products shall comply with Utility Company rebate program. New lighting controls shall be addressed in all areas. Motion and Occupancy sensors to be provided as required by Building Energy Code.

- Exterior lighting fixtures should be replaced with "period" lighting, building and pole mounted.

Life Safety Lighting Systems

Most exit signs are non-powered electro luminescent type. A few powered exit signs were observed.

No Emergency battery lights observed.

Recommendations:

- Remove all exit signs. Provide new LED Exit signs and Emergency light fixtures illuminating all egress paths, egress doors, stairwells, etc. Provide remote weatherproof Emergency fixtures above all egress doors, exterior.

Small Power Provisions and Branch Circuit Wiring

There are minimal receptacles around the building. Some newer, surface mounted devices have been installed around the circulation desk and on each mezzanine.

Conduit and general branch circuit wiring is in very poor condition. A lot of unsupported wiring was visible at the basement level. We suspect some old "knob & tube" wiring may still be active serving the pushbutton light switches and old receptacles. There are branch circuit conduits exposed in the elevator shaft running to the attic level. This is a Code violation. There is exposed wiring in basement, missing junction box covers, deteriorated service pullbox without cover, and unsupported junction boxes and conduit.

Recommendations:

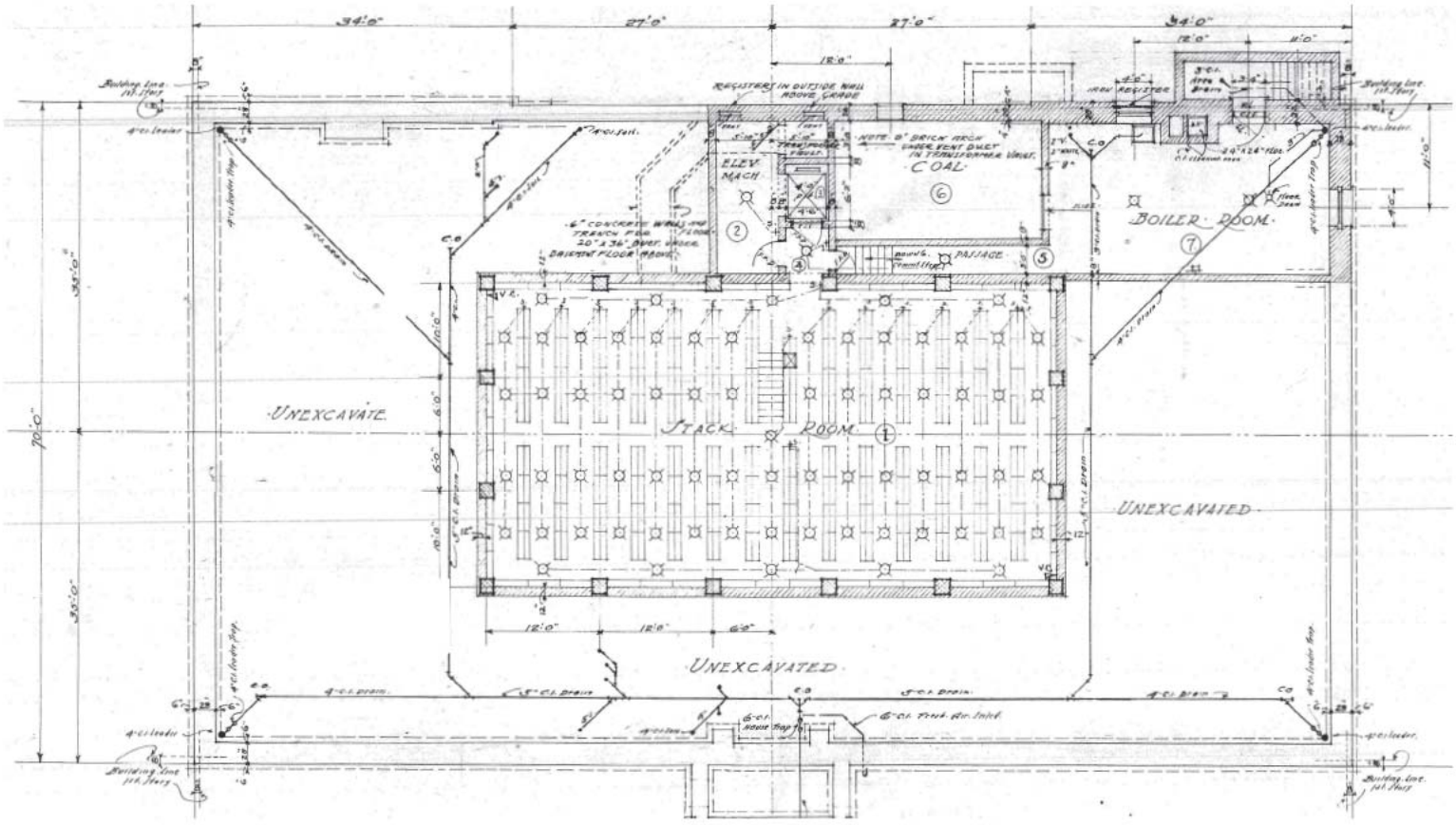
- Provide new branch circuit wiring for new receptacles throughout the building. Replace all deteriorated conduit, boxes and wiring with new. Replace all "knob & tube" wiring. "MC" cable shall be utilized where concealed in walls and above ceilings, conduit shall be utilized where exposed.

Fire Alarm System

Building is protected by a 1960's vintage ADEMCO Fire Alarm System, Model #508. This is a 6-volt, 4-zone conventional panel. Observed five (5) area smoke detectors in building. There are no manual pull stations, audio/visual units or alarm bells. Could not confirm if the system is monitored by an Alarm Company. The system does not comply with any of the latest Rhode Island Fire Safety Code requirements.

Recommendations:

- Disconnect and removal all Fire Alarm equipment.
- Provide a new Class "A" fully addressable system including smoke detectors, manual pull stations, audio/visual units, elevator recall and fire hat functions (on new elevator), HVAC unit shutdown, Fire Department notification and all other functions required for compliance with the latest Rhode Island Fire Safety Code.



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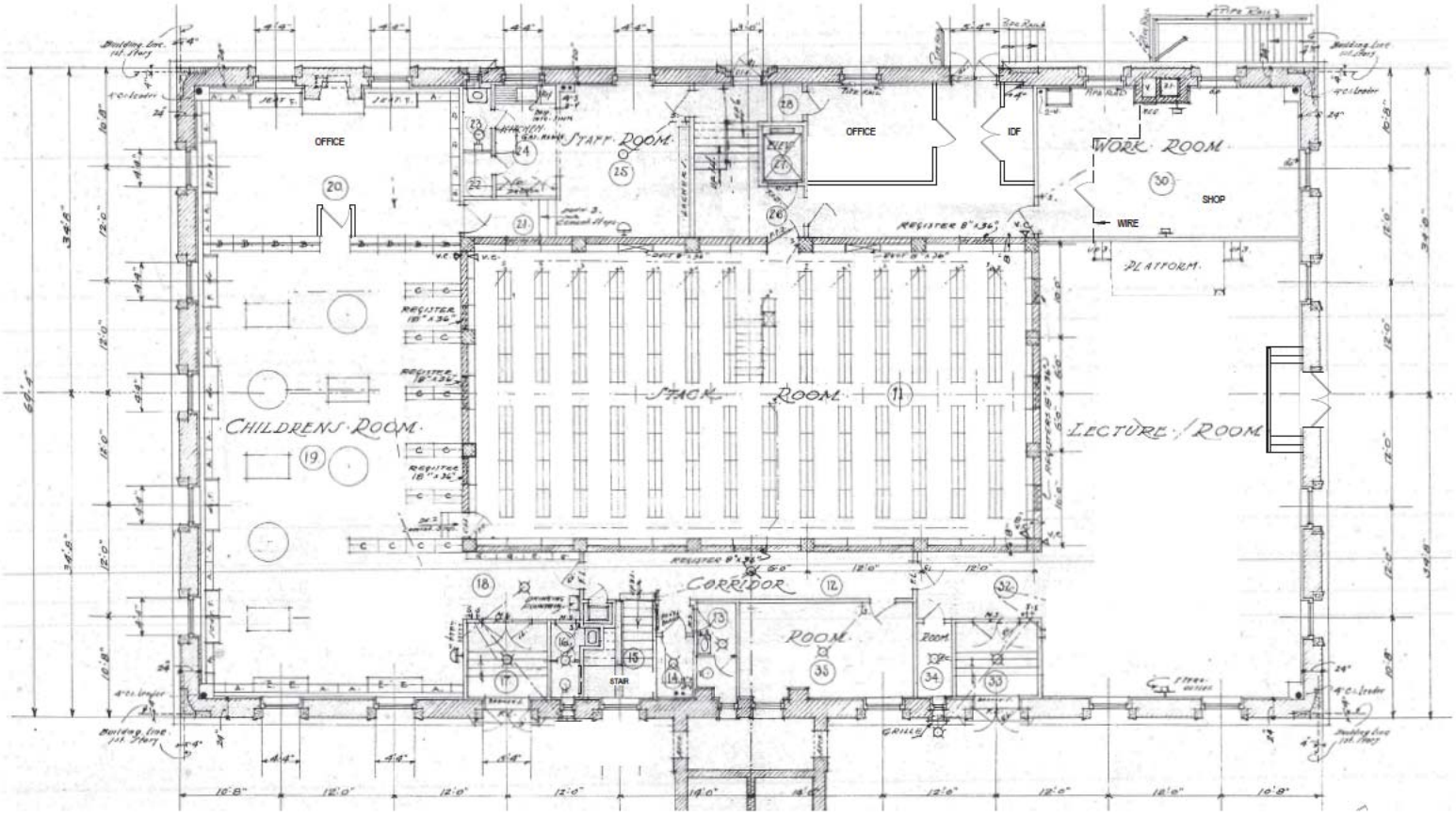
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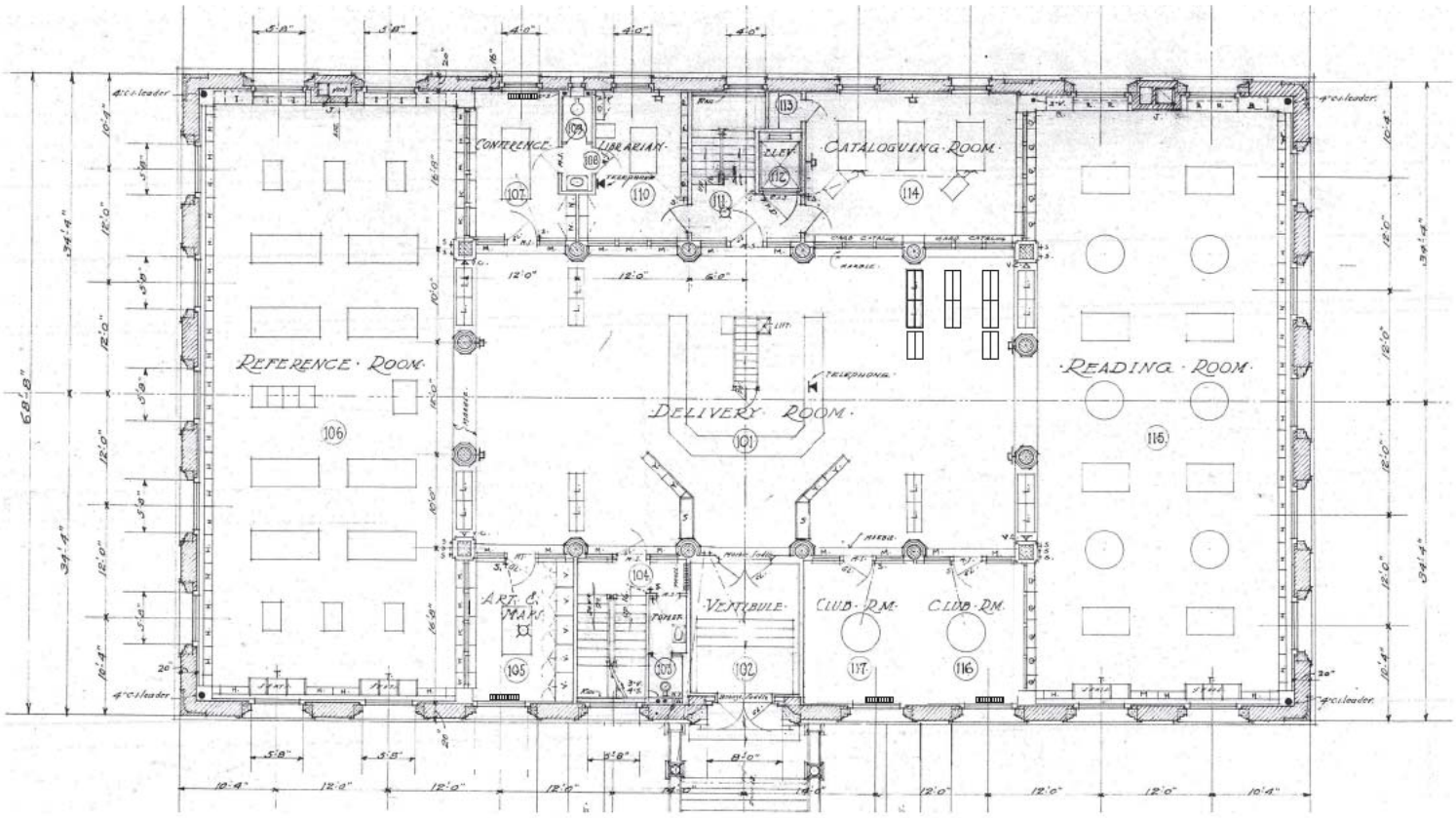
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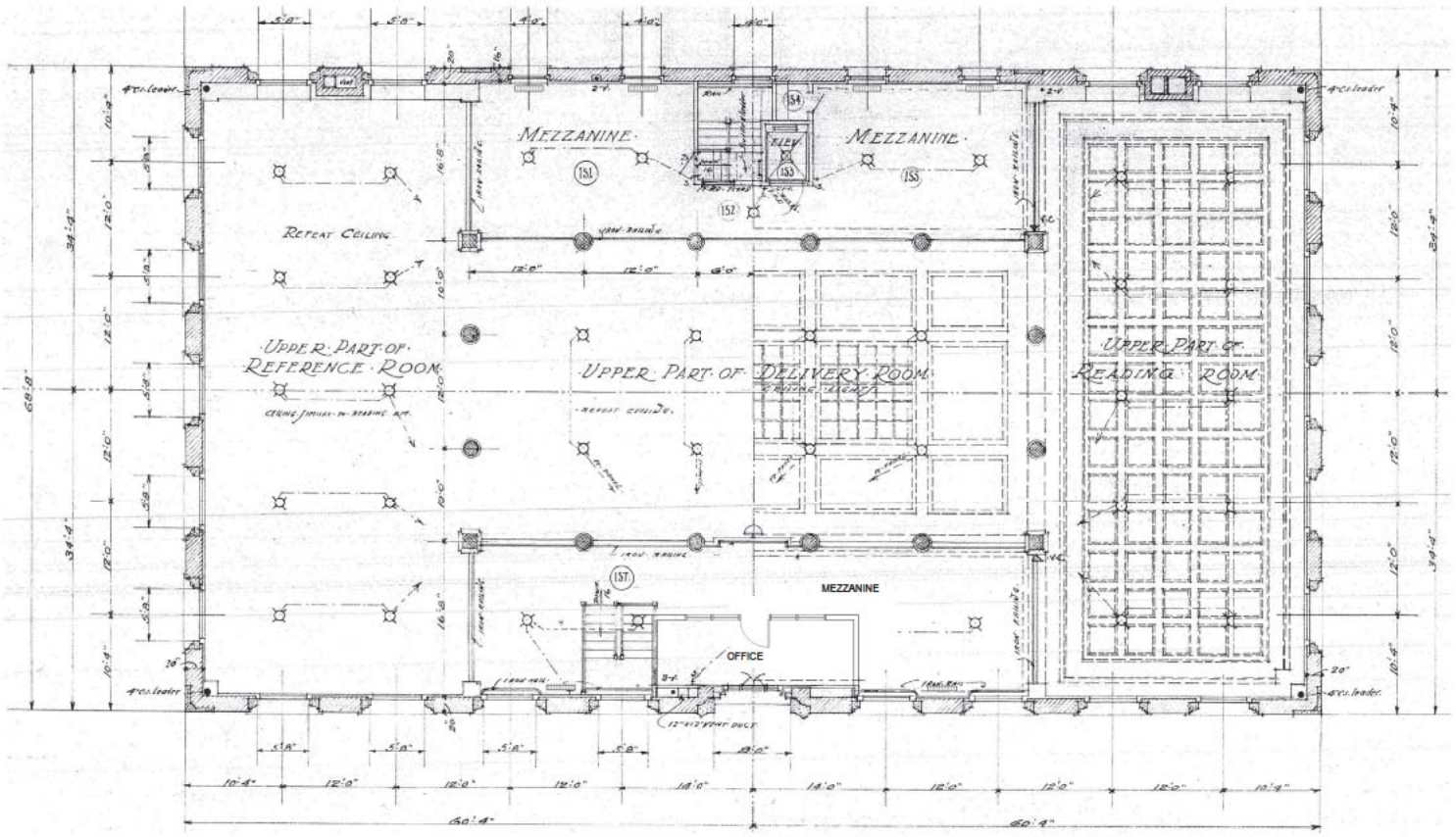
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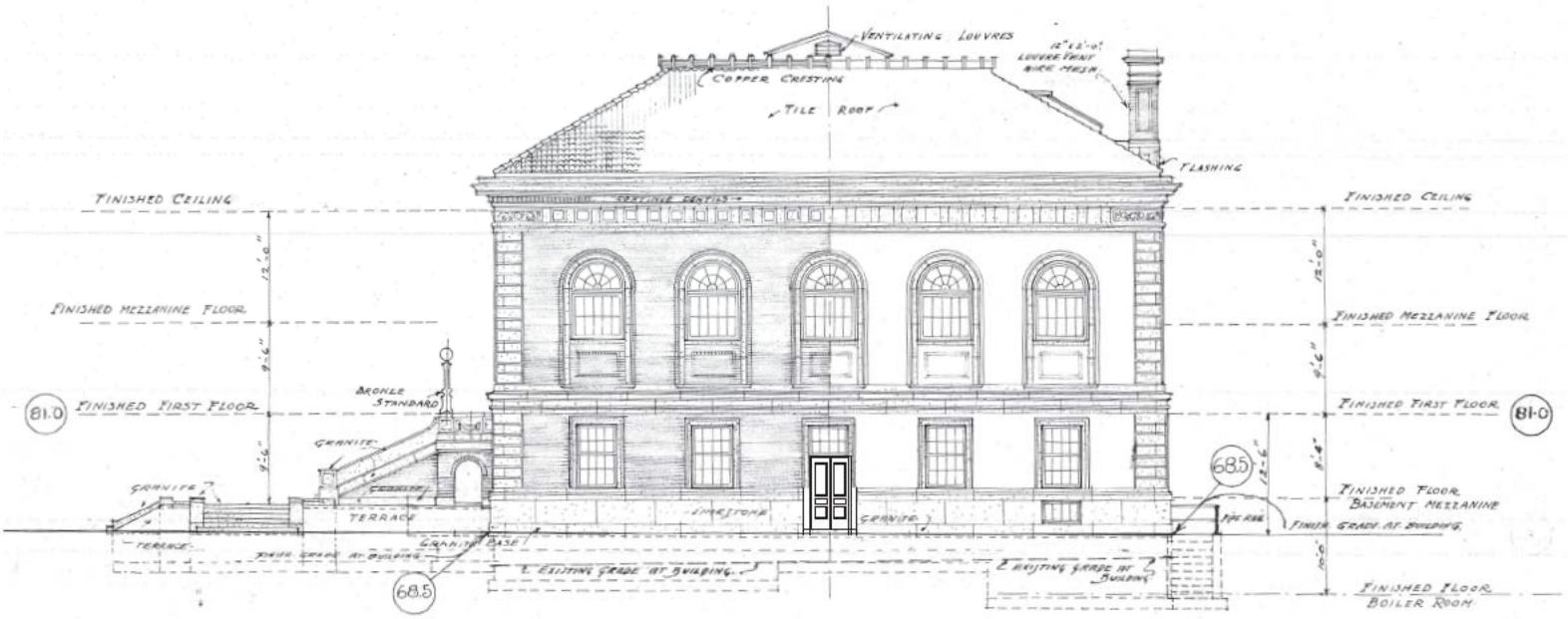
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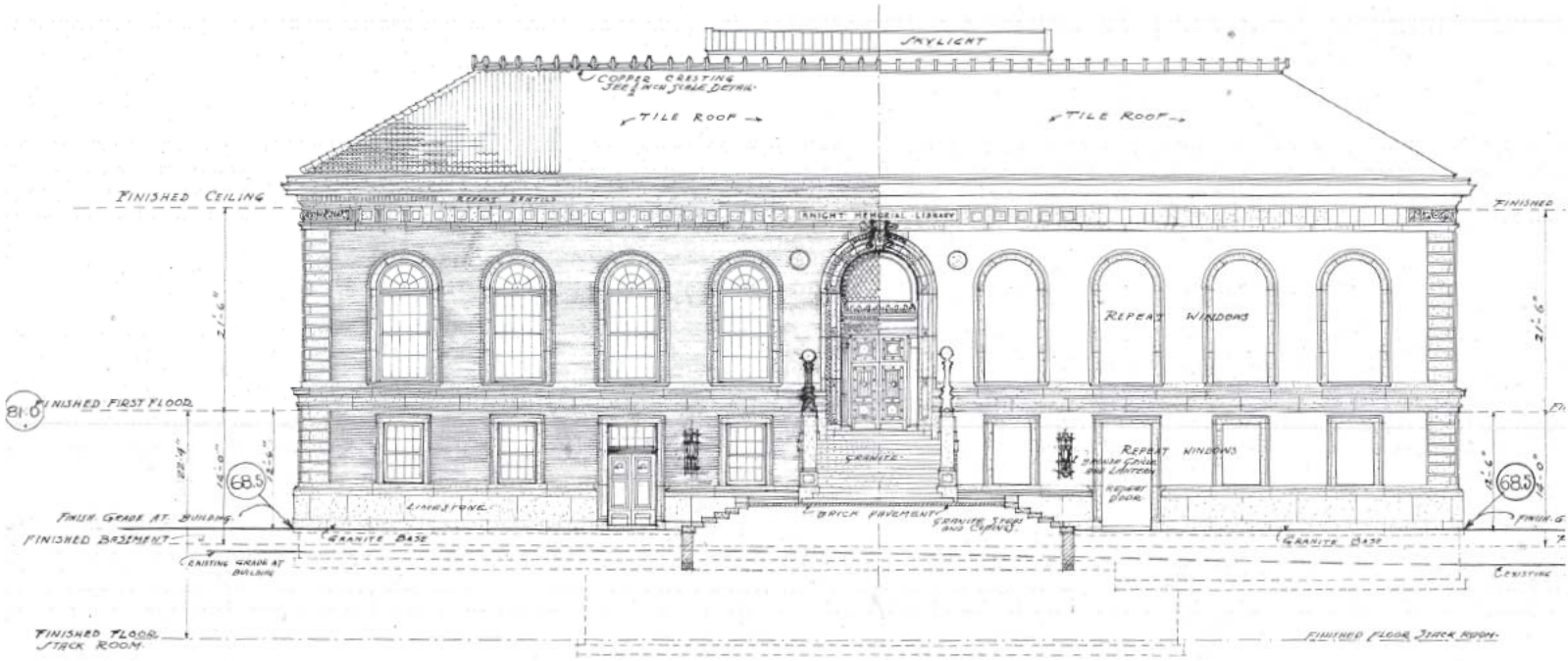
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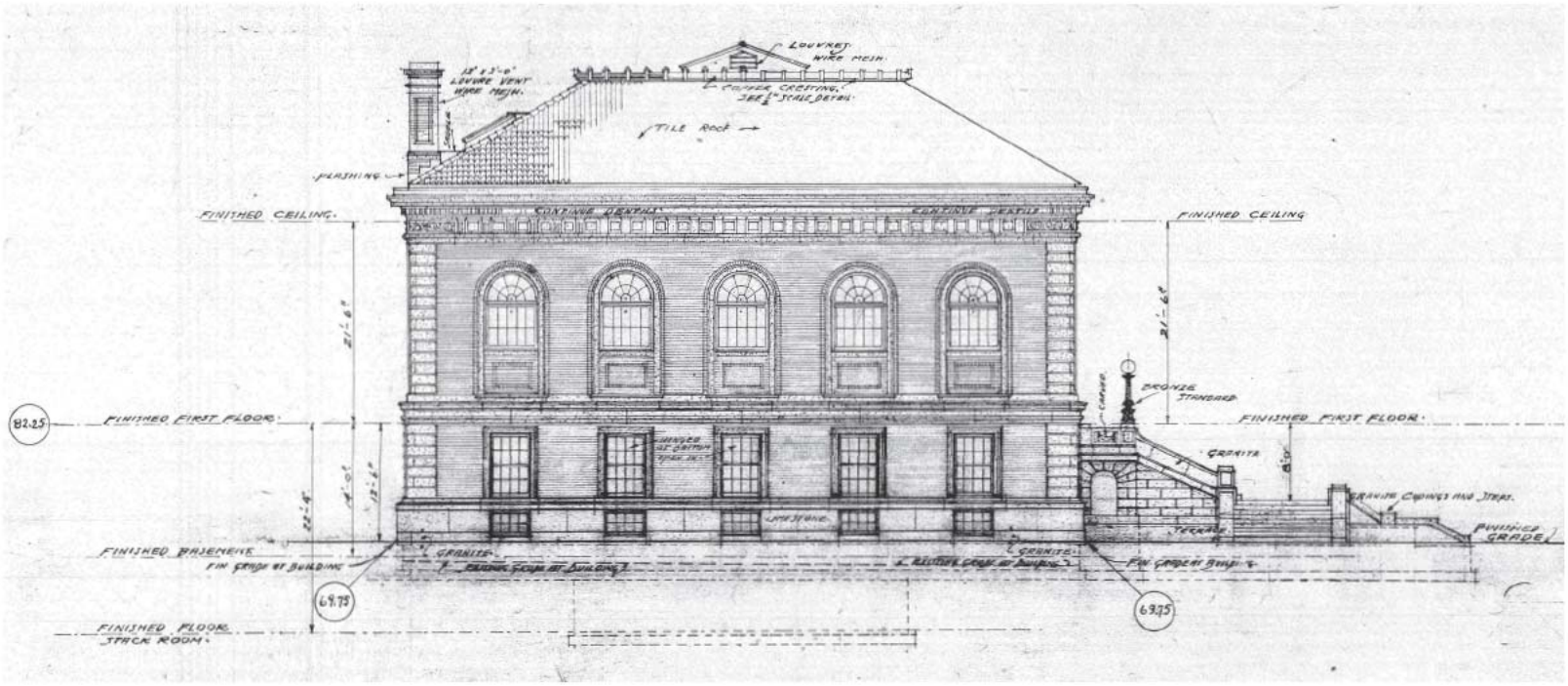
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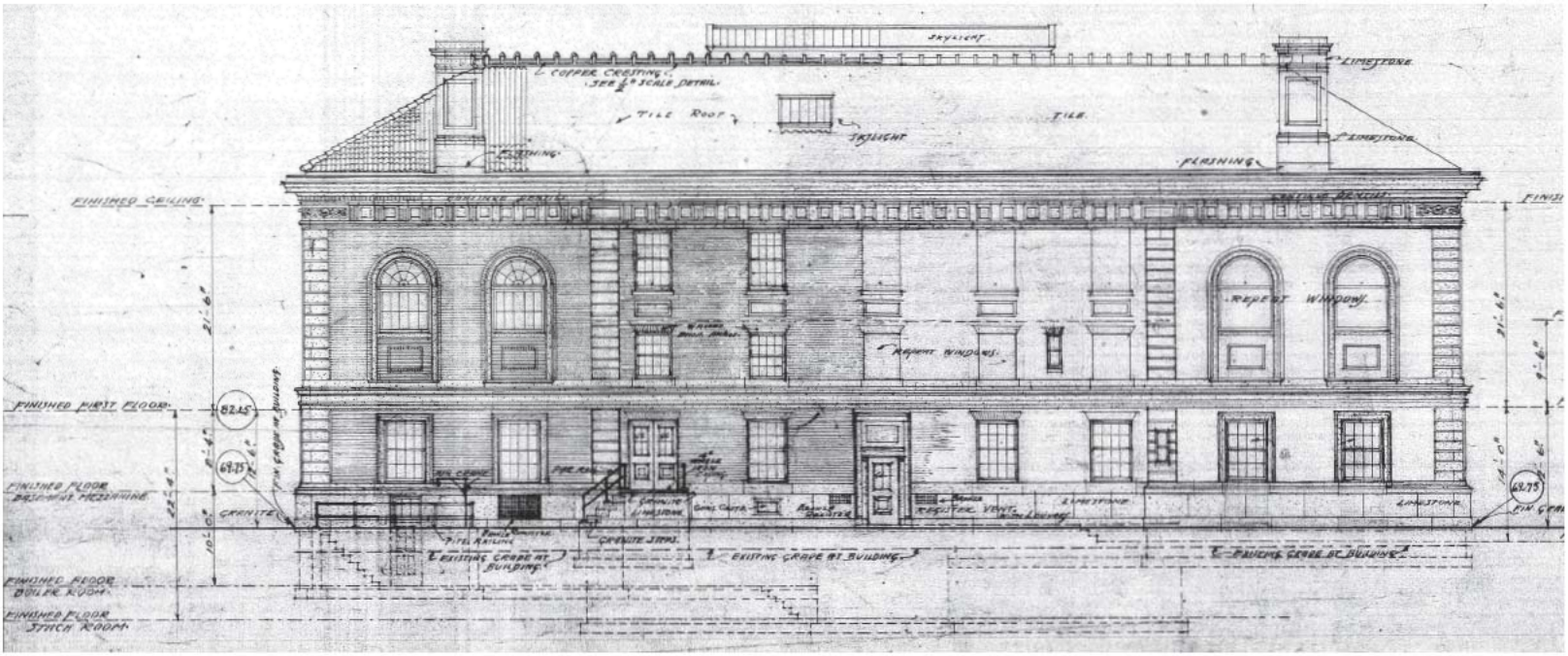
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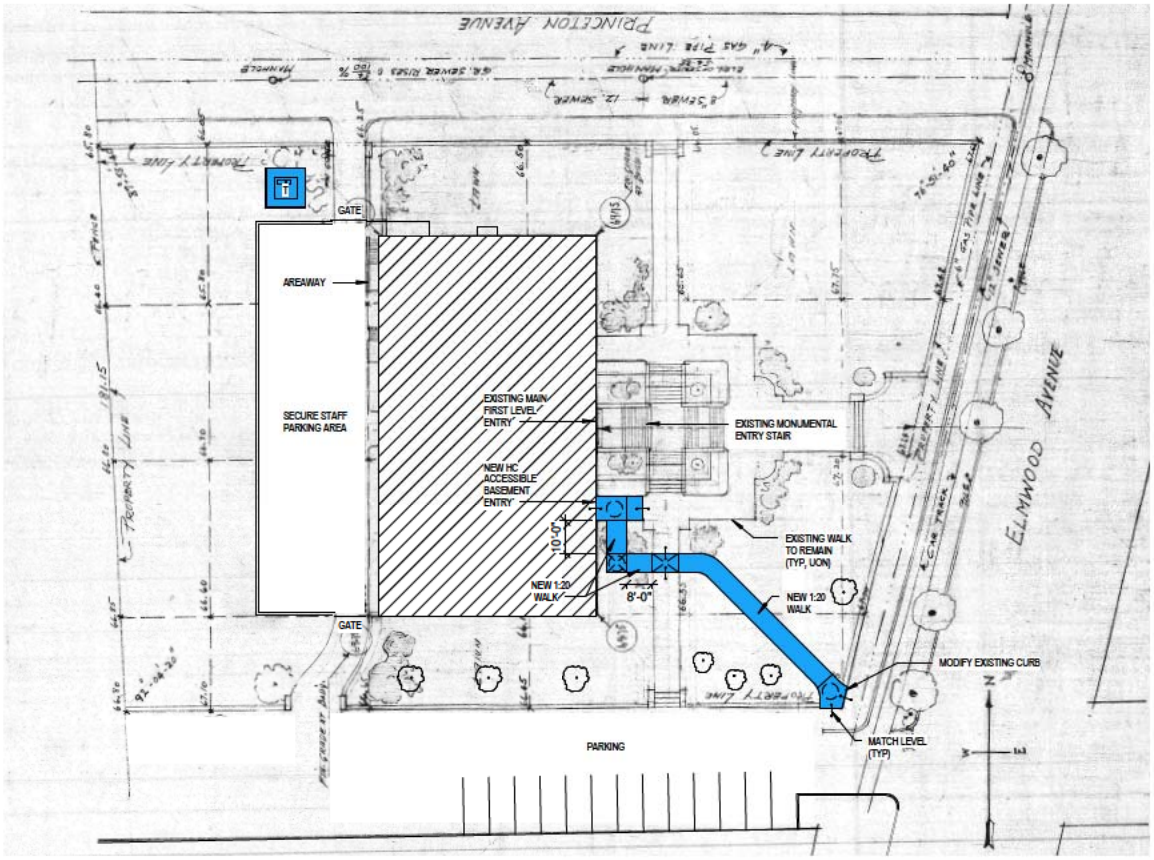
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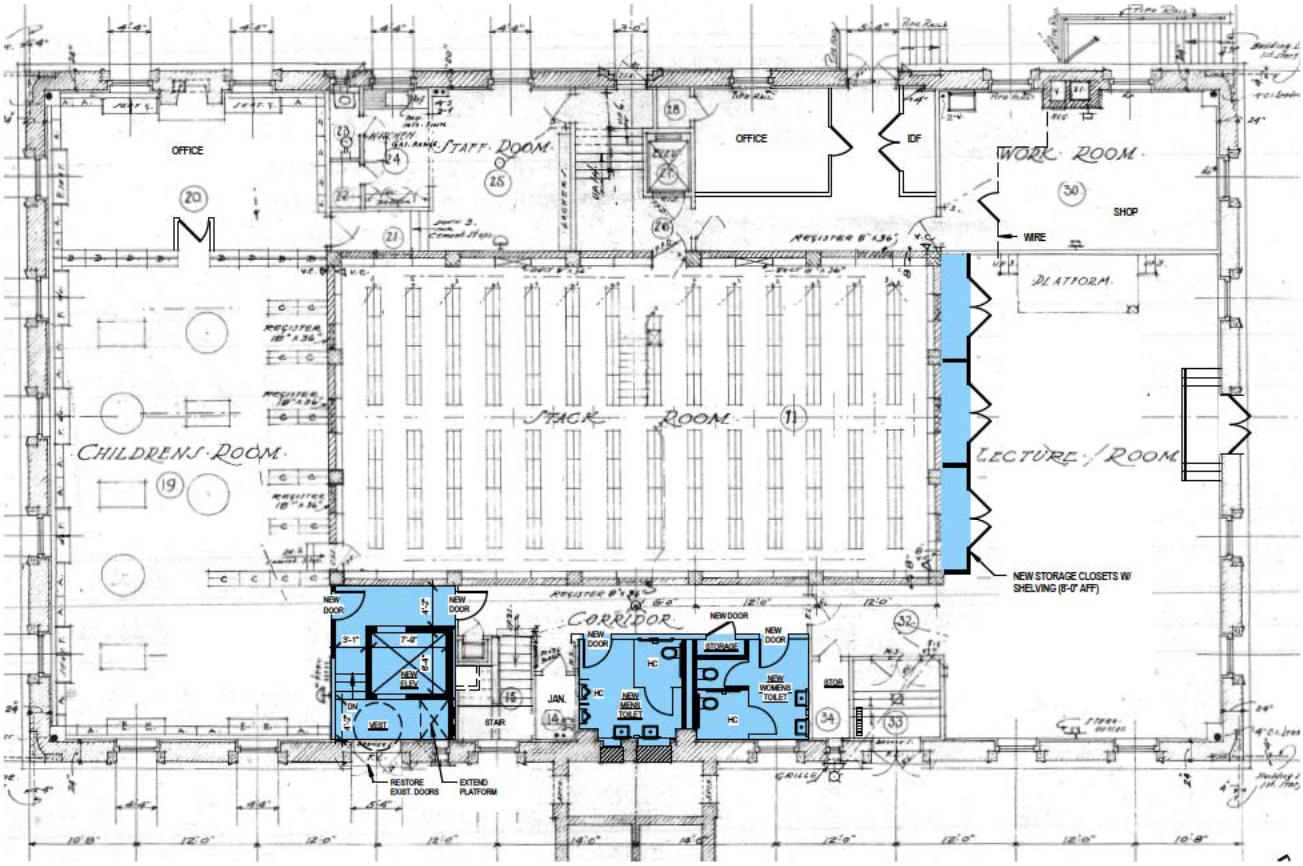
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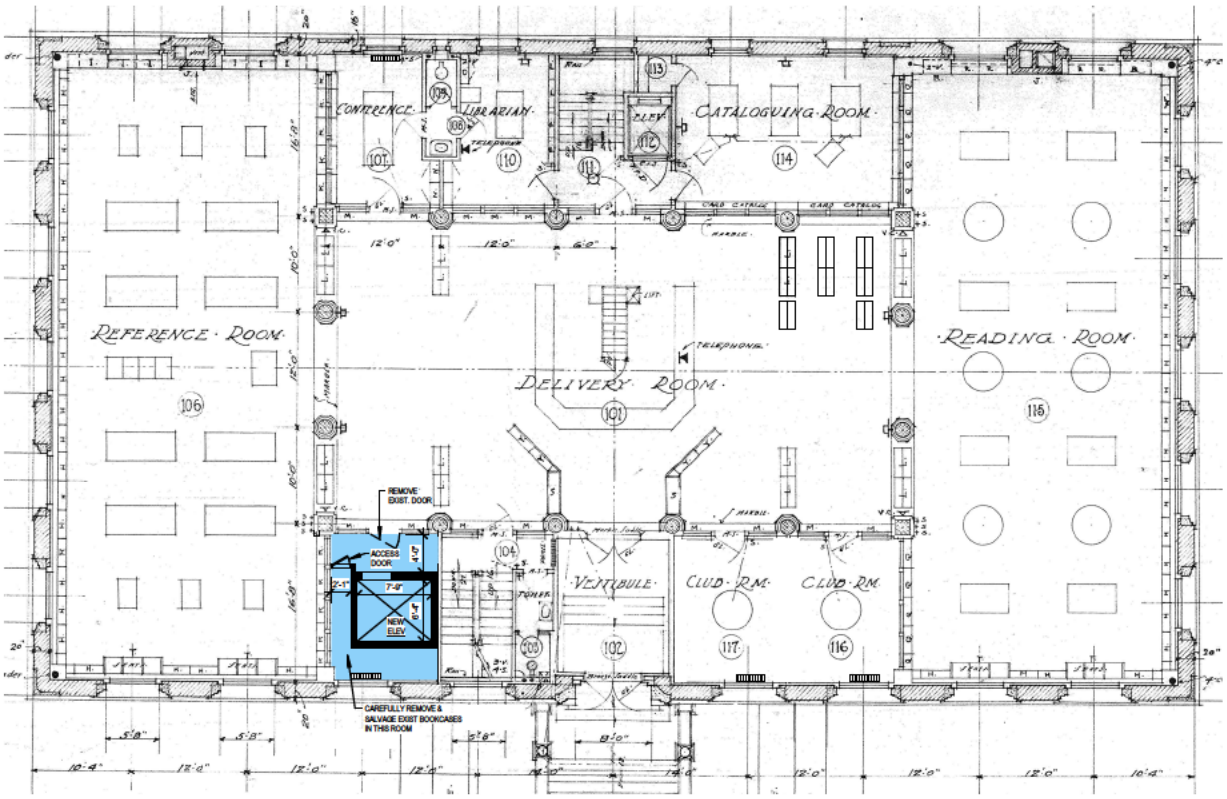
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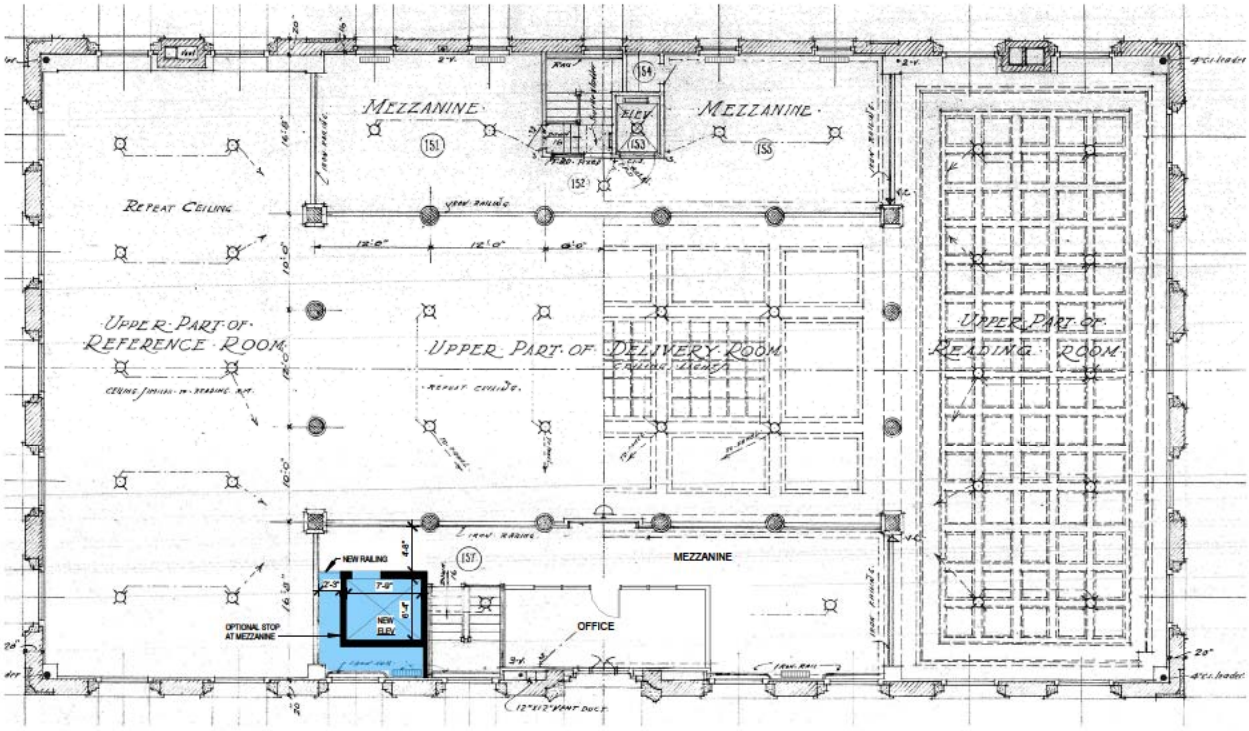
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