City Hall Accessibility Study

City of Berlin, NH

October 2018

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October 18, 2018

Mr. James Wheeler
City Manager
City of Berlin
168 Main Street
Berlin, NH 03570

Re: Berlin City Hall Accessibility Study

Dear Jim,

It was a pleasure working with the City on the accessibility study for City Hall. Attached is the final report that evaluates accessibility alternatives for City Hall. The report recommends approaches for replacing the existing platform stair lift with either a replacement platform lift or an elevator and provides cost estimates for construction of the different alternatives. Please contact me with any questions or comments.

Sincerely,

Robert E. Doyle, PE RA LEED AP

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1.0 Executive Summary

This study has investigated different alternatives for providing future accessibility to City Hall, for individuals with disabilities. Currently, an accessible entrance to the building is provided at the basement level, by the combination of an exterior ramp at the front of the building and a vertical platform lift. Accessibility to the upper floors of City Hall is currently provided by an inclined platform stair lift located at the central stair of the building. The inclined platform stair lift provides access to the first floor, auditorium and second floor levels of the building. Both the vertical platform lift and the inclined platform stair lift have been in service for 30 years and should be replaced. Cost estimates has been provided to replace these lifts with lifts that match the current lifts in layout but provide the latest lift technology and meet the current building code requirements.

The NH Sate building code allows a ramp, a platform lift, a passenger elevator or a combination thereof to provide an accessible route to all levels of the building. This study has assumed that the combination of the ramp and vertical platform stair lift will remain and continue to provide the accessible entrance to the building at the basement level. An upgrade from the existing inclined platform stair lift would be to use a passenger elevator to provide access to the upper floors of the building. A passenger elevator would provide greater speed, capacity and ease of use compared to the inclined platform stair lift. Because the elevator installation is in an existing building the building code allows a limited use / limited application (LULA) elevator as well as a more traditional passenger elevator. The auditorium balcony level is currently not accessible but a future elevator could provide future access to the balcony.

Four potential locations were evaluated to determine the best location for installation of an elevator in the building. These locations included: an exterior location near the side entrance stair of the building; a location in the central stair of the Main Hall; and a location on either side of the Main Hall. The exterior location and the two locations on either side of the Main Hall, required significant changes to the functional space layout of the building and would have significant additional renovation costs. The central stair location in the building's Main Hall was determined to be the best location for a future elevator. The central stair location would have almost no impact on the functional space layout of the building and would have only minor conflicts with the structural system of the building. The central stair location should be the least expensive alternative for installation of an elevator in the building.

The study evaluated two types of elevators, a 2100-pound holeless hydraulic elevator and a LULA elevator. The 2100-pound elevator would have the capacity and speed of a small typical traditional elevator. A LULA elevator would be similar in appearance and operation to the 2100-pound hydraulic elevator but would have a lower capacity and speed. The LULA elevator would have a lower upfront elevator cost and a lower hoistway construction cost than the 2100-pound elevator. A LULA elevator would have lower power requirements and would have lower maintenance costs than the 2100-pound hydraulic elevator.

Because of the lower capacity, speed and cab size of a LULA elevator, it is primarily meant to provide accessibility for individuals with disabilities. A LULA elevator is not meant for servicing a large percentage of a buildings circulation. The LULA elevator's use should be evaluated based on City Hall's current and future use to determine if a LULA elevator can best meet the requirements of the building's users.

Construction cost estimates have been provided for the replacement of the existing platform chair lifts, and for the installation of a LULA elevator and a 2100-pound holeless elevator. The construction cost estimates include construction costs and design and construction administration costs. The platform lift replacement costs would have the lowest cost to provide future accessibility to the building. A passenger elevator would be a major upgrade from the platform lift in speed, capacity and ease of use but would have additional costs for the elevator installation and hoistway construction. A LULA elevator would have less cost than a traditional hydraulic elevator due to a lower elevator cost and lower hoistway construction cost.

2.0 Building Code Review

The building code review included all sections of the NH State Building Code that address accessibility, elevators and platform lifts. The codes reviewed included: the ICC International Building Code (2009), the NFPA 1 Fire Code (2009), the NFPA 101 Life Safety Code (2009) and the ADA Accessibility Guidelines (2010). The ADA Accessibility Guidelines apply to both State and local public facilities. The following are building code references that are relevant to the installation of an elevator or platform lift in City Hall:

ICC IBC (2009) International Building Code

Section 708 Shaft Enclosures

708.2 Shaft enclosure required. Openings through a floor/ceiling assembly shall be protected by a shaft enclosure.

708.4 Fire resistance rating. Shaft enclosure shall have a fire resistance rating of not less than one hour when connecting less than four stories.

708.12 Enclosure at the top. Shaft enclosures shall be enclosed at the top with a horizontal assembly with the same fire resistance rating as the shaft enclosure.

Section 3411 Accessibility for Existing Buildings

3411.8.3 Platform lifts. Platform lifts complying with ICC A117.1 and installed in accordance with ASME 18.1 shall be allowed as a component of an accessible route of travel.

NFPA 101 Life Safety Code (2009)

9.4.3. Fire Fighters Operations

9.4.3.1 All new elevators shall conform to the Fire Fighters Emergency Operations requirements of ASME A17.1/CSA B44.

ADA Accessibility Guidelines (ADAAG) 2010

Section 206 Accessible Routes

206.2.1 Site arrival points. At least one accessible route shall be provided from accessible parking spaces; public streets or sidewalks; to the facility entrance.

206.2.3 Multi-Story buildings and facilities. At least one accessible route shall connect each story or mezzanine in multi-story buildings and facilities.

206.6 Elevators. In a building or facility permitted by 206.7 to use a platform lift, elevators complying with 408 (LULA Elevators) shall be permitted.

206.7 Platform Lifts. Platform lifts shall comply with 410. Platform lifts shall be permitted as a component of an accessible route in an existing building or facility.

407 Elevators

407.1 General. Elevators shall comply with ASME A17.1 They shall be passenger elevators as classified by ASME A17.1.

408 Limited-Use/Limited-Application Elevators

408.1 General. Limited-use/limited-application (LULA) elevators shall comply with 408 and with ASME A17.1. They shall be passenger elevators as classified by ASME A17.1.

410 Platform Lifts

410.1 General. Platform lifts shall comply with ASME A18.1 Platform lifts shall not be attendant-operated and shall provide unassisted entry and exit from the lift.

Building Code Summary: The existing exterior ramp at the front of the building and the existing vertical platform lift inside the building basement entrance at the bottom of the ramp meet the code requirement for an accessible entrance as part of an accessible route. The building code allows an inclined platform lift, a limited use/limited application elevator, or a traditional passenger elevator to provide access to the upper three levels of the building as part of an accessible route. The elevator would need to be enclosed in a one-hour fire rated shaft to separate it from the stairwell and the remainder of the building. The elevator would need to comply with the Fire Fighters Operations requirement of ASME 17.1.

3.0 Elevator Location

A potential location for the installation of an elevator in the building would need to be adjacent to all levels of the building. The potential location elevator installation should have limited impact to the building space layout and should not conflict with major structural elements of the building. There were four potential elevator locations that best met these adjacency and functional requirements: an exterior elevator location adjacent to the building side entrance stair; two locations adjacent to the building's Main Hall; and a location in the Main Hall on one side of the open central stair (see Figure 1)

Exterior Location: There is a potential exterior elevator location which is adjacent to the building's side entrance that would be able to serve all levels of the building. This location would allow access at grade from the public sidewalk and would have the benefit that elevator hoistway construction would have less impact to the existing building than an interior installation. The exterior location hoistway walls would need to be of exterior type construction and a vestibule would need to be constructed at grade level. Additionally, a second floor would need to be constructed over the existing stair vestibule to connect the elevator to the second floor. This location would also require a corridor connection from the elevator to the front public area of the building at the first and second floors. The corridor connections would require changes to the existing building floor plan. The additional construction costs required for the hoistway exterior enclosure, the at-grade vestibule and the floor plan changes would make the exterior option significantly more expensive than the interior elevator location alternatives.

Adjacent to Main Hall Locations: On either side of the Main Hall of the building, there is a location that is adjacent to all levels of the building and would only require minor changes to structural framing at the first and second floors in order to construct the elevator hoistway. These locations would require some floor plan changes to the building's layout on all floors (see Figure 1). Due to the floor plan changes, these locations would have additional construction costs and would impact the function of the building space layout.

Central Stair Location: An elevator, located in the central stair in the building's Main Hall, would be adjacent to all levels of the building and would provide easy access to the existing public area on all floors of the building. The elevator would be placed on the left side of the double-sided open central stair with the other side remaining for building circulation. At the basement level, this location would be adjacent to the building's accessible entrance. A double-sided elevator would be used in the central stair with the front entrance providing access to the three main floors of the building and the rear entrance providing access to the auditorium. The rear entrance could also provide access to the auditorium balcony if this area is made accessible in the future. At the Auditorium level and second floor levels an extension of the existing stair landings would be constructed to provide access from the elevator.

The central stair elevator location, in comparison to the other elevator locations evaluated, would have the least impact to the building structure, interior finishes and space function of the building. For the central stair location, demolition would be limited to a portion of the stairs. The stair location would only conflict with one secondary floor beam, which would be supported by the proposed hoistway structure. For the remainder of the study, the central stair elevator location will be used as the basis for determining elevator selection, hoistway construction requirements and construction costs.

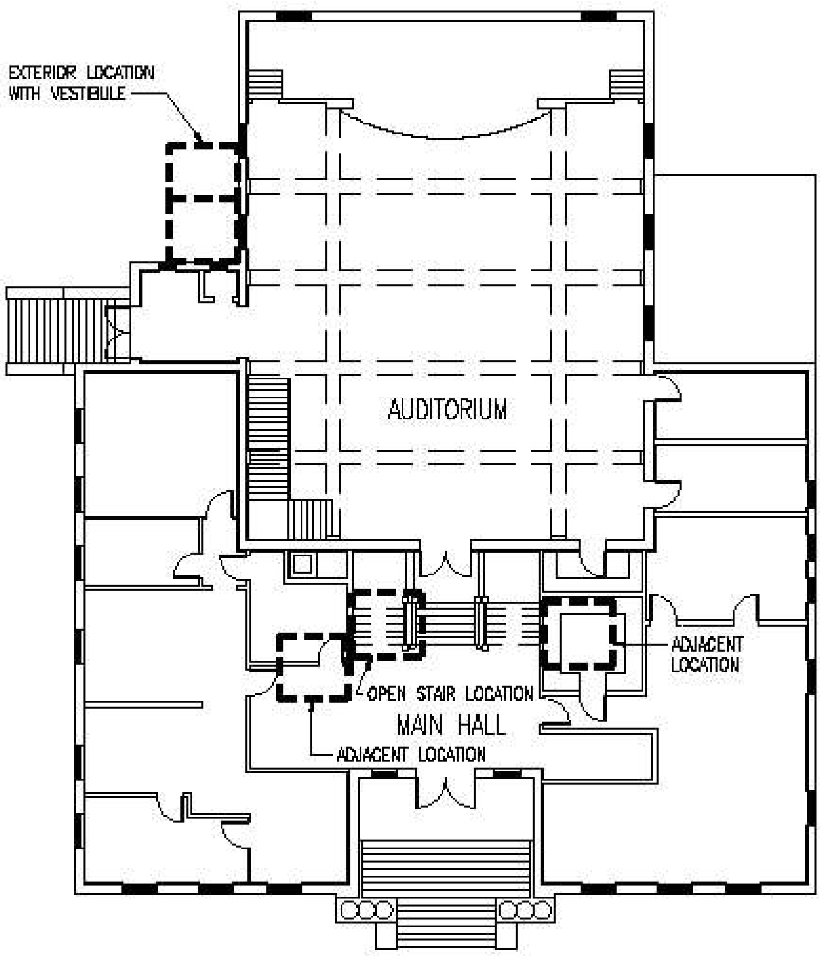

Figure 1 – Potential Elevator Locations

4.0 Elevator Selection

Hydraulic Elevators

The travel distance for City Hall, from the basement to the second floor, is twenty-five feet. For this relatively short travel distance, a hydraulic elevator would be the least cost alternative for a traditional type elevator. A hydraulic elevator would have lower upfront equipment costs and lower maintenance and operation costs than a traction type elevator. The construction of a hoistway and machine room would be less for a hydraulic elevator than other traditional type elevators. Most elevator manufacturers have hydraulic elevators that are available in three different configurations: holed, holeless and machine-room-less.

A holed hydraulic elevator has a below ground cylinder which requires drilling a jack hole. The City Hall elevator installation would require drilling the jack hole in the existing building basement, which would add cost to the elevator installation. The possibility of having to drill the jack hole through ledge could also add additional cost. Holed elevators also have the issue of potential leakage of hydraulic oil below ground, which can cause environmental issues and add maintenance costs.

A holeless elevator has dual above ground cylinders on each side of the elevator car and would not require below ground drilling. A holeless elevator would have some additional maintenance costs compared to a holed elevator because there would be two cylinders to maintain instead of one. A holeless elevator has a greater overhead clearance requirement than a holed elevator. Because of the greater overhead clearance required for a holeless elevator, the elevator hoistway for a holeless elevator would conflict with the structure of the attic floor (see Figure 2) The construction of the hoistway for the holeless elevator would require raising the attic floor structure 15 inches, which would add some construction cost.

A machine-room-less elevator has the benefit of not using building space for a machine room, but a machine-room-less elevator has a larger upfront cost than a corresponding holed or holeless elevator. Because the building has underutilized space in the basement that can be used for a machine room there is little benefit to using a machine room less elevator for City Hall. A machine room would also provide better maintenance access to the oil reservoir and pump than a machine-room-less elevator, which would require hoistway access for maintenance.

The hydraulic elevator that best meets the building's requirements would be a holeless hydraulic elevator. The holeless hydraulic elevator installation costs would be less than a holed elevator and there would be no environmental issues caused by leakage of hydraulic oil. The holeless hydraulic elevator size evaluated for this study is a 2100-pound elevator. A 2100 lb. elevator is the smallest hydraulic elevator commercially available that can provide the service City Hall requires while limiting the hoistway size, the upfront elevator cost, and the future maintenance and operations costs (see Figures 3 through 5)

LULA Elevator

The LULA elevator as its name implies is considered a limited use and limited application elevator. The LULA elevator is limited in use and application because of its lower capacity, speed and vertical travel limits. The capacity of a LULA elevator is 1400 pounds and it has an elevator car floor size of 18 square feet. The speed of a LULA elevator is 30 feet per minute which is less than half of a typical low speed traditional elevator. The vertical travel limit for a LULA elevator is 25 feet.

The LULA elevator has minimal pit depth; hoist way size, and overhead clearance requirements, compared to a hydraulic elevator. The pit depth is only 14 inches for a LULA elevator compared to 5 feet for the holeless hydraulic elevator so construction costs for the pit foundation would be less. The hoistway plan size is less for a LULA than a hydraulic so the construction of the elevator hoistway would have less impact on the building structure and layout. (see Figures 6 through 8)

The overhead clearance for the LULA is 20 inches less than the holeless hydraulic elevator so the hoistway construction will not impact the attic floor structure above (see Figure 2) Overall, the hoistway construction costs will be less than for the holeless hydraulic elevator. The power requirements would be much lower for the LULA elevator than a hydraulic elevator and would have significantly lower operation costs. The LULA elevator has a lower maintenance frequency than a hydraulic elevator and will have relatively lower maintenance costs.

A LULA elevator's primary purpose is to provide accessibility, for disabled individuals, to a building. A LULA elevator is not meant to provide for a large percentage of the building circulation, like a traditional hydraulic elevator would. The slow speed of a LULA elevator will help to limit the use of the elevator by most mobile users. The City should evaluate how the future elevator would be used to determine if a LULA elevator can best meet the circulation requirements of the building.

Elevator Specifications Comparison

Elevator	Operation	Capacity (pounds)	Car Size (inches)	Elevator Speed (fpm)	Hoistway Size (WxD)	Pit Depth (inches)	Overhead Clearance	Power (HP)
LULA	Roped hydraulic	1400	48 x 54	30-40	74 x 79	14	11'-0"	5
2100 lb	Hydraulic holeless	2100	68 x 51	80-150	88 x 80 3/4	60	12'-8"	25

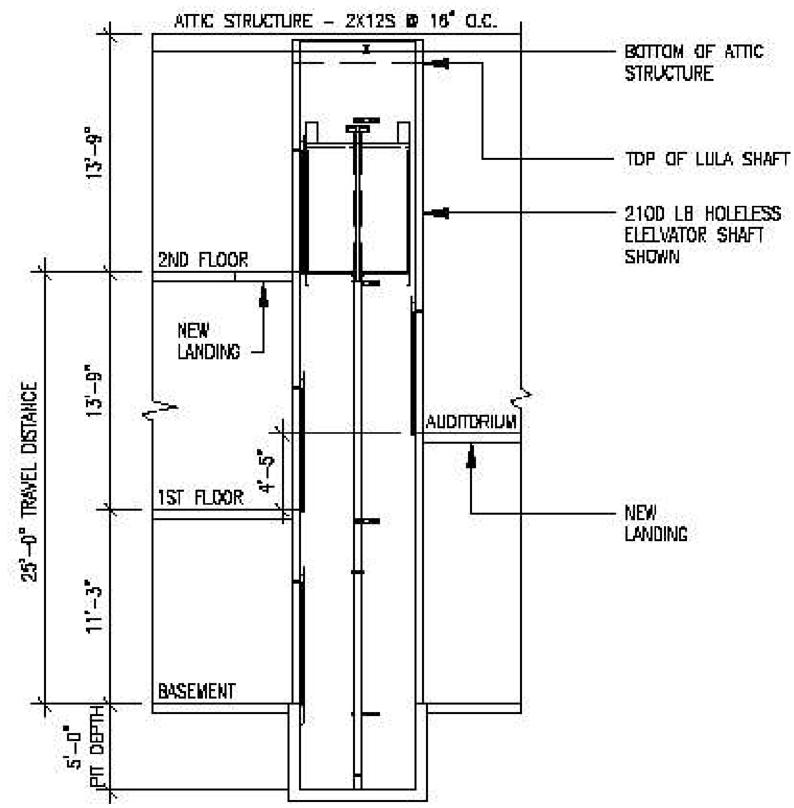

Figure 2 – 2100 lb. Elevator Hoistway Section

5.0 Elevator Hoistway and Machine Room Construction

The elevator hoistway construction was evaluated for the central stair location for both the LULA elevator and the 2100 lb. elevator. The evaluation included pit construction, hoistway construction requirements, and the changes required to the existing building to construct the hoistway.

Both elevators would require demolition of one side of the existing stair. The demolition would require saw cutting of the existing stair; structural reinforcement of the stair to remain; and reconstruction of guards and handrails as required. Because the hoistway of the LULA elevator is smaller by 14 inches in width than the 2100 lb. elevator, the LULA elevator would have less impact on the existing stair and would allow a greater width of stair to remain. The construction of the hoistway of the LULA elevator would cause less impact to the central stair and would have lower demolition and stair renovation costs than the 2100 lb. elevator.

Both elevator types would require a pit, the 2100 lb. elevator would require a 5-foot-deep pit while the LULA elevator would require a 14-inch-deep pit. The deeper the excavation, the larger the excavation area needs to be and the greater the impact to the existing building. The pit excavation for the LULA elevator would require an area not much larger than the size of the hoistway, while the 2100 lb elevator would require a larger area of excavation and would require shoring to protect the building walls and stair construction adjacent to the pit excavation. There would be significant additional excavation and shoring costs required for construction of the 2100 lb. elevator pit than for the pit for the LULA elevator.

The hoistway, for both elevator types, would require structural support of the elevator rails. In order to minimize the size of the hoistway, this study has proposed a structural steel frame to support the elevator. The structural frame would be constructed of four steel columns with steel beams at the floors, the elevator rail attachment points and the top of the hoistway. The steel columns would be supported on the elevator pit foundation. All gravity loads of the elevator would be supported by the steel frame, no gravity loads from the elevator would be transferred to the existing building. The structural frame would be internally braced with steel bracing and some minor lateral loads would be transferred at the floor connections. Because the overhead clearance requirement for the LULA elevator is 20 inches less than the 2100 lb. elevator, the LULA hoistway would be shorter and would not conflict with the attic floor structure above. The 2100 lb. elevator would have additional construction costs to raise the attic floor 15 inches in the area over the hoistway.

The elevator hoistway is required to be of one-hour fire rated construction. The one hour rated walls and ceiling of the hoistway would be constructed of cold formed metal shaft wall framing with fire rated liner panel on the interior of the shaft and fire rated gypsum wallboard on the exterior of the shaft. The gypsum wallboard on the exterior of the shaft would also function as the finished surface in the stairway.

Both elevator types would require a machine room adjacent to the elevator hoistway at the basement level. A possible location for the elevator machine room would be in the existing mechanical room adjacent to the elevator location. This area is underutilized space and would require minimal demolition to an existing storage closet and relocation of a service sink. The machine room walls would be constructed of cmu and would be of one-hour fire rated construction.

6.0 Platform Lifts

Garaventa Lift was the manufacturer of the existing vertical platform lift and the inclined platform stair lift. The lifts were installed in 1988, and according to the Garaventa representative, changes in technology make it difficult to support lifts that are in service over 20 years. The existing lift exceeds this period by 10 years and has reached the end of its service life. Garaventa Lift has provided costs to replace the existing lifts. The new lifts would have a similar layout to the existing lifts but would be of the latest technology and meet all current building code requirements. The lifts would have a capacity of 660 pounds and a speed of 20 feet per minute.

7.0 Construction Cost Estimate Summary

Construction cost estimates were developed for each lift and elevator option. Construction costs include general conditions, general contractor overhead and profit, bonds, and insurance. Architectural and engineering design and construction administration has been included at 8% of construction costs. The costs do not include permit fees, utility costs or winter conditions. The platform lift costs were provided by a lift manufacturer, these are complete installation costs that include demolition and removal of the existing lifts. Elevator construction costs have been separated to include: building renovation and hoistway construction costs; and elevator installation costs. The elevator installation cost is based on a subcontractor installation cost and is shown for comparison purposes. All costs have a 12-month aggregate escalation and market uncertainty of 5% and a 15% contingency.

Construction Cost Estimates

Elevator / Lift	Building Renovation & Hoistway Construction Cost	Elevator Installation Cost	Total Construction Cost
Vertical Platform Lift	-	-	$25,000
Inclined Platform Stair Lift	-	-	$70,000
LULA	$240,000	$100,000	$365,000
2100 lb holeless	$285,000	$165,000	$480,000

8.0 Proposed Floor Plans

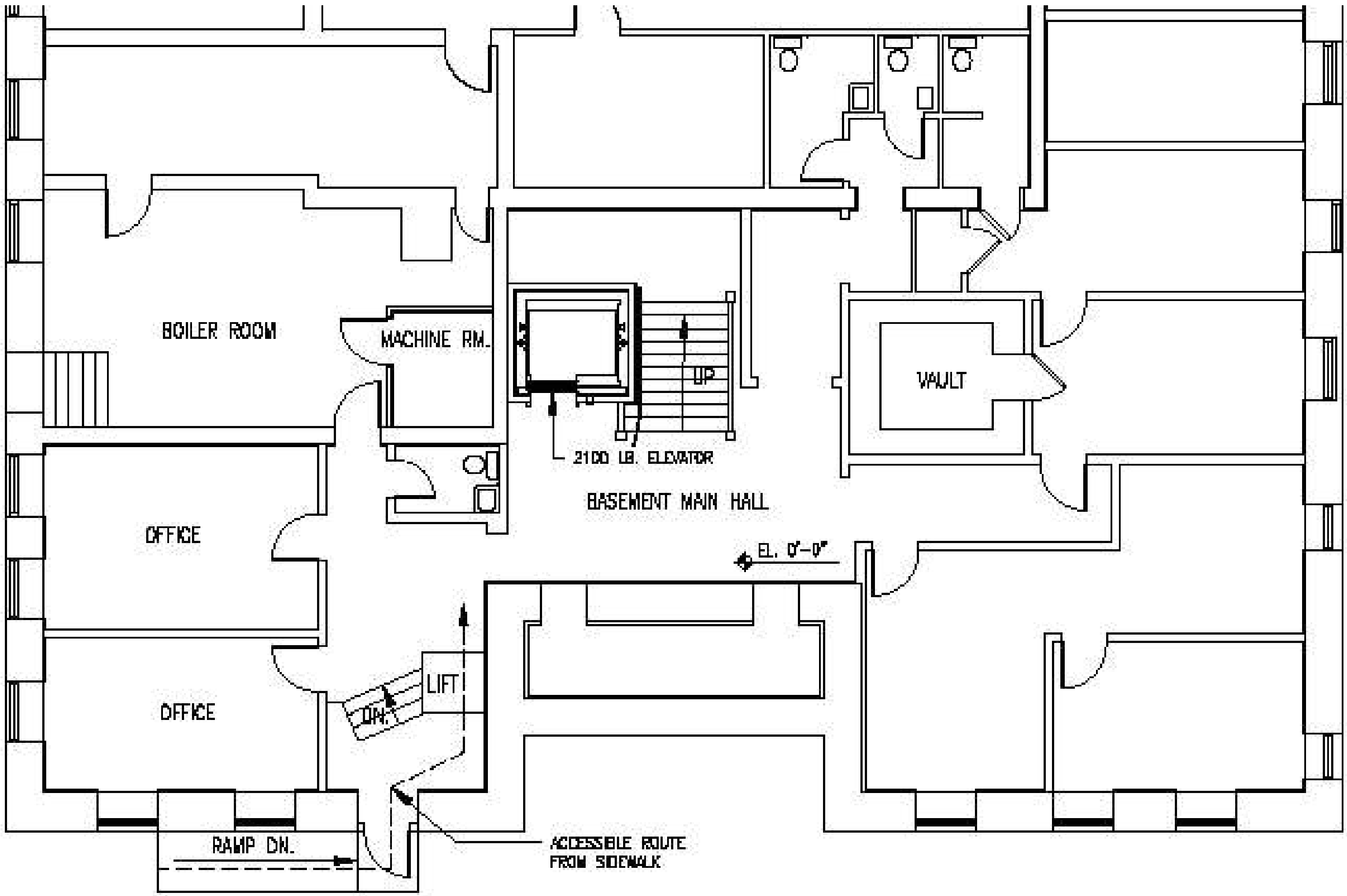

Figure 3 – 2100 lb. Elevator Basement Plan

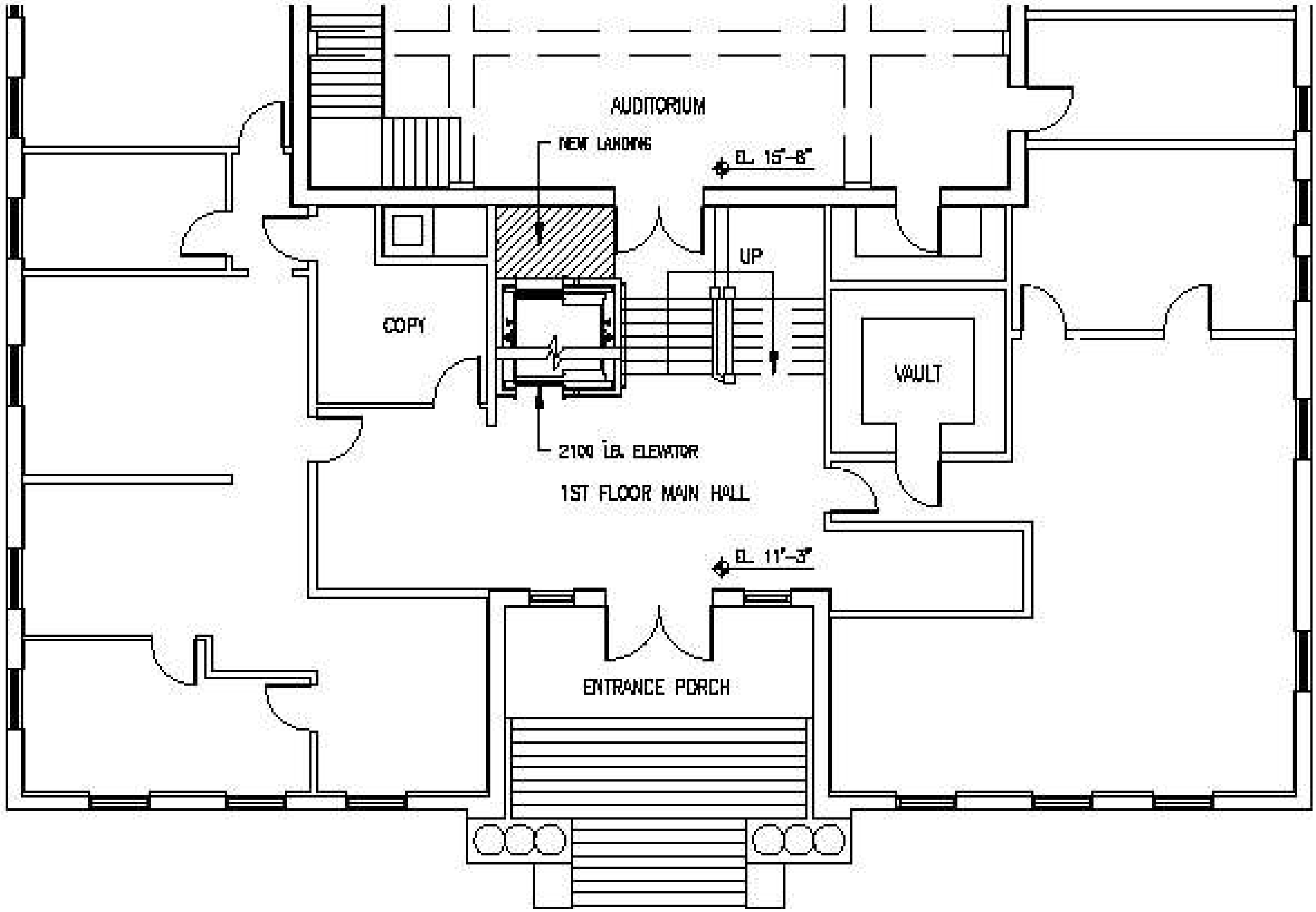

Figure 4 – 2100 lb. Elevator 1st Floor / Auditorium Plan

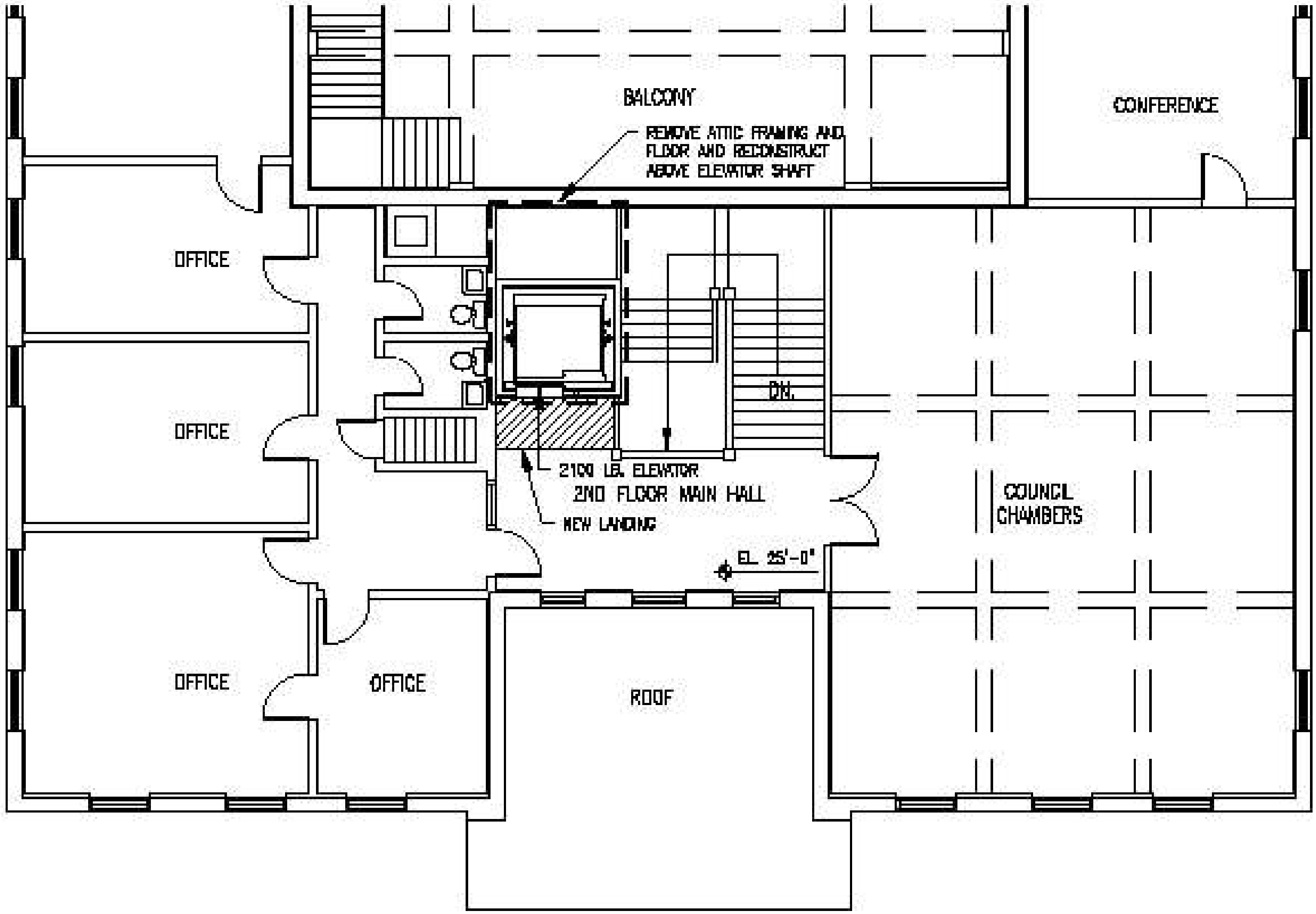

Figure 5 – 2100 lb. Elevator 2nd Floor Plan

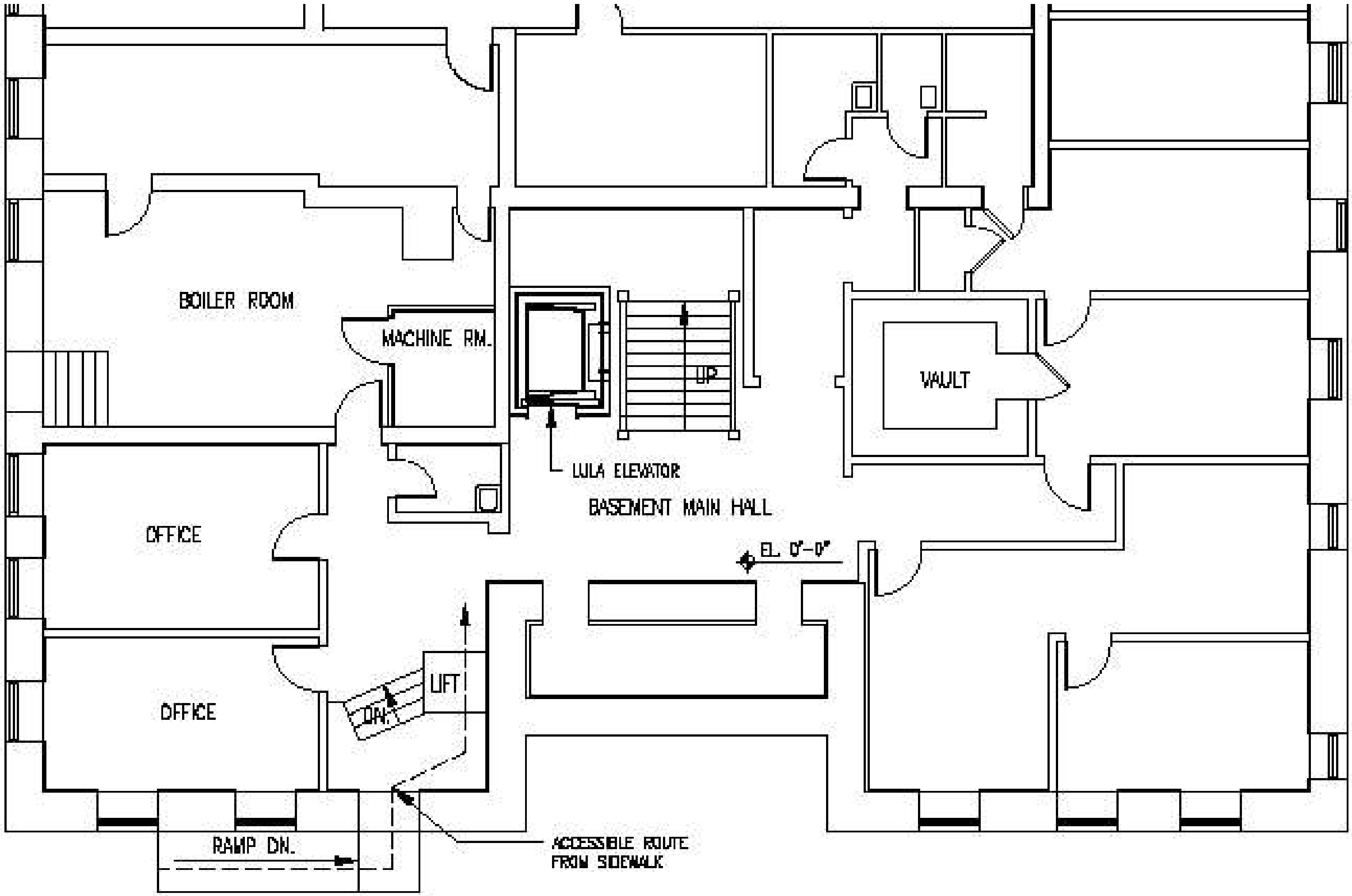

Figure 6 – LULA Elevator Basement Plan

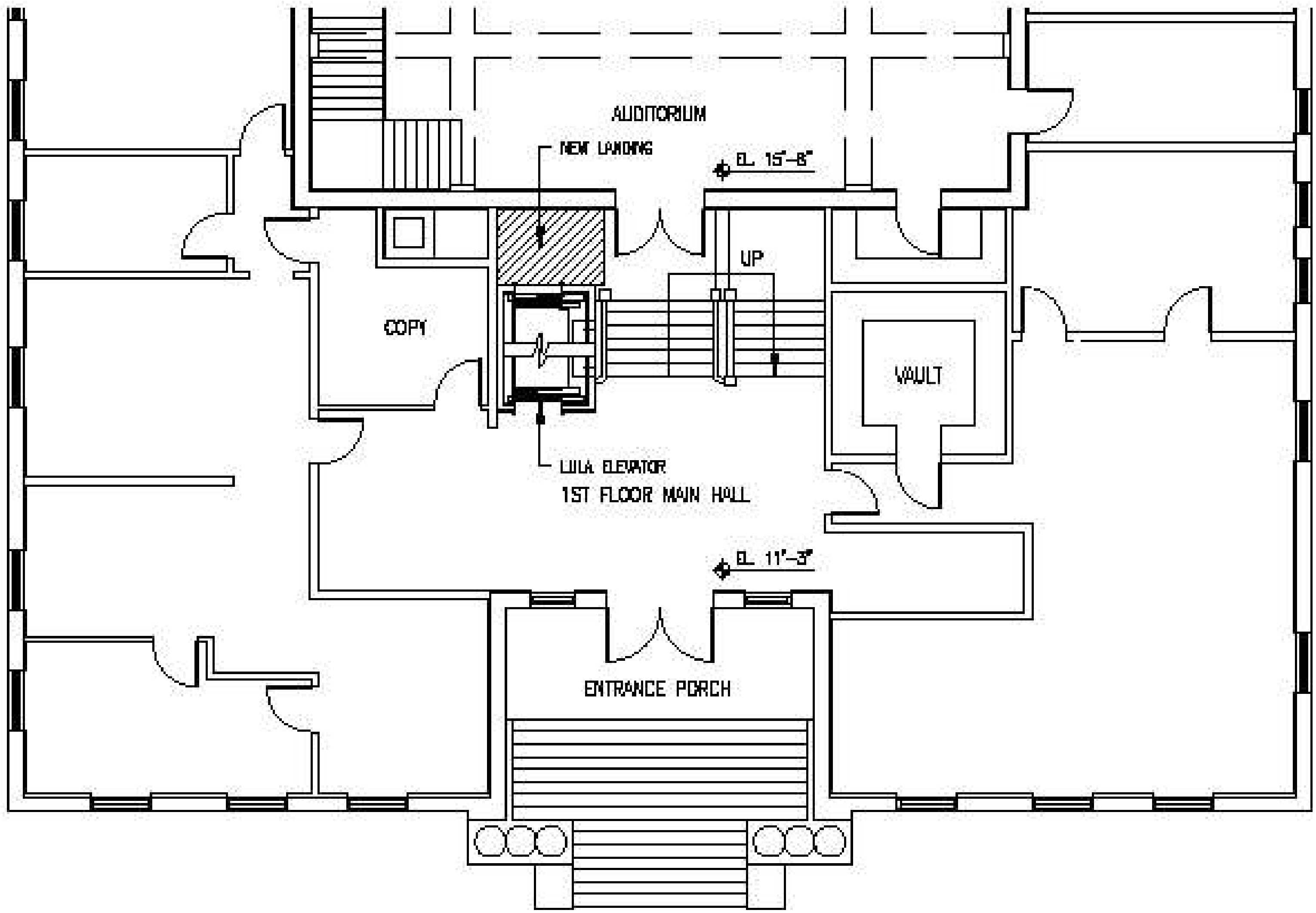

Figure 7 – LULA Elevator 1st Floor / Auditorium Plan

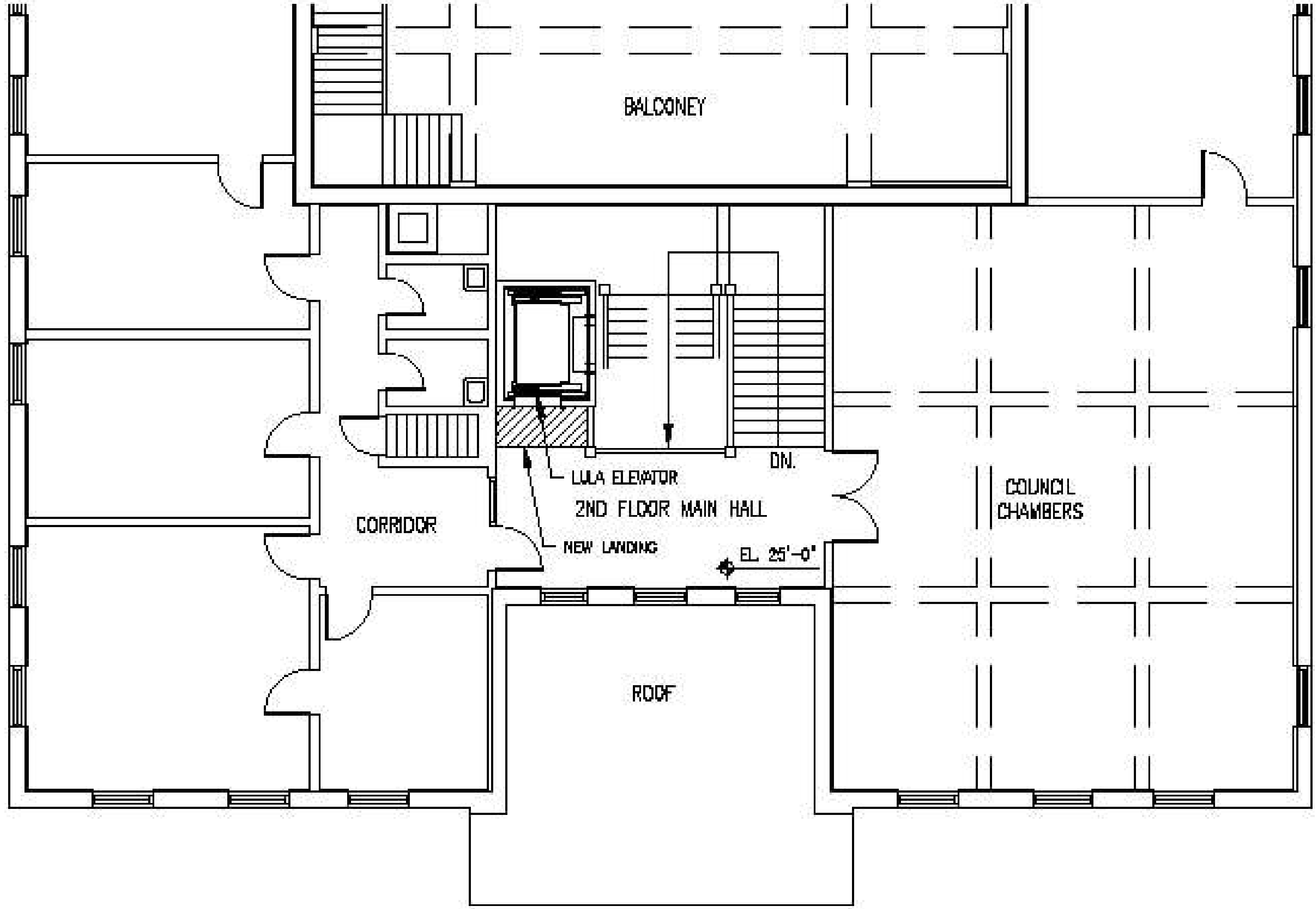

Figure 8 – LULA Elevator 2nd Floor Plan